

# **THE USE OF DIGITAL EDUCATIONAL RESOURCES AND TECHNOLOGIES IN THE TEACHING OF NATURAL SCIENCES IN HIGHER AND SECONDARY SCHOOLS**



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# **SOME HISTORY**

**2008 – Federal Goal Program “ The Development of the unified educational informational medium”**

## **Task:**

**to provide the unification of the state educational space**

## **Methods of realization:**

- **upgrading of the existing elements of informational infrastructure of educational area;**
- **formation the missing ones.**

# **THE DIGITAL EDUCATIONAL RESOURCES (DERs) ARE THE MOST PERSPECTIVE**

**DERs – a digitally available data set used in the educational process as a whole.**

**According to Dr. L. Gorokhova,  
DERs are the following educational materials which are necessary for the organization of the educational process:**

- digital photographs,**
- video clips,**
- static and dynamic models,**
- objects of virtual reality and interactive modeling,**
- cartographic materials,**
- sound recordings,**
- symbolic objects and infographics,**
- text documents, etc.**

# THE GENERAL REQUIREMENTS

## DERs MUST:

- **comply with all regulatory documents of all educational authorities,**
- **be in the agreement with all modern textbooks,**
- **be focused on the modern forms of education, provide high interactivity and multimedia training,**
- **ensure the possibility of level differentiation and individualization of education, take into account the age characteristics of students and the corresponding differences in their (cultural, social, etc.) experience,**
- **offer the types of educational activities orienting the pupil on acquisition of the decision of vital problems on the basis of knowledge and skills within this discipline,**

## **DERs MUST (continued):**

- **ensure the use of both independent and group work,**
- **contain options for educational planning which assumes a modular structure,**
- **be based on reliable materials,**
- **exceed the volume of the relevant sections of the textbook, at the same time without groundless expanding of thematic sections,**
- **be fully reproduced on the declared technical platforms,**

## **DERs MUST (ended):**

- **provide the ability to use other programs in parallel with DERs,**
- **ensure individual adjustment as well as preservation of intermediate results of work where it is methodically appropriate,**
- **have (where it is necessary) built-in contextual help,**
- **have a user-friendly interface.**

## **DERs MUST NOT:**

- **represent additional chapters for the existing textbook and/or educational-methodical complexes,**
- **duplicate publicly available references, popular science, general cultural information, etc.,**
- **be based on materials that quickly lose their credibility (become outdated).**

# **THE TYPES OF DERs**

- 1. Interactive components – questions, problems, control and test works, interactive models, and animations.**
- 2. Demonstration graphics – illustrations, video fragments,**
- 3. Texts – paragraphs of text, texts with sound, biographies of scientists, tables.**
- 4. Teacher materials – presentations and lessons.**

# **INTERACTIVE COMPONENTS**

**Control works and questions for self-checking are used to evaluate a knowledge level of students.**

**There are six types of interactive components:**

- choosing one answer from several answers,**
- multiple choice answer,**
- entering a word, a phrase, or a number,**
- indication of the desired object at the picture (point-n-click),**
- drag and drop objects and superimpose them on each other (drag-n-drop), i.e. match the correlation between two collections,**
- combined answer (several different types in one task).**

# **INTERACTIVE COMPONENTS**

**In the most types of tasks, the computer automatically checks the answer. In case of a wrong answer, a comment with a hint can be issued. So the student can try to answer the question again. The text of the hint depends on what answer the student has chosen.**

**Control tasks as well tasks for self-examination can be used at the different stages of the educational process both at the process of studying new topics and to provide feedback.**

## **THE EXAMPLES OF THE USE OF DERs WITH INTERACTIVE COMPONENTS**

- **during the explanation of the new material – solving a problem and discussion of correct and incorrect approaches to the solution,**
- **fixing of the educational material (solving 2-3 tasks for 5-10 minutes),**
- **homework or solving of the problems by students in the classroom at teacher's choice,**
- **preparation for thematic control, and so on.**

# **THE INTERACTIVE MODELS**

**The use of interactive models significantly accelerates the process of explaining the educational material and improves its quality, especially in basic classes, where there is a shortage of educational time and students tend to “humanitarian – visual” perception of the content of natural scientific education.**

**Images of phenomena, which are formed with the help of models and animations, are remembered for a long time.**

# DEMO GRAPHICS

**In the set of DERs, demonstration graphics are represented by diagrams, graphs, drawings and photographs, portraits of scientists.**

**Graphic objects are not just analogs of traditional text illustrations.**

**They complement, didactically enrich the material, form correct ideas about the studied objects.**

# THE TEXTS

The texts are illustrated in digital forms, designed primarily to repeat the material of the textbook.

The electronic form greatly facilitates the search for information in the text. These are brief notes of the textbook, formulations of laws, biographies of scientists.

Text objects can be organically incorporated into all forms and teaching methods. They can be used both by teachers and students at any stages of the educational process.

# **THE TEXTS**

**The texts with audio commentary can be effective for students for early repetition of the lesson's material.**

**These texts can be used as components of lectures, presentations during explanation of new material.**

**Texts with audio commentary can be useful for children with limited physical abilities.**

# **THE MATERIALS FOR TEACHERS**

**In addition to independent digital resources, now each teacher has the sets of ready-made presentations and lessons that will provide him with methodological support.**

**Teacher's presentation can be used as a form lecturing. A spectacular presentation is accompanied by explanations, comments of the teacher: he can pause the display of "slides", dwell on important material in more detail, not to demonstrate all the slides at once. This form of the lesson-lecture is more effective, as it gives the opportunity to interest students in the topic, intrigue, make them think...**

# **THE TYPES OF DERs**

- 1. Set of DERs that extend textbooks. These contain digitally submitted photos, video fragments, static and dynamic models, virtual reality and interactive modeling objects, cartographic materials, sound recording, symbolic objects, infographics, text documents and other educational materials which are necessary for the organization of the educational process.**

## **THE TYPES OF DERs**

- 2. Information sources of complex structure (IISS).  
IISS is a digital educational resource based on structured digital materials (texts, video images, audio recordings, photo images, interactive models, etc.) with appropriate educational and methodological support, switching on the activities of students and teachers on one or more topics of the subject area or providing one or more types of educational activities within our subject area.**

# **THE TYPES OF DERs**

## **3. Innovative educational and methodical complexes (IEMC).**

**IEMC is a complete set of learning tools which are necessary for the organization and conduction of the educational process . IEMC's feature is the active use of modern pedagogical and information-communication technologies. IEMC must ensure the achievement of educational results which are necessary to prepare students for life in the informational society (fundamental nature of natural science education, ability to learn, sociability, ability work in a team, ability to think and act independently, ability to solve non-traditional tasks using acquired subject, general knowledge, skills and abilities).**

# **THE DERs WERE CREATED FOR:**

- **providing new quality of education aimed at modern forms of education, high interactivity through the use of a wider range of means of visibility and new types of tasks for independent work of students;**
- **orientation towards the achievement of new educational results – competencies expressed in the ability of students to solve problems in various fields of activity (communicative, cognitive, evaluative, practical);**
- **ensuring the possibility of level differentiation and individualization of training (this applies to the level of formation of subject skills and knowledge as well as intellectual and general skills);**

## **THE DERs WERE CREATED FOR:**

- **taking into account age-related psychological and pedagogical features of students and existing differences in the cultural experience of students;**
- **orientation to work with information presented in different forms (graphs, tables, composite and original texts of different genres) and to work requiring mainly non-standard solutions;**
- **organization of educational activities, involving the widespread use of forms of independent, group and individual research activities, forms and methods of project organization of the educational process;**

# THE DERs WERE CREATED FOR:

- acquisition of students' experience in performing tasks that requires a choice of strategy of their own action.

## Зачем ЭОР?



Экономия времени  
и энергии



Планирование  
и организация



Автоматический  
контроль



Библиотека  
материалов

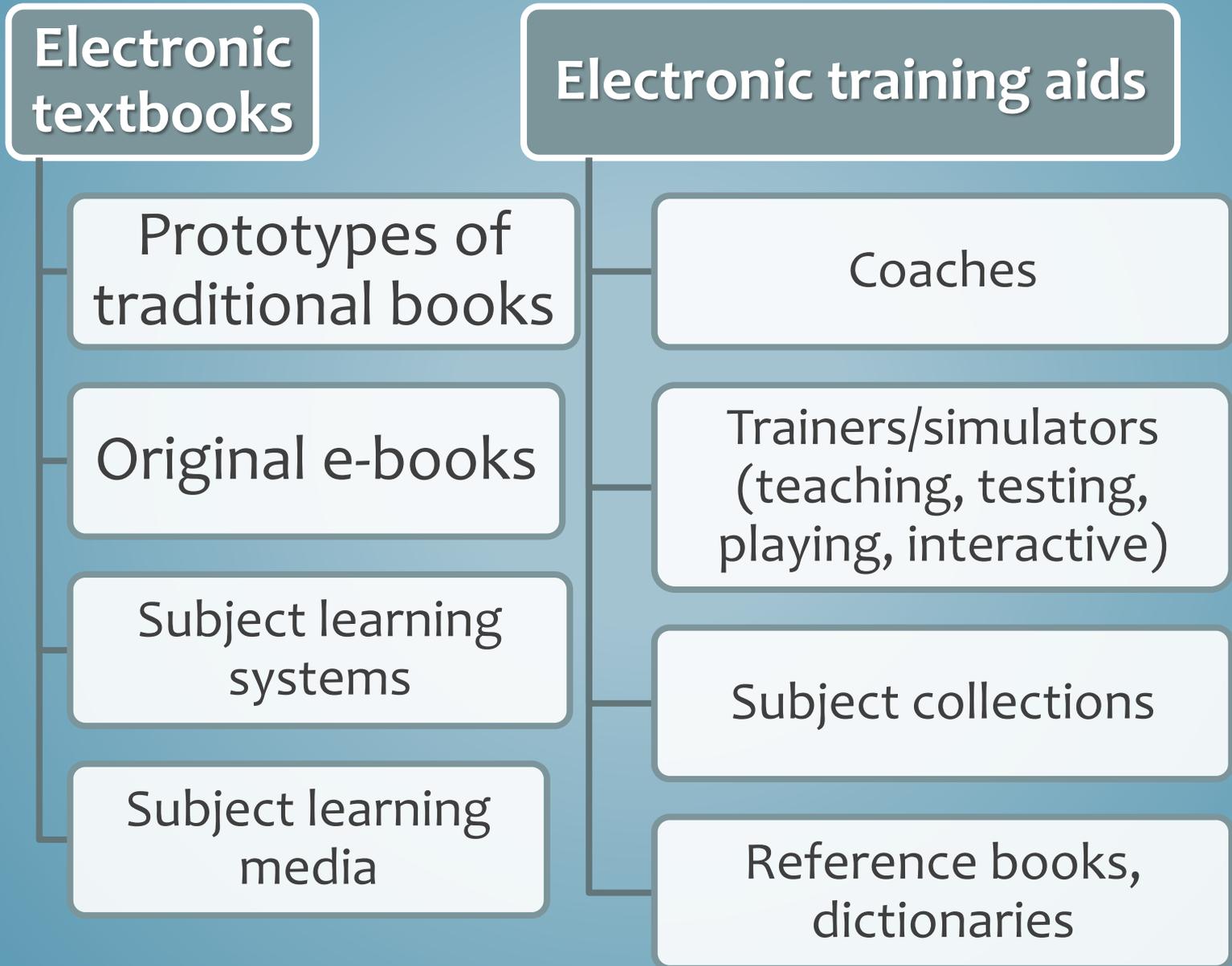


Визуализация,  
интерактивность

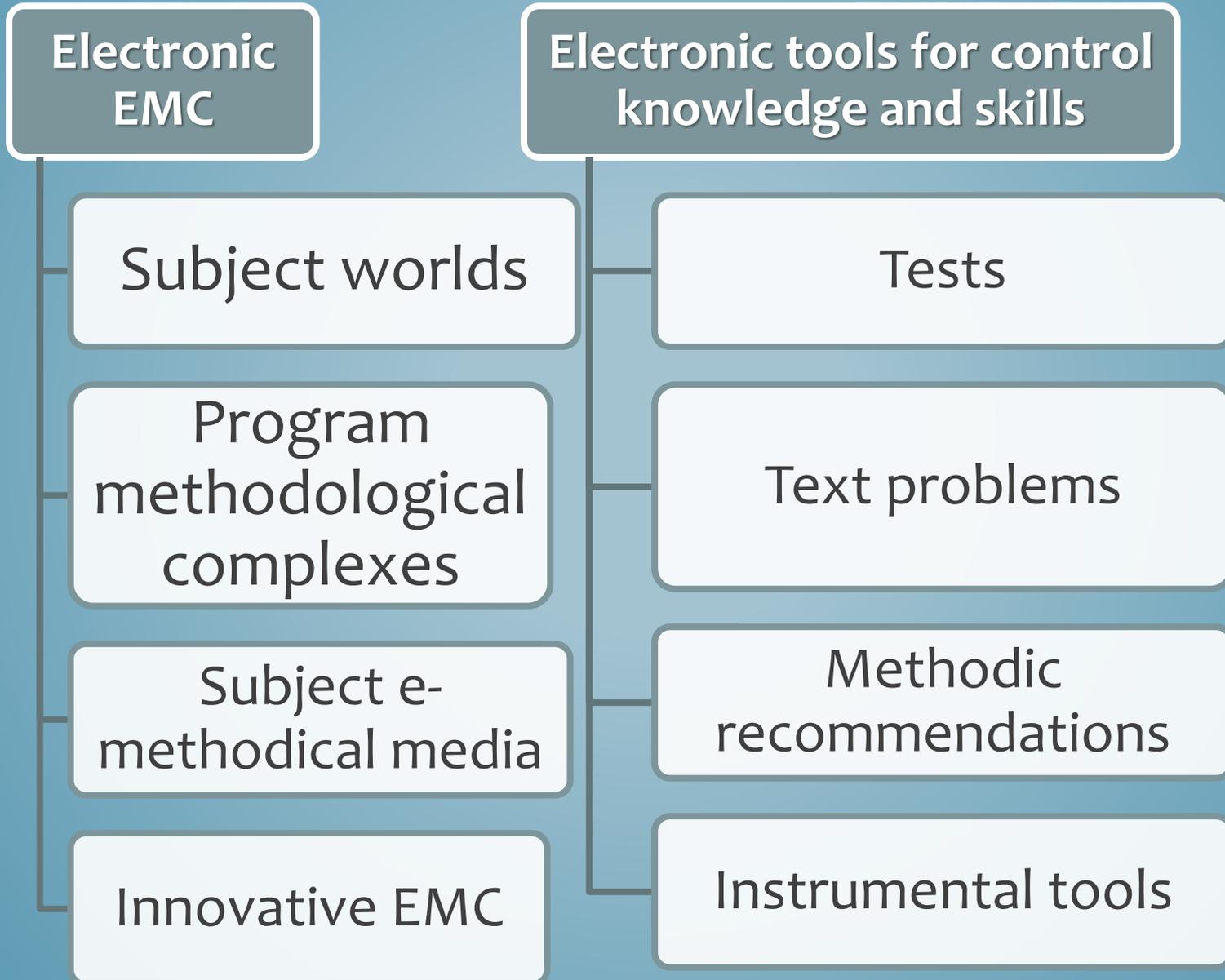


Самообразование  
+ непрерывное  
образование

# CLASSIFICATION AND APPLICATION OF DERs



# CLASSIFICATION AND APPLICATION OF DERs



# **MAIN FEATURES OF DERs**

- **Interactivity**
- **Multimedia**
- **Module principle of construction**

**Federal Centre of  
informational educational  
resources**

**WWW.FCIOR.RU**



МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

# ФЕДЕРАЛЬНЫЙ ЦЕНТР ИНФОРМАЦИОННО-ОБРАЗОВАТЕЛЬНЫХ РЕСУРСОВ

КАТАЛОГ

СЕРВИСЫ

О ПРОЕКТЕ

ФОРУМ

МЕТОДИЧЕСКИЕ МАТЕРИАЛЫ



## ПРОСМОТР РЕСУРСОВ

Для воспроизведения электронных учебных модулей, размещенных в каталоге сайта, может потребоваться установка свободно распространяемого программного обеспечения – [проигрывателя ресурсов](#).



[Установить проигрыватель ресурсов версии 1.0 \(8216 Кб\) для ОС Windows](#)



[Установить проигрыватель ресурсов версии 2.2.2.138 \(33673 Кб\) для ALT Linux 4.1](#)

[Инструкция по установке проигрывателя ресурсов для ALT Linux 4.1 \(618Кб\)](#)

## Каталог электронных образовательных ресурсов

<a href="#">Основное общее образование</a>	2 939
<a href="#">Среднее (полное) общее образование</a>	1 015
<a href="#">Начальное профессиональное образование</a>	2 211
<a href="#">Среднее профессиональное образование</a>	2 586
<a href="#">Дополнительное образование</a>	16



## НОВОСТИ

## О ПРОЕКТЕ

Проект федерального центра

Статистика обращений к хранилищу  
ФЦИОР

ПОИСК:  
Например  
СИСТЕМА

Програ  
 Б  
 п  
Тип мод  
 И  
 п  
 К  
Ограни  
все

Сбро

# Unified collection of DER

<http://school-collection.edu.ru>

## Единая коллекция цифровых образовательных ресурсов



The screenshot shows the website's interface with a search bar and a list of resources. The text on the page is in Russian and describes the collection of digital educational resources.

Федеральная коллекция Единая коллекция цифровых образовательных ресурсов (ФКО) была создана в 2005-2006 гг. в рамках проекта "Информационные технологии в образовании" (ИТОО) - выполняемого Национальным фондом поддержки образования Министерства образования и науки Российской Федерации. В 2009 году включена в реализацию федерального государственного задания программы развития образования (ФГО) РФ.

Целью создания Коллекции является социализация в едином месте и простом доступе для всех педагогов информации о доступных ресурсах, предоставление для преподавания и обучения различных учебных дисциплин и предметов в федеральных государственных образовательных учреждениях начальной, основной школы и государственных образовательных учреждений.

В Коллекцию вошли в настоящее время более 111 000 цифровых образовательных ресурсов, созданных на всех уровнях школьного образования. В Коллекцию представлены также цифровые ресурсы к дополнительным курсам, рекомендованным Министерством РФ в образовательных учреждениях России, авторскими учебными материалами, разработками педагогов, методическими пособиями и учебными пособиями, а также другие учебные, культурно-просветительские и познавательные материалы.

Работа по созданию Единой коллекции цифровых образовательных ресурсов ведется при поддержке Министерства образования и науки Российской Федерации в объеме финансирования из 300 млн руб. в рамках Федеральной целевой программы информационного ресурса.

>110.00  
resources,  
absolutely  
free

# Russian educational portal

[www.school.edu.ru](http://www.school.edu.ru)

(thematic collections – since 2002)

# Moscow e-School

ВИЗИТНАЯ КАРТОЧКА ПРОЕКТА



**МОСКОВСКАЯ**  
ЭЛЕКТРОННАЯ  
ШКОЛА

БУДУЩЕЕ  
ДЛЯ  
ОБРАЗОВАНИЯ

НОВЫЕ МОСКОВСКИЕ ВОЗМОЖНОСТИ

ИНФРАСТРУКТУРНЫЕ РЕШЕНИЯ

ПРОГРАММНЫЕ РЕШЕНИЯ

ОБРАЗОВАТЕЛЬНЫЙ КОНТЕНТ

ВКЛАД УЧИТЕЛЕЙ В РАЗВИТИЕ МЭШ

# Moscow e-School

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graph TD; A[Moscow e-School] --- B[Library of educational materials]; A --- C[e-Register]; A --- D[e-Diary]
```

Library of  
educational  
materials

e-Register

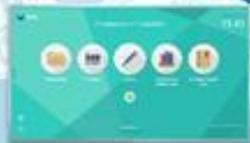
e-Diary

# Moscow e-School

## МОДЕРНИЗАЦИЯ ИНФРАСТРУКТУРЫ



Связь цифрового оборудования класса и школы с персональными устройствами учащихся и учителей для решения образовательных задач.



ИНТЕРАКТИВНЫЕ  
ПАНЕЛИ



НОУТБУКИ  
УЧИТЕЛЕЙ



ВЫСОКОСКОРОСТНОЙ  
Wi-Fi ДОСТУП

- ✓ Эффективное использование времени урока.
- ✓ Учебный материал представлен наглядно, динамично и интересно.
- ✓ Работа с электронным журналом и сценариями уроков в любом месте в удобное время.
- ✓ Современное рабочее место учителя.
- ✓ Использование устройств учащихся и учителей на каждом уроке, во внеурочной деятельности и в дополнительном образовании.

# Moscow e-School

НОВЫЕ ВОЗМОЖНОСТИ



КАЖДОЙ МОСКОВСКОЙ СЕМЬИ



## ДНЕВНИК И ЖУРНАЛ

- ✓ ОПЕРАТИВНАЯ ИНФОРМАЦИЯ О ХОДЕ И РЕЗУЛЬТАТАХ ОБРАЗОВАНИЯ
- ✓ СОХРАНЕНИЕ ОБРАЗОВАТЕЛЬНОЙ БИОГРАФИИ УЧАЩЕГОСЯ
- ✓ ЦИФРОВОЕ ОБРАЗОВАТЕЛЬНОЕ ПРОСТРАНСТВО

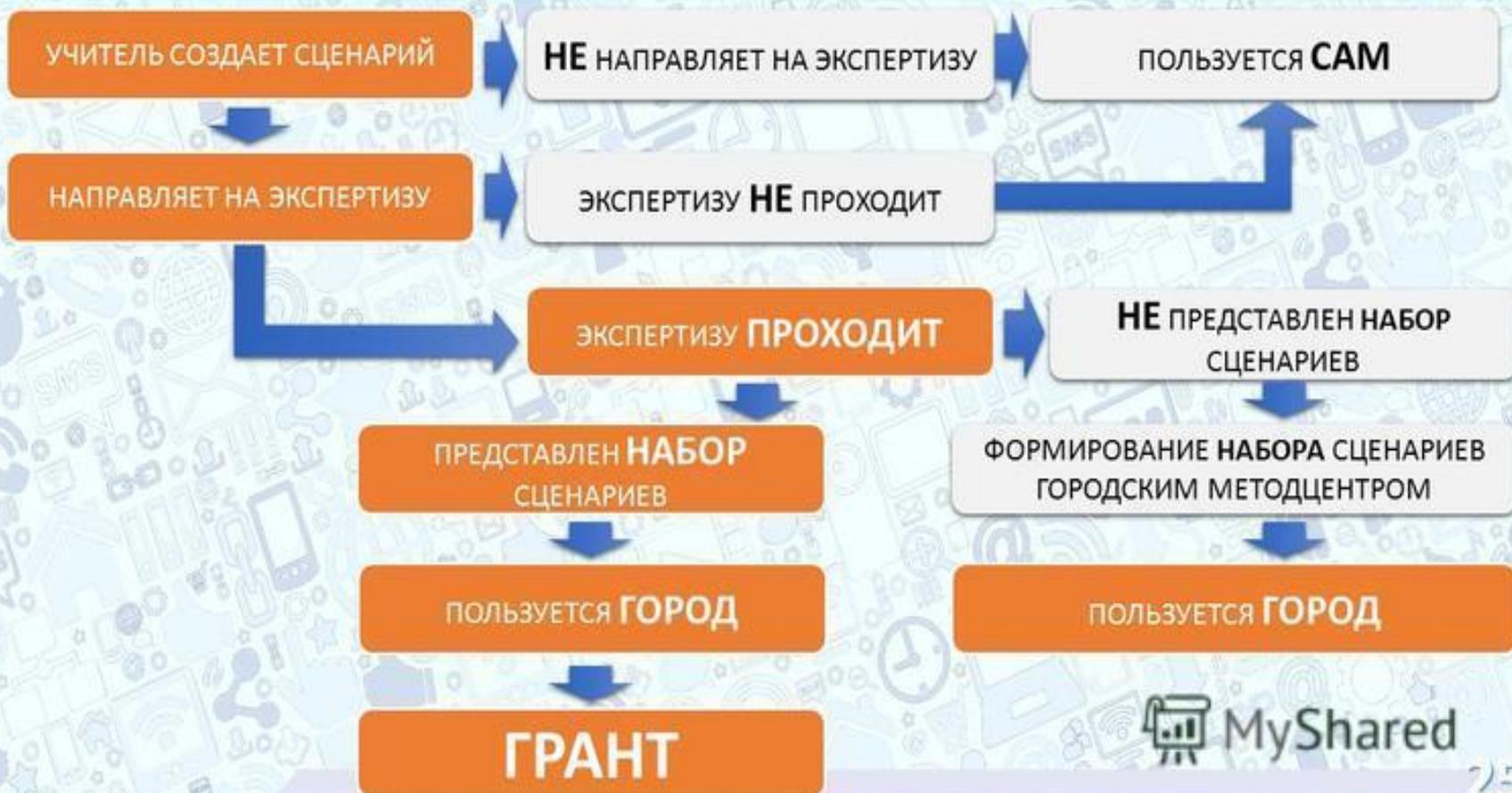


## БИБЛИОТЕКА

- ✓ ВОЗМОЖНОСТЬ ПОВТОРЕНИЯ УРОКА В УДОБНОМ МЕСТЕ В ЛЮБОЕ ВРЕМЯ
- ✓ ДОСТУПНОСТЬ СЦЕНАРИЕВ УРОКОВ УЧИТЕЛЕЙ ИЗ ДРУГИХ ШКОЛ
- ✓ ПОИСК ПО ТЕМАМ И КЛЮЧЕВЫМ СЛОВАМ
- ✓ ВСЕ УЧЕБНИКИ, ТЕСТЫ, СЦЕНАРИИ УРОКОВ С СОБОЙ

# Moscow e-School

## ВКЛАД УЧИТЕЛЕЙ В РАЗВИТИЕ МОСКОВСКОЙ ЭЛЕКТРОННОЙ ШКОЛЫ



# SUCCESSFULLY REALIZED PROJECTS

- Moscow e-school
- Russian e-school

DERs : for each school subject, for each year of education, for each lesson (information, training, control)

- School league RosNANO  
(1000 schools, 76 regions)

# SUCCESSFULLY REALIZED PROJECTS

- Resources for blended learning
- eLearning courses
- open university resources
- open e-library resources
- instruments for creation and organization video content
- video content
- cloud applications
- platforms for evaluation of skills
- tools for tutorship, etc.

## OLD IDEAS

- The world has changed...
- The Internet has penetrated into all spheres of our life...
- Children live in social networks...

## NEW IDEAS

- The school should showcase modern educational practices in the digital age.
- It should develop readiness for change, the ability to creative search and other “skills of the XXI century”.
- The school should teach teamwork.
- It should teach students responsibility for their own education achievements.

## Our common goals

- be always get acquainted with successful practices in the field of e-learning,
- determine the ways of their implementation in the educational process in the conditions of growing requirements of the society of high technologies to education.

## Our common tasks

- understanding the existing experience of e-education in the country and in the world, related educational challenges, requests and opportunities.
- introduction to e-learning and EdTech market offerings: services and products.

## Our common tasks

- consideration of the best cases of the use of digital technologies in the teachers' practice.
- formation of the request of teachers' community to the (inter)subject content and the most effective formats for the implementation of educational programs using digital technologies.

## Our common tasks

- **identification of new opportunities for partnership and cooperation of various educational organizations and projects.**

**I wish all us to be successful on this way**

**THANK YOU VERY MUCH  
FOR YOUR ATTENTION!**

**Assoc. Prof., Dr. Alexander SOBOLEV**

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