

Web-based resources for learning in a cloud environment

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ABSTRACT

The article presents a methodology for creating a website design "Cloud technologies in education", which is designed to train students in a cloud environment. At the heart of the presented design is the ADDIE model for designing web-based learning resources. According to this model, design goes through the stages of pedagogical design, technical design, implementation, testing and publication, and evaluation. According to the ADDIE model, a website "Cloud technologies in education" was created. The site was created with the capabilities of Google Workspace for Education and includes texts, presentations, mind maps and surveys. An important element of website design is the evaluation of students who perceive cloud learning as useful and exciting.

Keywords: Cloud technologies, Cloud environment, Google Workspace for Education, Web-based learning resources ADDIE model

1. INTRODUCTION

Educational design in technology education is a new stage in the development of educational technologies, which demonstrate new trends in their development through the application of modern cloud technologies. The analysis of scientific developments, which consider the conceptual basis for the development of web-based learning resources give an idea of new trends in the development of pedagogical design, as well as teaching aids created on the basis of modern information and communication technologies. It is using user-oriented approach in the development of web-based learning resources, in which participants in the educational process take an active part. There are different models for designing web-based learning resources, but their use can be understood through the ADDIE model. ADDIE (Analysis-Design-Develop-Implement-Evaluation) is used to design the Cloud technologies in Education website. It is a dynamic and flexible tool for creating web-based learning resources.

Web-based learning resources are an interactive web-based learning tool in the cloud. Web-based learning resources is a term found in the English-language literature [2], [3]. In Russian literature it is used as a "learning Internet resource" [1], [4], [5]. The concept of a web-based learning resource is similar to the term "web-based learning tools", which are referred to as "learning object" [3]. The term is defined as an "interactive web-based tool" that supports the learning process by accelerating, enhancing and guiding learners' cognitive processes [3].

The web-based learning resource must meet pedagogical, technological and content requirements. Technological requirements: compatibility options; technological usability; quality of the elements in the graphical user interface; accessibility, navigation and method of delivery to the user.

Pedagogical requirements: the strategy for lifelong learning are related to theories such as connectivism, constructivism and social learning.

Requirements to content must be in accordance with an approved curriculum. There are various web-based resources, such as the educational site, which includes illustrative material that the teacher can use directly in the lesson, as well as a summary of the teaching material, content of exercises or tasks, examples and their solutions and other information, which the teacher can ask the students for independent work.

2. METHODOLOGY

The design of a Web-Based Learning Resources based on the ADDIE model was applied in the development of a web site, which provides training to students in the discipline "Cloud Technologies in Education" at SWU "Neofit Rilski". The ADDIE model includes five phases: needs analysis; design; development-creation of a pilot resource and implementation and evaluation at each stage of the design process.

A. Analysis

The analysis includes:

- who are the students;
- with what characteristics;
- form of education;
- possible obstacles;
- assessment - how will we know that the trainees have achieved the goals;
- online pedagogical considerations;
- time frame and rhythm.

When it is difficult to make a complete analysis of the learners, a superficial analysis is performed. It will allow to choose the appropriate pedagogical strategy.

There are three areas for surface analysis:

- general characteristics (full-time or part-time education, adults, pupils, students, etc.);
- initial level of skills and habits: level of computer literacy; already acquired qualification and / or work experience, etc. (relevant documents may be required);
- learning style - there are many diagnostic tests that determine the profile of the learner and offer appropriate training methods.

Establishing the input level

Establishing the preliminary knowledge and skills of students in the discipline, their learning style, motives and interests in the discipline is an important factor in achieving the goals and objectives. To clarify these features, different approaches are provided for establishing the entry level of students, such as: conducting an oral discussion, test questionnaires or reports from students. Depending on the level of preliminary preparation shown, an update of the content, volume and depth of the topics covered, as well as teaching methods is envisaged.

B. Design

- During this phase the following are specified:
- What are the goals of the training?
- Are the learning objectives measurable?
- What habits / knowledge will develop?
- What should the interaction be?
- What strategies will be used?
- In what sequence will the learning process be realized?
- How will the level of perception of the learners be assessed?
- What network environment is applicable?

The web site "Cloud technologies in Education" aims to introduce students to cloud technologies and their application in the educational process. Under objectives:

- developing an idea of the nature and capabilities of modern cloud technologies;
- formation of basic computer skills;
- competencies necessary for effective professional and pedagogical activity in the conditions of information society.

Inbound connections: The course is related to IT (Information Technologies) and other technical and pedagogical disciplines that are studied in 1st and 2nd year.

Initial connections: Technical and pedagogical disciplines, which are studied in 3rd and 4th year.

The main tasks are aimed at:

- Introducing students to the opportunities provided by modern cloud technologies and the formation of skills for working in an online environment.
- Mastering basic functional knowledge and formation of skills for the use of cloud technologies in the implementation of various activities serving the purposes of technological learning.
- Mastering basic information activities and services such as electronic communication, school mail;
- Calendar - recording appointments, events, meetings;
- Calendar sharing;
- Setting tasks and monitoring their implementation;

- Creating a list of contacts and contact groups;
- Creating and editing interest groups, joining members to a group, group chat, sharing files with a group, shared calendar and group notebook;
- Use of new cloud technologies in publishing, corporate governance, communications, e-government, the automation process;
- Effective use of cloud technologies in technological learning;
- Enriching the information culture of the students.

C. Development of the Web Site

During this phase the following are specified:

- What are the goals of the training?
- Are the learning objectives measurable?
- What habits / knowledge will develop?
- What should the interaction be?
- What strategies will be used?
- In what sequence will the learning process be realized?
- How will the level of perception of the learners be assessed?
- What network environment is applicable?

The development of a pilot resource of Web Site "Cloud technologies in education" includes the answer to the following questions:

- What resources will be used?
- How will the development process be managed and how will it be coordinated?
- Does your project contain different learning styles?
- Presentation of the material in different formats so that the student can make a choice. Inter-activity must be creative and useful. The environment should enable the learner to create their own "virtual individuality" and stimulate teamwork.
- How will the material stimulate interest and interaction?
- How will the feedback take place?

Create the website "Cloud technologies in education" (Fig. 1) with Google Sites.

The website consists of 11 pages that correspond to the topics in the curriculum of the discipline "Cloud Technologies in Education":

- Home page;
- Theme 1. Cloud technologies – essence;
- Theme 2. Use of cloud technologies in education;
- Theme 3. Applications of cloud technologies MS Office 365 and Google Workspace for Education;
- Theme 4. Document repositories - Microsoft OneDrive and Google Drive;
- Theme 5. Google's educational platform - Google Classroom;
- Theme 6. Creating documents, spread-sheets, forms and presentations online;
- Theme 7. Creating, editing and sharing Google Documents and documents with MS Word online;
- Theme 8. Creating a site with Google Sites; Mind map and Questionnaire



Figure 1. Nome page Website

The Cloud Technologies in Education website uses a variety of web-based learning resources created with the capabilities of Google's cloud education services - Google Slides, Google Docs and Google Forms.

D. Implement the Web site

This phase of the design of the website "Cloud Technologies in Education" provides an opportunity to: for interaction and feedback and for clarification, further development and updating of the previously set goals.

Looking for answers to questions:

- What is the most effective way to implement the web site?
- How can teachers and students get the most out of the website?
- To what extent the educational content will be able to be updated, etc.

In this phase of the design of the website "Cloud technologies in education" the most effective use of learning resources must be ensured, as well as coordination, interaction and assistance in learning activities.

The selection of the relevant audience for the presentation of the e-portfolio is closely related to the set goals. Who should see the evidence of what has been learned?

E. Evaluation of the website "Cloud technologies in education"

When evaluating the website "Cloud technologies in education" it is necessary to take into account both the pedagogical usability of the resource and its technological usability. The evaluation criteria are grouped into five groups:

- Entry level of usability;
- Access;
- Functionality and usefulness;
- Attitudes;
- Demographics.

Respondents are 26 students studying in the specialty "Pedagogy of Technology and Entrepreneurship Education" at SWU "Neofit Rilski" – Blagoevgrad. They chose to study the elective course "Cloud Technologies in Education". Toolkit: The questionnaire consists of 10 questions (Appendix 1), divided into five criteria: Entry usability level, Access, Functionality and Usefulness, Attitudes and Demography. It was created with Google Forms.

3. RESULTS

To analyze the results of the survey, descriptive methods were used, which serve for classification and summary presentation of data in tabular, graphical and analytical form. They provide an opportunity to obtain summaries of the data.

Descriptive statistics deals with the aggregation of systematized data. It is of particular importance in empirical research and the description of experimental results. Through the methods of statistics, the data can be analyzed, taking into account the randomness and uncertainty of the observations, and on this basis to draw conclusions about the regularities contained in them.

Depending on the type of studied features, the arithmetic mean, median and fashion are used as measures for the central trend. Both the standard deviation and the coefficient of variation were used as a measure of data variability. Medium level indicators describe the typical state of the trait - its center. Fashion is the most common value of a variable. The median is a kind of positional mean. The values of the variable are sorted by size - in ascending or descending order. Then determine which one is in the middle.

Standard deviation (Std. Deviation)

In probability theory and statistics, standard deviation is a measure of scattering, or scattering, of variation, of data, and also a measure of their probability distribution. A low standard deviation means that the data or points that describe it on the graph are grouped very close to the same value (average), while a large standard deviation implies that the data is located on a large set of values.

A. Entry level usability

The analysis of the answers to the question 1 (Appendix 1) "Before studying this course, how often did you use the applications in Google Workspace for Education or MS Office 365" Shows that the majority of students (58%) rarely used these applications, and (38%) of them have never used them. Only (4%) of them have used these applications regularly.

As a result, the education turns out to be new to them and puts them in a different learning environment (Fig. 2).

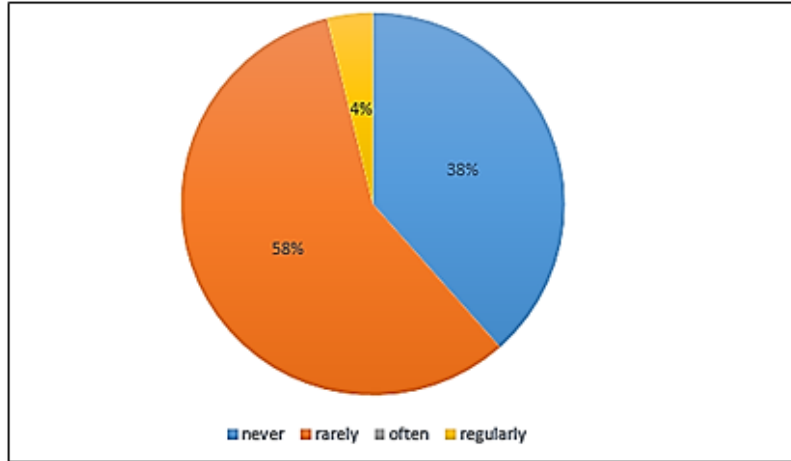


Figure 2. Question 1. "Before studying this course, how often did you use the applications in Google Workspace for Education or MS Office 365"

B. Access

The majority of students use their personal laptops (91%) or smartphones to access the Internet using a touch screen (72.7%). The most preferred browser for them is Google Chrome (80.8%) (Fig. 3).

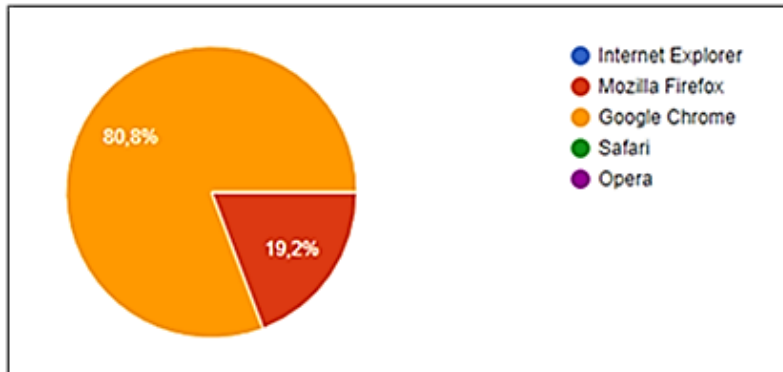


Figure 3. Question 4 "Select the browsers used to access"

C. Functionality and usefulness

Students appreciated the ease of use of specific features and functions of Google Workspace for Education. The question was rated on a four point Likert scale using values of Very Easy, Somewhat Easy, Somewhat Hard, and Very Hard. The preferred answers were "very easy" and "somewhat easy" (Fig. 4).

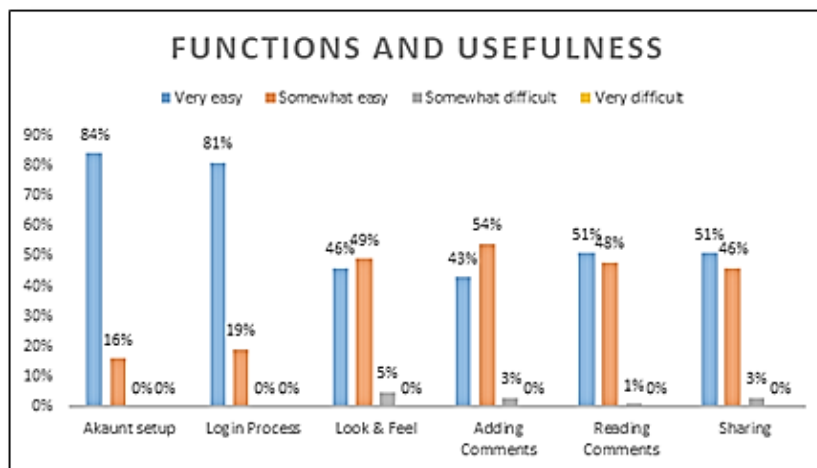


Figure 4. Question 5. "Evaluate the ease of use of applications"

The students who participated in the survey found the use of Google Sites, Google Docs, Google Spreadsheets, Google Slides, Google Drawings and Google Forms useful.

D. Attitudes

The web site "Cloud technologies in education" aroused students' interest and influenced their overall attitude towards cloud technologies. To the question "Do you like the use of cloud technologies in education", all students (100%) answered in the affirmative. Students' perceptions of evaluation criteria are as follows (Table1).

Table 1: Descriptive statistics for the criteria

Criteria	N	Min	Max	Mein	Str. Dev
Entry level usability	26	3	5	4.5	.586
Access	26	3	5	4.31	.654
Functionality and efficiency	26	3	5	4.47	.578
Attitudes	26	3	5	4,56	.593

It appears from the analysis that the data support the students' perceptions of evaluation criteria of web site. The results for the distraction in relation to the arithmetic mean of the students' opinion about the functionality of the used applications is less than 50%, which is small and means that they gave uniform positive answers.

E. Demographics

No significant differences in students' responses on demographic grounds were observed. The study included students of different ages as (56%) of the respondents are aged between 18-24 years, (20%) are between 25-34 years old, (12%) are between 35-44 years old and (12%) are over 44 years old. (52%) women and (48%) men were surveyed. Regardless of age and gender, the answers to the questions are close.

The findings can be summarized as follows. First, most students agreed that the evaluation criteria of the website were well-designed and implemented. Despite the differences in the age of the students, they gave close assessments of the design of the website.

CONCLUSION

Cloud technologies are rapidly entering education and provide new opportunities for students to study various pedagogical specialties. They offer opportunities for creating modern and interactive education. Cloud technologies are not only rapidly entering education, but also allow easy and fast development of web-based learning resources. An important element in the development of such resources is the application of various design models, such as the ADDIE model. It clearly implements the pedagogical, technological and content requirements for the website "Cloud technologies in education".

The results of the evaluation of the site show that there is interest and positive attitude of students to the use of cloud technologies in their education.

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APPENDIX

Student Survey Questionnaire

Evaluation "Web site" Cloud technologies in education "

1. Before studying this course, how often did you use the applications in Google Workspace for Education or MS Office 365? *
 - never
 - rarely
 - regularly
 - often

2. What devices do you use to access the applications in Google Workspace for Education. *
 - Personal laptop / computer /
 - School laptop / computer /
 - Smartphone
 - Tablet
 - Other

3. If you used a smartphone / tablet / specify the method (select all applicable): *
 - Touch screen
 - Bluetooth keyboard
 - Voice recording application
 - Other

4. Select the browsers used to access. *
 - Internet Explorer
 - Mozilla Firefox
 - Google Chrome
 - Safari
 - Opera

5. Evaluate the ease of use of applications: *
(Very easy; Somewhat easy; Somewhat difficult; Very hard) *
 - Setting up a Google Account
 - The process of entering applications Google Workspace for Education.
 - Google Docs formatting (font, type size, line spacing, etc.)
 - Adding comments to another document
 - Read the comments that are posted in your document
 - Sharing a document with another user

6. List 3 of the most useful features of G Suite for Education. *
 - ability to share a document with others
 - opportunity to create a document in collaboration with others
 - opportunity to comment on the documents of others
 - ability to chat on the screen with other people while working on the document
 - ability to access documents from any device that is connected to the Internet
 - ability to revert to older versions of a document

7. Evaluate the usefulness of: *
(Useful or Useless)
 - The applications of Google Workspace for Education
 - The applications of MS Office 365
 - The applications of Mind mapping

8. Do you like the use of cloud technologies in education? *
 - Yes
 - No
 - I do not know

9. Your age:
 - between 18-24
 - between 25-34
 - between 35-44
 - other

10. Your gender: *
 - male
 - female