Design principles of web-based distance education system and sample application in Afyon Kocatepe University

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Abstract: In recent years, number of web-based distance education systems has rapidly increased as a result of improvements in the Internet. Universities have an important role in this situation. Having substantial infrastructures in point of accessing the Internet, permanent education staff and system design team has made distance education more attractive for universities. Distance education systems have begun to make their education activities by using tools and services such as electronic books, electronic mails and conference calls. With the increasing number of these methods and by developing them consistently, the structure that covers the whole system was named the web-based distance education system (WBDES). Although there are many data and information about these systems, there is no detailed information about the software-preparing process and obtained experiences. In this study, a universal WBDES that can be used by all distance education entities has been designed. This WBDES is compatible with any institution or organisation and suitable for universal SCORM standards. It includes many features and functions such as student account creation, user roles, lessons, examinations, security applications, student affairs, counselling services, internal communication, executive functions and assessment, etc. With designed systems, a software infrastructure that is necessary for a virtual academic institution is provided. The system is currently used in Afyon Kocatepe University. While designing the system, MS SQL Server 2005, ASP.NET and C#.NET programming languages were used for the database, web interfaces and programming, respectively. Studies and experiments in designing the system were explained in detail.

1 Introduction

Education is not preparation for life. It is life; it is exactly like life. In this sense, education directs life and determines features of life styles. People should access the information that is necessary to maintain their life and thus they should be educated. When we evaluate the subject from this perspective, it is undeniable that the effect of distance education systems in our life is great. Due to these types of reasons, changing requirements that becomes important in learning–teaching periods has started to affect education systems. Thus, various education systems that move from traditional education to distance education have appeared. The main concern in education is how classical educational institutions will establish an education environment for an active population that is increasing. The purpose of mobile education is to move today’s stable education environment to flexible, virtual education environments of the future [1].

People can be educated with e-learning without going to school and wasting their time on the roads. People who live in places distant from school due to reasons such as work, health or family have the opportunity to learn without leaving their locations. According to a research result, contribution of e-learning to success is about 50%. So, e-learning can be much more effective than other single-direction, passive learning methods. There is a growing interest in online learning all over the world [2]. Electronic learning (e-learning) plays a big role in not only academic institutions, but also small- and medium-sized enterprises.
When it is examined in terms of cost, it can be seen which will be considered in designing the LMS have been learning management systems (LMS). Factors and methods because of business life. WBDESs are generally called of time or cannot be in a location where education is made, reason for preference people who have trouble with shortage in independent of time and location[8]. So, it is an important students and educators is working in a structure that is increasing the number of WBDESs and being accepted by cost advantage of the system have provided the opportunity to form WBDESs[7]. Today, the most important reason in the rise of WBDESs is the increase in the requirement of this kind of system in a parallel way with the development of information technologies [6].

One of the most important advantages of WBDESs is having the ability to form a virtual campus and providing asynchronous education. Students can access educational contents that were transferred by educators into the system and take advantage of these sources. This flexibility and the cost advantage of the system have provided the opportunity to form WBDESs [7]. Today, the most important reason in increasing the number of WBDESs and being accepted by students and educators is working in a structure that is independent of time and location [8]. So, it is an important reason for preference people who have trouble with shortage of time or cannot be in a location where education is made, because of business life. WBDESs are generally called learning management systems (LMS). Factors and methods which will be considered in designing the LMS have been discussed in the literature, with many different perspectives [9–11]. When it is examined in terms of cost, it can be seen that the cost of WBDESs is half of traditional and formal education costs. On the other hand, interactive education and up-to-date content presentation features of WBDESs should not be ignored [12].

In this article, designing the stages of a WBDES which is suitable for universal SCORM standards, provides education and instruction activities and accomplishes the functions of all educational institutions such as colleges, faculty or institutions over Internet, has been introduced. At the beginning of this study, the literature has been investigated and distance education, WBDESs, information security, informatics technologies and server security concepts have been associated, trying to establish them on a right base. In the first stage, database design of WBDESs has been performed. Later, web environment has been arranged with related code studies. Test running of the system is performed preparing sample contents for computer technology and programming of the associate degree programmes. Thus, a WBDES which can be used to create virtual academic entities and enable entities to work collaboratively has been designed. The system is also compatible with all other software in Afyon Kocatepe University. Briefly, an infrastructure that can be used to create a virtual campus has been formed.

2 Web-based distance education systems

In WBDESs, almost all the different techniques used for Internet environments are utilised. In order to access the content, page structures such as HTML, HTM, ASP and PHP are organised. E-mail lists are used to provide a health is communication and some tools such as forum and chat software are used to increase interaction. Having the ability to form a virtual campus and providing asynchronous education is the most important advantages of WBDESs. Students can access the content in the system whenever they want and benefit from the sources at will. When combined with cost advantages, this flexibility allows the formation as an ideal model.

There are some basic features that WBDESs must have in order to be separated from simple education contents on the web. These features must include the functions below in spite of them the changing sometimes according to the purposes of the education system and the target audience. Developed systems must provide these functions [13].

2.1 User operations

WBDESs which run over the Internet can have a structure that is open to public access. But it may not be desired to show education contents to all. WBDESs must have a structure that can define and manage users when it is desired to give the system access authority according to specific user groups and rights. This situation can be expressed as a membership system generally. Users can access the WBDES environment by using only user names and passwords.

2.2 Preparing lesson contents

Preparing lesson contents or transferring ready ones can be done by using the system interface as an essential function of the WBDES. It is possible to use templates or different software such as Flash animation and presentation software to prepare lesson content.

2.3 Tracking lessons

It is important to control students’ lesson load and watch some information like which lessons were taken by students and which lessons can be taken on any terms. It can be provided for students to track and finish a specific programme in the light of all these information. Thus, using intensity of active lessons can be tracked easily.
2.4 Opening private programmes for the student

One of the most important advantages of the WBDES is its flexibility. This feature comes to forefront with preparing private programmes for the student. Since the education programmes can be designed independent of time, periodic, monthly and even weekly lesson loads can be determined in different ways.

2.5 Giving homework or projects and receiving them

In WBDESs, users should have the ability to do operations such as giving homework and projects to the students, providing contents and explanations for work and controlling the work after receiving them. Making all these operations over the system will speed up the process.

2.6 Preparing and applying exams and tests

In WBDES applications, it must be determined at which level transferred information has been understood by students. This must be done by using exams and tests in WBDESs. All other education systems also use exams and tests to achieve this. Two different methods are usually preferred for this work. One of them is conducting exams at the end of the term/education after gathering students in a place. The other method is online exams. In this method, students answer the questions that come from the centre by using terminals. The student must test his/her own knowledge in the systems that use each method or both during the education. In addition to the tests used in general assessment, it is also necessary to create tests for only trial purposes and provide them to the students over the education system.

2.7 Monitoring and examining student activities

One of the most important works which will bring WBDESs success is having the ability to analyse the active using rate of the system. In order to do this, users’ activities over the system must be monitored. Some information such as what time and to what degree the students use the system or how much time they spend on any lesson content needs to be monitored over the system. Furthermore, students’ ideas about each subject must be learned by using surveys. Transferring obtained data to the responsible people as specific statistical information must be the responsibility of the system.

2.8 Assessment of students’ success status

Assessment of students’ success status will show both student success and system success at the end of the education. This assessment will determine if the student deserves a success paper like diploma and certificate or not. Assessment of success status will also show if prior conditions have been accomplished or not. All this work is the responsibility of the system.

2.9 Management of interactive communication environments and support services

The aim of Student Support Services is to help students to use organisation sources effectively. In distance education, students need more support according to many traditional education systems. But students blame themselves instead of asking for help when they cannot do or understand a lesson. So, it is very important to know students’ features and eliminate technical and managerial shortages regarding interaction and motivation, in student success.

Additionally, WBDESs that will be designed must be compatible with SCORM standards. The main source that points out the rules for designing small, reusable and functional content is SCORM (Sharable Content Object Reference Model). SCORM-compatible objects in highly modular education software can be combined easily with other compatible objects that were designed in other software tools. Developing pedagogic techniques and combination of significant experiences in the curriculum needs rule groups such as SCORM [14–16]. SCORM standards are not interested in teachable features of the content. They are interested in publishing the contents [17, 18]. While designing a distance education content management system, SCORM standards must be considered and they must be used in designing. If SCORM standards are considered, the developed study can be used for a long time and moved easily. It can also be in the form that allows users to reach the contents from anywhere.

3 Designing stages of WBDES software

For designing the WBDES, the literature has been investigated first and analysing work has been done trying to establish distance education, WBDESs, information security, informatics technologies and server security concepts on a right base. In the first stage, database design of WBDESs was performed. Later, web environment arranged with related code studies. Sample contents have been prepared for computer technology and programming of an associate degree programmes.

A specific hierarchical order must be followed and realised step by step to prepare WBDES software. Stages of the software can be sorted as below.

3.1 Software analysis

Rather than writing and designing program codes, software development operation reaches the solution by analysing the problem that makes software structure necessary. So all
parts must be defined correctly and designed in all its aspects before starting to code writing. The first stage in software development is defining the general coverage of the problem. An analysing operation that includes the platform (where the software will be executed), system, network sources and hardware components must be done with this concept.

### 3.2 Database design

Database design is a detailed study which is revised many times in the period of analysing operations. In analysing operations, tables, fields and field properties that must be included in any module are applied onto the database in the same way. If there are operations like data filtering or data entering from different databases, the database must be prepared by associating and in an integrated structure. Users must take pains to not to damage the relational database established in each stage of analysing operations. A defect which appears because of relations can damage the data integrity and put the data security at risk. The database of the distance education system represents a relational and complex structure. Having different users and authorities, behaviour rules according to every authority and information sharing in the light of these authorities make a relational database necessary. For example, if a new member is to be added to the system, fields that will be used for this member must be automatically created. In the distance education system, different information about a member is kept in different tables like 'exams', 'personal data' and 'lessons'. A relational database design which automatically creates these fields when a member is added to the system is required. Similarly, fields must be removed automatically from relational database tables when a member is removed from the system. Database of the designed system has been prepared in an MS SQL Server.

### 3.3 Writing program codes of the software

Before writing program codes of the analysed software module, its algorithm is generated. Related program codes are written according to this algorithm. The software programming operation must be tested and controlled with some security filters because of threads which work according to each user’s authority and includes different functions in especially web-based, multiuser applications. But the size of the project and its complexity make these controls and tests difficult to do. Security errors that may be made while writing program codes for software are explained by WASP (Web Applications Security Platform) as below:

- **Unchecked input**: Processing data received from user without checking. For example, the system may allow users to type different characters into the text boxes, where only numbers must be typed in.
- **Unsecured setting management**: Making incomplete or unsecured system settings on the server side. The system does not work properly as a result of this situation.
- **Unsecured storing**: Storing data as unencrypted or not encoding parts of data well while sending them to the user.
- **Invaded access control**: Users may use another user’s authority or access to a forbidden information because their roles and authorities on the system have not been defined clearly.
- **Invaded authorisation and session management**: Users may obtain account passwords, authentication keys or any important data stored on the system.
- **Cross-site scripts**: Web software may be used as an attacking tool on the computer.
- **Buffer overflow**: Buffers in the system memory may be overflowed to gain control over the system.
- **Injection bugs**: In this situation, some parameters that are used for programming the software may be given to the system. This means that the system is open to any injection operation. For example, SQL codes of the system can be controlled by giving different program codes.
- **Unsuitable error management**: Software errors and warnings are open to users in this situation and the user may be notified when a system error occurs.
- **Unsecured setting management**: Making incomplete or unsecured system settings on the server side. The system does not work securely as a result of this situation.

These are the problems that are not taken into consideration very often and met in daily life, on web-based applications. But these problems can be removed after suitable controls with susceptibilities in code writing. Predicted methods to apply these controls can be listed as below:

- **Program codes of the software must be written in a collaborative work.**
- **Implementing the code writing operation in a way to which all team members can contribute and determining a suitable format.** An application which was developed by a team member can be understand easily by another team member and any necessary change can be done to the work, thanks to this format.
- **Team members should not be allowed to write codes in a way that is not suitable for the format.** Controls must be done by team members who were deployed. Related safety measures must be taken by these team members, too. Therefore, a control mechanism is formed in the project and a related control plan is prepared.
• With checking the mechanism, units that will check the process are divided into groups and they are put in charge.

• At the end of analyse – design process, some control groups are implemented for the project. These groups will be some controls that examine units like choosing architecture, module relations and data storing strategies.

• After starting to write program codes, specific control groups are implemented in a horizontal hierarchy at the end of each part. This work will provide special controls for a code like controlling coding methods.

• After completing the modules, another group of controls are made. These are controls that have no meaning as a single part. But they can be seen throughout the system.

3.4 Software development platform

In WBDESs, choosing a software platform is required, like choosing the server system platform. There are not many options in choosing a software platform having a web-based application. Today, the most popular ones are software development tools like Microsoft .NET with PHP and Java, which are used mostly in Linux-based systems. The WBDES developed in this study has been prepared in the .NET platform.

The software has been developed in the .NET environment by using C# and ASP.NET programming languages. In the .NET environment, two different files with same names are created when the user wants to create a new form interface. These files' extensions are '.aspx' and '.cs'. For each tool created on the form, the software tool writes some codes into .aspx file, on the background. If required, the form, appearance can be changed by editing the code included in the .aspx file. The environment used for editing and coding is named ASP.NET. The layer where programmatic logics and algorithms are used is the file with .cs extension. In this layer, C# programming language codes are used. System behaviours according to users’ response are determined by writing program codes in this file. The application is developed by writing codes for loops, classes and database operations, in this file.

One of the most important features of the .NET environment is the creation of a web.config file in the web-based development operation. The file is automatically created by the software tool when a new application runs for the first time. Web.config is an advanced file where some security and connection settings are stored. By editing this file, which is kept away from visitors by the system, the programmer can keep web page behaviours under control.

3.5 Multiuser authentication

In web-based, multiuser applications, users’ activities in the system according to their authority are determined with an access control mechanism. Access control can be defined briefly as determining and managing authorities and access rights for any user in the system. Users who have enough authority are allowed to access system and its data, thanks to access control. More than one user is assigned to perform specific operations in the system. User groups that will do necessary operations must be determined first. As a result of implementing this principle, a process controlled from beginning to end by different users is provided.

3.6 Multiuser authentication application

User privilege levels, which are operations that users can do according to their authority, must be examined and users that have no privilege must be blocked. In ASP.NET technology, security consists of two parts: authentication and authorisation. Authentication is finding out whether username and password information are true, by checking the structure in which stores user information. If authentication is done successfully, it is decided whether the user can access the related sources. It can be done by using an authorisation control process. The user can also work on ASP.NET codes according to the authority, by using the user ID. This situation is called personification. Briefly, the security in ASP.NET applications consists of three steps:

3.6.1 User authentication:

This is the process of logging into the system by using user names and passwords. If user name and password are correct, the user is accepted by the system. In ASP.NET technology, three different structures are used for user authentication. These structures can be listed as below:

• Form-based authentication
• Windows authentication
• Passport authentication

User authentication that is used on WBDESs must be prepared as form-based authentication. It is the most flexible approach among the written ones above. Cookies are used in the form-based authentication structure for authentication. Cookie is a name used for defining the files which store some information on the user's computer, while the user is visiting the web page. Cookies include some information like visiting time, pages that the user visited and some parameters used on last visiting.

3.6.2 User authorisation:

When a user logs into the system, the way that user will proceed is determined after getting authority information from related fields in the database. After the authentication process, user access controls can be examined by using the file: web.config.

3.6.3 User personalisation:

After determining the user's authority, all his/her behaviours are kept continuously workable. After the login process, the user's own information must be...
shown on all forms. Some information, which depends on each student, like my lessons, my exams, my reports and my messages must be shaped according to student's information, when a user logs in to WBDES as a student. So, user information that can be used among forms must be stored and kept in the memory while working on the system. A method called ‘Session’ is used to accomplish this function. The term session can be defined as a session created on the server side. A session is started for the user, when he/she logs in to the system for the first time. While working on pages, session information is stored until the session ends. After the user logs in to the system with the user name and password, user information that can be used in other pages are stored as a session and kept alive until the session ends. There is no need to move session variables between pages. They are stored along a specified time or as long as the user is active in the system. The session object, which was created while working on the pages, is ended when the time that was determined by programmer or server is up. Additionally, when the user leaves the system, the session, which was created for him/her, is ended.

In some cases, timeout operation is realised and session information is terminated when the user takes no action for a while. But the user may be unaware of this situation and want to continue his/her work. In this case, a code block, which provides a safe log-off operation, may be used to make the security stronger and prevent the system from errors.

3.7 Encryption in authentication

During the login process, authentication is made by controlling the username and password from the database. If the username and password are true, the user is accepted by the system. Keeping password characters in the table that includes user information may cause some security problems. If the username and password are captured, the user’s personal data are endangered. User password stored in the system may also be defined in different applications. So, user data stored in other applications may also be captured. To avoid this situation, user passwords are encrypted with an encryption algorithm that cannot be decrypted and stored in the database. The programmer can also use his/her own algorithm to encrypt user passwords. But there are some encryption algorithms that come with .NET technology. These are algorithms such as SHA1, SHA2 and MD5.

3.8 File transfer operations

One of the most important features of distance education systems is certainly file transfer operation. File transfer operations are realised with upload (data transfer from local computers to server systems) and download (data transfer from server systems to local computers). A service must be used on the server to provide both upload and download operations. FTP and HTTP services can be used for file transfer on the server side. But in web applications, HTTP is a service that helps the application and it always runs. So, there is no need to run another service on the server.

In today’s web applications, files are stored in two types of environments and provided to users. These methods are: ‘storing files directly in folders on the server’ and ‘storing files in the database’, respectively.

3.8.1 Storing files directly in folders on the server:

With this method, files which are considered to be used on the web application, such as pictures, music files or some document files are stored in specific folders. But this folder must be prevented from users or systems that are not recognised by the system. Displaying the content of the folder means that other files stored in this folder are shared. This operation is performed outside of the application, and as a result, a factor that threatens the information security appears. Similarly, an uploading operation on the server must be performed by only the application. The programmer enables the application to check files and store them in suitable locations by adjusting the folders in which files will be stored. The programmer also prohibits users from transferring data to different folders. However, if this operation is performed by users, some files that threaten the information security may be transferred to the system. Furthermore, some uncertainties on file locations may occur and as a result of this, information inconsistencies may appear. Files or documents like picture or audio files, which will be used during the content preparing process mostly, are stored in this manner.

3.8.2 Storing files in the database:

Files are directly stored in the database, thanks to this method. Some fields and file storage parts can be created on tables in the database. This method is safer than the other method. In WBDESs, secret files are stored mostly in the database. In the system, users can store their personal files or send files by using instant messaging tools. So, a safer and healthier working environment can be ensured because each user stores their personal files.

3.9 Storing and displaying contents

Preparation of lesson contents or providing prepared ones over the web environment are the main principles of distance education systems. Educators are deployed for preparing lesson contents mostly because the educator must prepare visual, active and also rich educational contents that can attract students’ attention. Contents must include interesting examples that can be understood by students. The quality of education that is given by educators depends on the visual design of the contents intended to be used and explaining them in a fluent way. Visual design elements consist of line, space, shape, texture and colours. Some designing principles such as integrity, equilibrium and emphasis must be considered for an effective visual content.

Some issues must be considered in using voice and video because they are used frequently in web-based educational materials. These issues can be explained as below:
• Web page design must be made in a form that can display the related file when a user clicks on its link. It must not be loaded without any user’s request. Some information about size of the file and transfer speed must be given to the user. Informing the user about transfer time is important since the file transfer speed changes according to computer network bandwidth and fullness rate, because the user can make his/her own decision about viewing the file according to the status of the file transfer rate.

• Video and audio files must be used only when it is necessary. Videos can be used in web-based education material to show a motion or provide an application from different perspectives.

• Size of video and audio files must be observed while preparing them. Files must be provided after decreasing their sizes to low levels.

• Video and audio files must be presented in a standard form to adopt all platforms. It is also important to inform users about the platform(s) in which file(s) can be used.

• While placing a visual element into web-based education material, the image can be shown in the same page or a new window can be used to view it.

3.10 System error controls and security

The programmer must determine what should be done when an error occurs on the system, especially in web applications and Windows applications. The purpose is to determine the error and take necessary precautions if any operation has appeared aside from normal functions. ‘Try-catch’ blocks are used to see error events in the .Net environment. If the programmer wants, the system can be enabled to show its own error message or programmer’s messages.

In a distance education system, errors occur in not only web application but also in the database system. The main reasons of database errors are situations like database connection errors, sending data which is in wrong format, to fields on the tables, sending wrong SQL queries, trying to import data which is not in suitable scale to the fields or trying to modify data which is adverse for relation, in relational databases. In these cases, the database system will return an error message as data for the application. But, if programmer enables the system to show these error messages to the user directly, some hints about the system are also given to the user. To prevent this, it is more suitable to show error messages in the programmer’s own language.

Another method that is used for controlling database errors is to control related errors in Stored Procedure...
structure in the database. In such a structure, programmer use try-catch blocks in Stored Procedure structures according to the type of errors.

One of the most important points to ensure information security in a web application is to create control mechanisms in the application. In this context, mechanisms are placed at important points that are used in the application for storing operation logs. These mechanisms are structures that chain operations and can be used for control when it is necessary. Many control mechanisms have been developed for this purpose in the designed distance education system and they have been used at important points in the application.

4 WBDES application

The designed WBDES is actively used in Afyon Kocatepe University. The system has been named Afyon Kocatepe University Distance Education Center (@KU-UZEM). It is efficiently run on the web address: www.uzem.aku.edu.tr. It is not possible to explain the system here with its all features and functions. The WBDES is used to perform online learning activities as a part of the course given. The WBDES has been designed and developed at the Afyon Kocatepe University, Afyonkarahisar, Turkey and it is currently used for e-learning studies in the university.

Microsoft ASP.Net technology was used to design and develop web application of the system whereas the database structure of WBDESs was developed with Microsoft SQL Server 2008. WBDES is compatible with any web browser and do not require any additional software or patch to run. However, both a username and user password are required to log on to WBDESs. Before starting the course, usernames and user passwords were delivered to students and teachers. Fig. 1 shows the home page of the system. After they log on to WBDESs, students and teachers can use a fast and easy-to-use web application interface to perform teaching or learning activities.

WBDES consists of several tools used by both students and teachers during the course. The most important tools are those for preparing or viewing course topics, communicating with each other and watching students’ learning performance on the system.

After logging on to the WBDES, students can use educational tools and complete their online learning activities.

![Figure 2 Educator course page](image-url)
Learning activities performed on the system are explained below:

1. **Online course topics**: Topics discussed in the course are presented for students through the WBDES. Online forms of topics include some interactive elements like flash animations, animated exercises, and videos that can be viewed or played by students. Every week, the teacher may upload one course topic for students. But it is also possible to upload and activate all of the course topics at the same time (Fig. 2).

2. **Homework**: The teacher gives one or more homework studies for students on each course topic. Homework announcements can be made on the WBDES interface. The teacher may want students to prepare and upload their homework files to the WBDES before a specific date and time. After getting the uploaded files, the teacher then evaluates the homework studies. Results can be discussed on the WBDES.

3. **Taking quiz and exercise**: Each course topic given to the students ends with a quiz. As seen in Fig. 3, all of quizzes are taken by students on the WBDES and average points gained from these quizzes are added to final examination points. The teacher also provides one or more exercises to solve for each course topic. Exercises have the same features as quizzes but their results do not affect the final examination point. Both quizzes and exercises must be solved before specific dates and times determined by the teacher.

4. **Online communication**: Students use the chat tool integrated to the WBDES to discuss course topics with other students and the teacher. As default, the chat tool is disabled for student use and it can be enabled by only the teacher at specific dates and times. Chat meeting announcements can be made on the WBDES interface. Fig. 4 shows Chat meeting web page.

Another tool, the discussion forum, is used by students to post new messages or comments on posted ones, to other students and the teacher. Forum discussion topics are related to the course topics given. Online discussions are
moderated by the teacher and he/she can grade students’ posts according to their contents.

After some applications, the most important results that were obtained from students’ and instructors’ comments can be listed as below:

1. The WBDES encourages students to study harder on course topics.
2. The model allows students to have better learning experiences.
3. The WBDES allows students to boost their self-confidence.
4. The WBDES has a colourful interface that attracts students’ attention.
5. The discussion forum is an effective tool that enables students to share their ideas and have discussions about posted topics.
6. Communication tools provided by WBDESs allow students to communicate with the teacher without any distance and time limitation.
7. The WBDES has a simple interface, so everyone can use this LMS easily.

5 Conclusions and future work

In this article, a WBDES design which is suitable for universal SCORM standards, providing education and instruction activities and accomplishing the functions of all education institutions like colleges, faculty or institutions over the Internet has been introduced. At the beginning, the literature was investigated and performance analysis was implemented by taking essentials such as distance education, WBDESs, information security and server security into consideration. In the first stage, database design of WBDES was implemented. Later, the WEB environment was organized with related programming studies and test run of the system was started by preparing sample contents for Computer Technology and Programming of an associate degree program. Thus, the infrastructure of Afyon Kocatepe University – Distance Education Center has been formed.

No significant problem has been experienced for about 8 months since the system started to run. But some new modules like survey and Wikipedia, which have determined by system designers and educational professionals, have been added.
In future work, intelligent content systems can be added to the system and data mining can be used in performance analyse stages.

6 References


