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## WEB-BASED INFORMATION SYSTEM FOR RESEARCH AND DEVELOPMENT OF EDUCATIONAL PORTFOLIO (EDUPortfolio)

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### Abstract

*A portfolio is a purposeful collection of student work that exhibits the student's efforts, progress, and achievements in one or more areas of the curriculum. We present an information system for management of portfolio development and organization of scientific research on portfolio thematic. We propose some new ideas related to portfolio assessment and security of the portfolio materials.*

### Introduction

An educational portfolio is a collection of evidence that demonstrates the progressive acquisition of knowledge, skills, and attitudes. It also gives a picture of your individual experience in a learning situation. In the paper we present an information system (**eduPortfolio**) that serves main ePortfolio routines. It covers the full process of portfolio development - collection, selection and assessment. But there are a lot of new features that make portfolio development and usage more convenient and effective.

### Educational portfolio

A portfolio is a record of learning that focuses on the student's work and her/his reflection on that work. It should represent a collection of students' best work or best efforts, student-selected samples of work experiences related to the outcomes being assessed, and documents according growth and development toward mastering identified outcomes [7].

The collection must include the following:

1. Student participation in selecting contents;
2. Criteria for selection;
3. Criteria for judging merits;
4. Evidence of a student's self-reflection.

In this new era of performance assessment related to the monitoring of students' mastery of a core curriculum, portfolios can enhance the assessment process by revealing a range of skills and understandings one students' parts; support instructional goals; reflect change and growth over a period of time; encourage student, teacher, and parent reflection; and provide for continuity in education from one year to the next. Instructors can use them for a variety of specific purposes, including:

1. Encouraging self-directed learning;
2. Enlarging the view of what is learned;
3. Fostering learning about learning;
4. Demonstrating progress toward identified outcomes;
5. Creating an intersection for instruction and assessment;
6. Providing a way for students to value themselves as learners;
7. Offering opportunities for peer-supported growth.

There are three major types of portfolio [3]:

**Working** - work in progress as well as finished samples of work. It serves as a holding tank for work that may be selected later for a more permanent assessment or display portfolio.

**Display** - display of the students' best work. The purpose of a display portfolio is to demonstrate the highest level of achievement attained by the student.

**Assessment** - to document student learning on specific curriculum outcomes. As such, the items in the portfolio must be designed to elicit the knowledge and skill specified in the outcomes.

An electronic portfolio, also known as an e-portfolio or digital portfolio, is a collection of electronic evidence assembled and managed by a user, usually on the Web. Such electronic evidence may include inputted text, electronic files, images, multimedia, blog entries, and hyperlinks. Some e-portfolio applications permit varying degrees of audience access, so the same portfolio might be used for multiple purposes [2], [5], [6].

### Information system for educational portfolio (eduPortfolio)

We present an information system for ePortfolio with some new features that raise it to a higher level than the existing similar systems [4], [5], [6], [9]. The system contains two basic functional modules. First one covers the whole process of portfolio development. The other one focuses on scientific research on portfolio thematic.

First we will consider the portfolio management module. It covers the full process of portfolio development - collection, selection and assessment. All the users have specific roles assigned. These roles are predefined and could be changed and assigned only by the administrators of the system. Non registered users could only see some demo data and generally could not use the system. Basic user roles are administrator, creator, teacher, student, assessor, parent, viewer etc. All these roles determine user access to different types of data and system functionality.

The main **workflow** of a document in the system is as follows. A new document is created and added into the system. This could be done either by a student or by a teacher. The document could be from various types - text, image, video, graphics, sound etc. After that it could be assigned to the working portfolio of a concrete student(s). The document has initial status and could be additionally modified. When the document receives final status there is no opportunity to be modified by the student any more. The document appears in the teacher profile and should be approved in order to become a permanent part of a working portfolio.

Next is the step of building a display portfolio. Students select their best works and assign them special "weights" in order to differentiate its quality. In this process they are restricted by predefined restriction given by the teachers - in example if a student is good in music but not so in mathematics it could not select only music materials to include in the portfolio or the student should select materials from all parts of the curriculum. Here is one of the most important new features of the system - evaluation helper capability.

Users with parent role could see a portfolio of their children and make comments and proposals that could improve the student's portfolio.

The final step is assessment process and building assessment portfolio. Users with the assigned role assessor define assessment criteria according to the curriculum goals. Then they give marks ("weights") to the student materials that are included in the working portfolio. In order to select a set of materials that best suits curriculum goals with given marks and restrictions assessor could use evaluation helper capabilities of the system.

Evaluation helper gives opportunity to automatically assess the portfolio using criteria and restrictions predefined by the educator. This service could be used in two directions. Students could use it in order to build their display portfolio. The evaluation helper uses "weights" given to the documents by the students and select best compilation of them bearing in mind restrictions for selection process given by the educator. On the other hand this service could help also to the assessor. He gives marks ("weights") to the students' materials and also creates specific limitations according to the curriculum targets. Thus using this data evaluation helper service could propose to the assessor a package of student works that is most appropriate for assessment portfolio.

The second main module of the system is devoted to scientific research in the area of educational portfolio. Users that could use this functionality are students, PhD students, researchers and all interested in the portfolio as a scientific matter. This part of **eduPortfolio** gives some useful functionality to the researchers. There is a database with a lot of papers, books, presentations and other materials related to a portfolio that could be used in the research process. Also there is a list of journals and scientific conferences that could be used either as a reference or as a source for future publications. All the materials included are semantically annotated and this gives opportunity for easy and powerful search. There is also a module for building new and publish results from already created questionnaires related to educational portfolio. All the results could be analysed automatically is several different ways, exported in different formats (XML, CSV, XLS, etc.). Also there is a graphical representation of data.

In the development of **eduPortfolio** a two-tier configuration is used. It consists of Application Space and Database, which communicate through PHP code. The application space uses a Web-browser, which communicates with an Apache server through HTTP. The database is maintained by a MySQL server. Evaluation helper functionality is developed in two different software realizations. For easier access and configuration it could be used as a part of the main source code of the system. There is also a possibility to use it as a separate web service in case you want to host it on a different machine or to attach it to other information system.

In view of the fact that unique photo material is kept in the system, protection against illegal copying and spreading is needed. There is an opportunity for downloading partial photo materials on the client computer, but before that, it is uniquely signed, so that its origin could be proved. We use digital watermarking for that signing. A digital watermark is a visible, or preferably invisible, identification code that is permanently embedded in the data, and remains present within the data after any decryption process [8].

We use techniques described in [1] in order to add visual and non visual watermarks to the materials added into the system.

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