# Electronic Educational Resources as a Subsystem of an Integrated Information and Analysis Area of the University*

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**Abstract.** The article substantiates the use of electronic educational resources integrated with the information-analytical environment of the educational organization of higher education.

Electronic educational resources are designed to provide learners with materials for classroom and independent work. Conducting lectures, laboratory work and practical exercises with the help of electronic educational resources improves the quality of education and helps to adapt the learning process depending on the individual abilities of students, such as limited health and intellectual and creative potential. The integration of electronic educational resources with the information-analytical environment of the university ensures the integrity of information management and ensures data security.

The scientific results of the study are used in the educational process of future IT specialists - students of the "Applied Informatics" training areas in the disciplines of "Databases Design and development", "Informatics", "Methods of research and development".

The main theoretical provisions of the study are practically tested in the structural units of the Humanities and education science (branch) Academy of V.I. Vernadsky Crimea Federal University in Yalta.

**Keywords:** electronic educational resources, improving quality education, individual abilities of students, continuous education.

## 1 Introduction

### 1.1 The relevance of the study

Improving the informational infrastructure in the fields of science, education and technology is one of the most important tasks for development of fundamental science and applied investigations in Russian Federation (Order of the Government of the Russian

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Federation of December 8, 2011, No 2227-p “On approval of the strategy of the innovative development in Russian Federation till 2020”, Order of the Government of the Russian Federation of July 28, 2017, No 1632-p, “On approval of the program Digital Economy of the Russian Federation”).

Significant applied research and development are carried out in priority areas for the development of science, technology, and technology. They should be aimed at solving integrated scientific, technical and technological problems and focus on the final result, which can become an innovative product, in which data in digital form is a key factor of production in all spheres of socio-economic activity.

Electronic educational resources, designed on the basis of information technologies and integrated with the information and analytical environment of the educational organization of higher education, improve the quality of education, and adapts the educational process depending on the individual characteristics of students.

### 1.2 Purpose and objectives of the study

The purpose of this study is to justify the importance of the use of electronic educational resources in the educational process of educational institutions of higher education integrated with the information-analytical environment of the educational organization of higher education.

The objectives of the study are:

1. The theoretical substantiation of the importance of the use of electronic educational resources in the educational process.
2. Demonstrate the functioning of the designed electronic educational resource, integrated with the information-analytical environment of the educational organization of higher education.

## 2 Integration of educational resources

### 2.1 Electronic educational resources

In the era of digital information technology, many educational institutions of higher education have recognized the need to visualize learning. For the formation of the modern concept of the development of education, electronic educational resources are being introduced into the educational process.

Electronic educational resources carry the foundation of e-learning. The term eLearning - electronic (online) training was first professionally introduced in 1999 by Elliott Macy, an expert in educational technology. Since then, e-learning has gained popularity due to factors such as the development of the Internet and multimedia, the availability of digital devices and the development of learning management systems.

Before the advent of the Internet, many educational organizations used printed educational publications, CDs and other local methods for education and training. The development of the Internet has provided an opportunity for educational institutions of higher education to abandon one-dimensional learning and use the flexibility of e-learning.

The development of e-learning has contributed to the integration of video, audio and graphic elements, which has led to the development of multimedia. Visualization of learning has proven to be a more effective way of engaging learners in the learning process as compared to traditional learning [4].

Digital devices, such as personal computers, laptops, tablets, and smartphones, are currently being upgraded and become popular because of the affordability and intuitive interface. The development of digital devices has contributed to the growth and popularization of e-learning.

The development of the Internet, multimedia and digital devices have led to the development of learning management systems, which have become complex, moving from locally installed to cloud systems. Educational organizations often use learning management systems to organize many forms of learning. When choosing a learning management system, consideration should be given to the functionality and support necessary to achieve the goals of the teacher and students.

Electronic educational resources are characterized by four signs:

1. Learning resources that are available online, rather than from print sources.
2. A learning resource available online in an online educational environment. These can be HTML web pages, with information about the objectives of the discipline, lecture notes, guidelines for conducting laboratory work or practical exercises. These can be audio or video lectures, interactive exercises or tests for the exam, or links to other web pages.
3. Any digital material used to teach students.
4. Educational content on digital media or materials available to students online.

Thus, an electronic educational resource is a learning resource represented in digital form, containing structure, subject content, and metadata. An electronic educational resource may include data, information, and software necessary for the study of disciplines.

To ensure access to all participants of the educational process, electronic educational resources should be presented as web pages of information and analytical system with on-line access 24 hours a day and storing information throughout the entire life cycle of continuous learning.

## 2.2 Electronic educational resources, integrated subsystems of the information-analytical environment of the university

The fundamental feature of the activities of educational institutions of higher education is the level of information and analytical support. Based on the international experience of reengineering of educational institutions of higher education, we can conclude about the need to provide information and analytical support in the form of information and analytical environment.

Information and analytical systems are designed to collect, store and issue formalized economic, technical or technological data at the request of the user. We can assume that information and analytical systems are focused on working with specific data of a digital or text type. There are various information and analytical systems depending on

the type of request and the form of presentation of results. The request can be standard and arbitrary. The results can be presented either in the form of a standard certificate or in the form that is developed by any type as desired by the user when processing his request [5].

The single information-analytical area of the educational organization of higher education covers such areas as educational and methodological activities, administrative and management activities and educational activities, therefore this area is based on storing and managing the following information:

- information of students, such as education level, form of education, form of payment, gender, age, orders of the movement of the contingent, personal data that students are required to provide when enrolling in the university, passing the selection committee;
- information about academic staff, such as age, academic rank, academic degrees, position, and rates;
- information on educational activities, such as the main professional educational programs of higher education [3].

Designing single information and analytical area for a higher education organization will allow organizing accounting, storage and on-line access to data collected during the work of structural subdivisions of an educational organization of higher education for providing relevant information.

The introduction of modern technology, providing single information and analytical area in the workflow of the educational organization of higher education, will increase the efficiency of information processing.

The provision of single information and analytical area for an educational organization of higher education is based on the informative model of comprehensive information and analytical system for uniting structural units of an educational organization of higher education, providing reliable information about applicants, students, and teachers.

A technology that provides unified information and analytical area for an educational organization of higher education, designed with the help of comprehensive information and analytical system for analyzing and monitoring the indicators of a contingent of applicants, students and teachers of the higher education institution GPAYALTA home page, which is shown Figure 1.

The design tool for the technology providing unified information and analytical area of the educational organization of higher education is the Microsoft Visual Studio 2013 Ultimate environment – a set of design tools that allows development teams of any size to turn their ideas into cross-platform ASP.NET-enabled applications.

The main task of ASP.NET is the development of Web-sites. Therefore, HTML markup is included on web pages developed in ASP.NET, which includes controls for managing information. When creating a Web page with the .aspx extension, the Web-form is most often used with controls that are automatically created when dragging from the ToolBox.

**Fig. 1.** Starting web page GPAYALTA

The integration of electronic educational resources, as a subsystem of the information-analytical environment of the university, is necessary to ensure on-line access for students and teachers, to systematize and manage the educational process.

Electronic educational resources, integrated with the information-analytical environment of the university, will provide teachers and students with modern digital technologies, with the help of which it is possible to manage the schedule of classes in the disciplines, provide students with methodological materials for lectures, laboratory work, and practical exercises.

To organize the educational process in an educational organization of higher education, it is necessary to comply with the approved schedule, according to which lectures, laboratory work, and practical classes are held.

The schedule indicates the group, the name of the discipline, the type of lesson, the date of the lesson, the time and audience for the lesson, and the full name teachers. In the electronic educational resource integrated with the information-analytical environment of the university, the subject of the lesson was added.

On the web page with the schedule, teachers have access to adding information about classes, deleting records of classes, a link to go to a web page with details of classes (Fig. 2).

The Lesson Schedules Web page is formed using an ASP.NET GridView visual control, which is used to present data in a screen table formed from rows and columns. GridView contains a wide range of built-in methods and commands.

To add a lesson entry, use the FooterTemplate tag – a field property of the footer column of the GridView control's TemplateField object. The choice of using TemplateField is justified by the fact that this object provides the use of various controls, such as Label, DropDownList, and TextBox, which greatly contributes to providing a software solution for creating a convenient working interface of the Lesson Schedule web page.

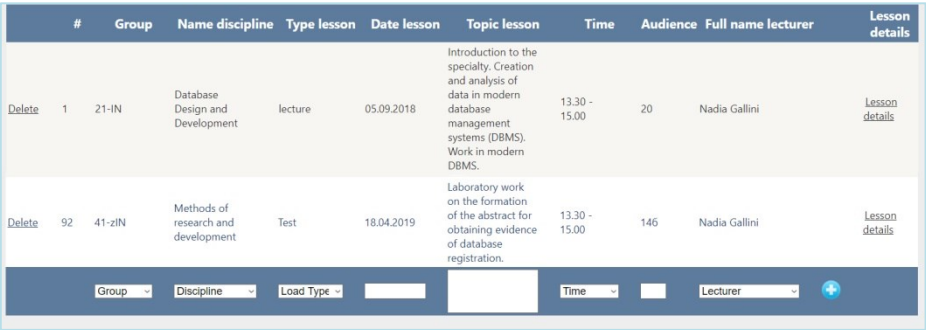


**Fig. 2.** Webpage Lesson Schedules

To navigate to a web page with lesson details, use the HyperLinkField column, which supports the properties required for the data connection. The HeaderText property sets the column header. The NavigateUrl property sets the URL to navigate when clicking on a hyperlink. The Text property sets the text value for the hyperlink. The runat="server" property indicates that the server will manage HTML. The DataNavigateUrlFields property is formed to associate with the name of the data source field used to form the URL of the object's hyperlinks. The DataNavigateUrlFormatString property required to store information about the URL of the web page to go to. The meta: resource key property is required for localizing Web pages.

On the web page with the lesson details, the teacher can edit the timetable data (Fig. 3), place the presentation for the lesson (Fig. 4), and save questions to check the students after the lesson to check the learning and assessment (Fig.5).

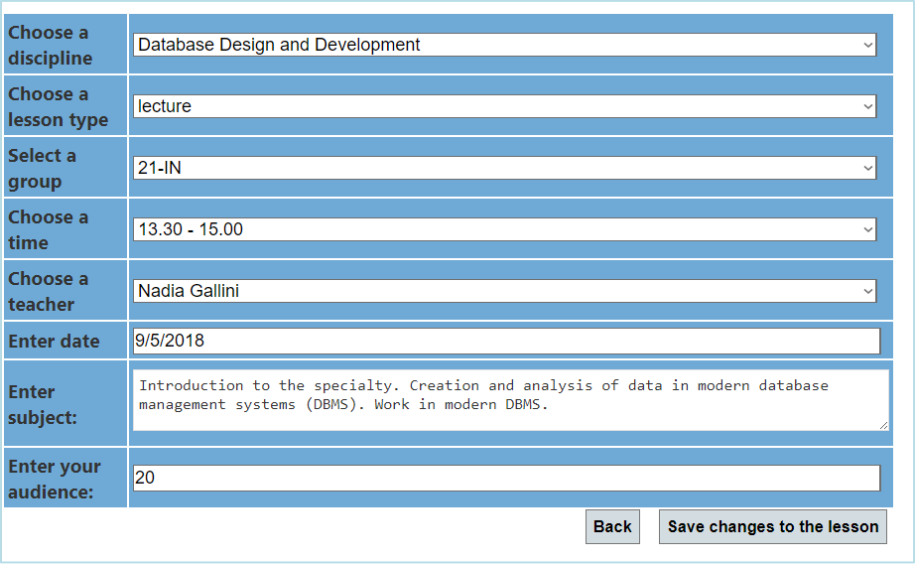


**Fig. 3.** Edit Lesson Web Page (Schedule Data)

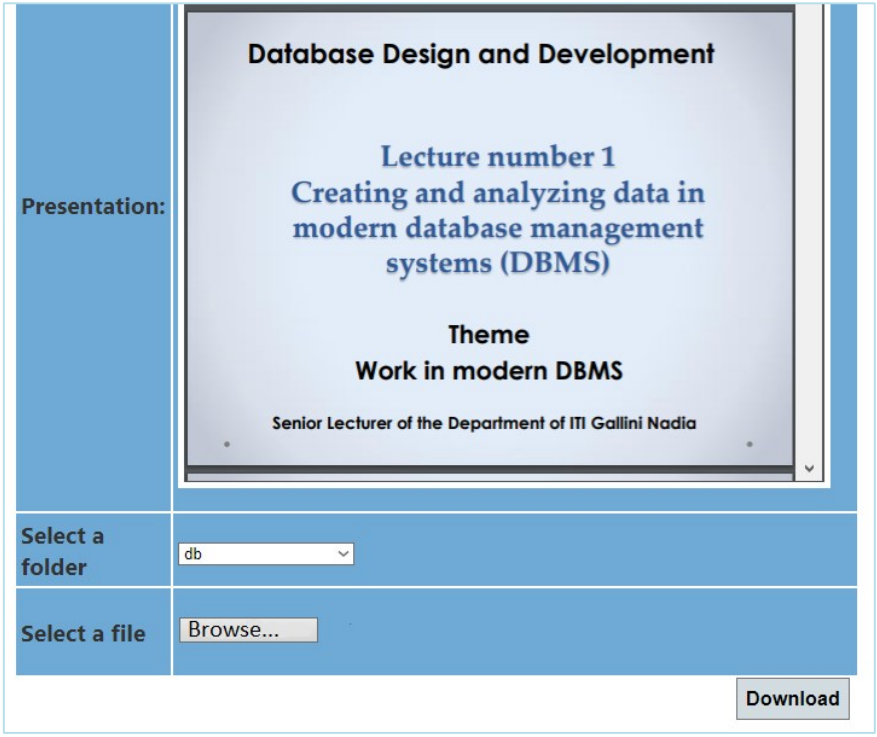


**Fig. 4.** Web page Editing a lesson (presentation)

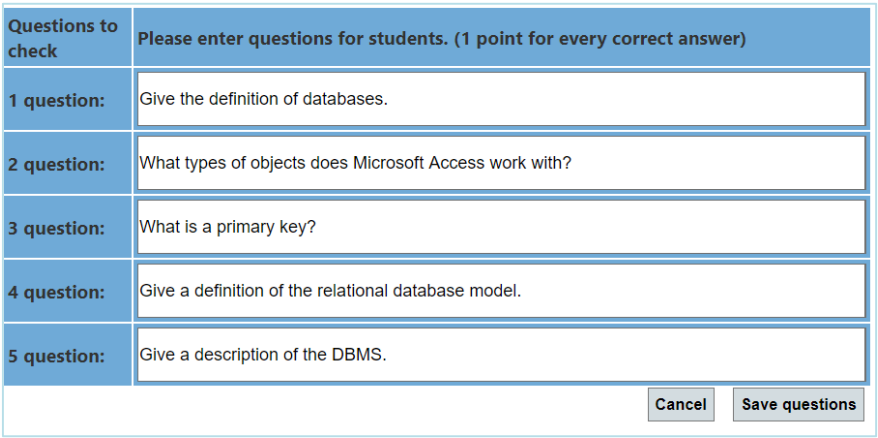


**Fig. 5.** Web page Editing a lesson (questions)

Thus, the teacher, filling out information for classes on the discipline in an electronic educational resource, integrated with the information-analytical environment of the educational organization of higher education, provides management of the educational

process and students with all the necessary information, teaching materials and organizes testing knowledge of the discipline.

Teaching with the help of an electronic educational resource integrated with the information-analytical environment of the university provides multilingualism since this resource is developed in English and Russian. The use of English in the study of disciplines of students in applied computer science is a pressing issue since the importance of the role of the English language is recognized in research activities and international communication.

On the web page with the schedule of classes, students receive information on the name of the discipline, type, date, time and audience of the lesson, as well as the topics of the lesson and assessment obtained after checking the teacher's assignments (Fig. 6).

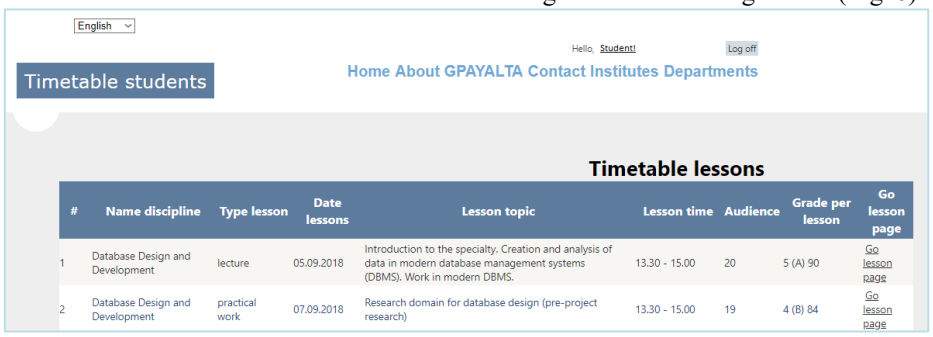


**Fig. 6.** Web page Student timetables

A student can go to a web page with a lesson using a HyperLinkField with the name "Go lesson page" from a web page with a lesson schedule. Figure 7 shows the student's lesson web page.

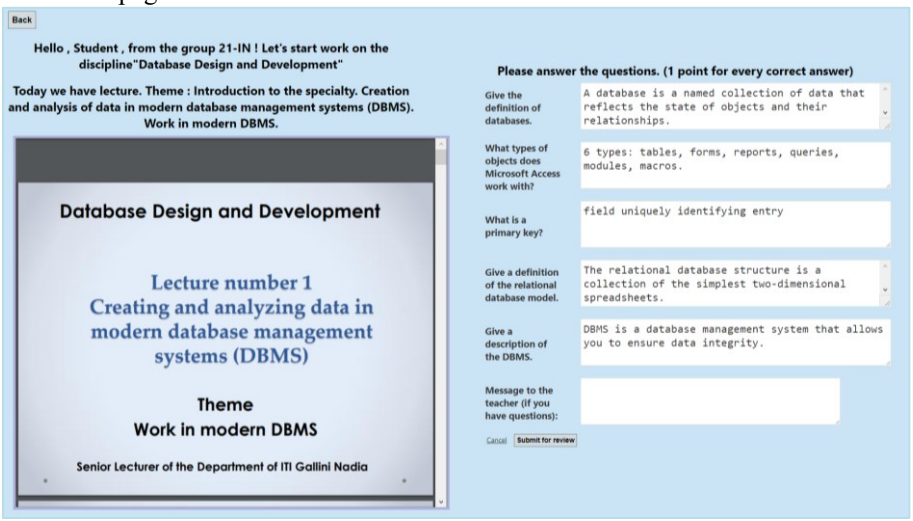


**Fig. 7.** Webpage Student Classes

## Conclusion

In the process of studying the disciplines with the help of electronic educational resources of the integrated information-analytical environment of the university, students will receive knowledge; skills and experience that will help them acquire the necessary competences in studying information technologies, such as "Databases design and development", "Computer Science", "Methods of research and development work". And what is very important is the support of communication competencies, since training takes place using a multi-language environment.

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