Implementing a Web Application, which provide High School students, who are physical not able to attend classes, with a live access to the class lecture and create a method for tracking their participation

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Abstract

This paper explores the development of a Web Application that results from the prerequisite education, from Elementary to High School, and mandatory attendance to class lectures. The research is aimed to develop an Application that will allow all students to have remote access to learning, despite of the situations. The development of the Web Application varies between the backend codding (creation of the database) and the frontend work (the web design and frontend web development). This paper provides a possible solution to students, who have to attend Schools, and closely examines the development of the Web Application prototype.

Keywords: *database, design and web development, Web Application prototype*

1 – Introduction

In this paper presents the development of a prototype of a Web Application, which can provide students in Schools with a chance to have access to education even though they are physically unable to be there. Schools have most of the students following regular classes and taking regular exams, however for some students this is impossible due to illness or impracticalities, such as being involved in performances as a high-level athlete. Consequently, those students miss classes and important lectures, thus the need of development of a prototype which can provide all students the opportunity to attend lectures is crucial. The prototype of the Web Application is intended to provide a satisfying VoIP, which stands for Voice over Internet Protocol, and allows teachers to communicate with their students over the Internet using their voice. Design with hyperlinks to the database,

virtual live access to lectures, timeline, as well as the upload and download of files, the scholastic Web Application will clearly stand out in comparison to other applications such as Skype, Viber, or OoVoO. This paper provides an in-depth description of the focus of creating, developing and implementing a Web Application with which students can virtually attend and conveniently take classes over the internet.

2 – Context and Research Question

2.1 Context

High Schools such as Helen Parkhurst {1-01}, located in Almere and which has about 1700 students whom follow classes at three different levels of education VMBO-T, HAVO, and VWO, often face situations where students are unable to attend classes. Although most of the students are following regular classes and take regular exams, some students find this impossible, due to either illnesses or impracticalities, due to their implication in performances such as sports on a (semi) professional level or competitions. Therefore, because of those circumstances, students miss classes and important lessons. Nevertheless, classes are mandatory by law, thus any unattested reasons, given by the student to be absent, must be verified. Hence, teachers have to keep records of all absentees, and all the students who have physical incapability of attending classes gives rise to a lot of bookkeeping as well potential penalties might be applied, such as expulsion for a period of time. Concerning this is not the only issue with the students who are unable to attend classes, important materials such as handouts given during classes and essential instructions of completion for their courses will be also missed by

them. To help solve this critical problem a cooperation between VoiceWorks {2-02} and Inholland University of Applied Science {3-03} first year students was established. The majority of the work was solely done by students under the supervision of VoiceWorks member Milos Radujkov and university consultant Harald Drillenburg and university tutor Belinda Kroes.

2.2 Main Research Question

The main research question describes the fundamental focus of the research in a short sentence.

How to provide High School students, who are physically not able to attend classes, with an opportunity to the class lecture and implement a method for tracking their participation?

2.3 Sub-Questions

The main question is then further divided into sub-questions to ensure a steady step by step development of the application and providing answers that will eventually answer the main research question.

1. Which type of access will suite the purpose and how to implement it?
2. How to track student's attendance during such classes?
3. What data about students should be stored and how?
4. How to implement an interface, attendance tracker and connection to the data storage for such an access?

3 – Research Strategy

The research strategy that will be carried out through the development of the Web Application involves a number of very important phases of development.

In the first phase, the type of research is being established, in this study both qualitative research and quantitative research have been used to gather important data. Initially we design an interview [1-1] and survey [1-2] from which more information will be gathered from both the teachers and students. Qualitative research is aimed to gather an in-depth understanding of the needs that are compulsory to be meet by Web Application. Along with the interview a survey will also be conducted, by both the teachers and the students, to make sure that no important information is lost.

The second phase, of the research strategy is defining the units of analysis and the constructs. The unit of analysis used in this research is type of the remote access which allow students to be present during the lectures. The constructs of analysis are the functionalities that the Web Application holds. Such functionalities include the possibility to track attendance, provide each student with a personal account and to keep as well as display data, which is gathered during the online lectures.

Taking part in the third phase is the analyzation of the data, which was obtained through the interviews and the survey. Closely examining the most important features, that must be present in the end product, and the complexities which the development process will be up with. Then develop a plan of the steps that need to be fulfilled, to meet the client's demands and needs.

Lastly the forth phase, which is the development and testing of the prototype. In order to guarantee a well-developed product to the clients, a test must firstly be conducted and then very comprehensively evaluate the outcome. With

meticulous comparisons between the demands of the client and the product outcome, the research aspires to satisfy and accomplish all the requirements.

The communication, done by the developers during the development of the Web Application, will be mainly done through the social media website Facebook. However, all documentations and all the files that each member has completed will be uploaded on GitHub and Git {8-08}, control system were information will be collectively edited and saved to current versions of the files or documents.

4 – Methods

The student's part in research consist of building a user-friendly interface and data access to the sample database, as well as provide the possibility to both alter and add new information to the existing database upon enhancing the provided Web Application. Protection, security features as well as minimum time-consuming way to work with data were also taken under consideration for the development of the Web Application.

In principle, the design of the implementation of the Web Application is divided into two main and different parts: One is to implement a database that will suit the purpose of the project, the backend work which is described in detail in section 4.1. The other is to implement an interface that establishes an easy way to be handled by both the students and the teachers, the frontend work elaborated in section 4.2.

The development began with an initial extensive lay out of an online application, which has been provided for this research by VoiceWorks. This

application had already implemented a series of very important demands that the final product must have included such as a live video and audio connection as well as an e-mail service. In addition VoiceWorks provided access to their libraries, UCConnect {4-04}, along with the usage of other files, such as JavaScript {5-05}.

4.1 – Backend Work Development

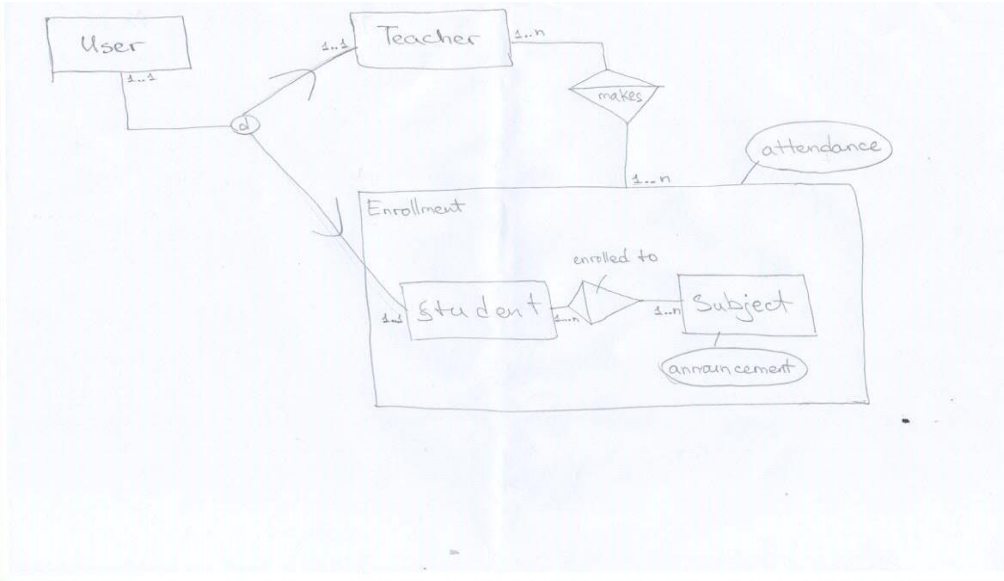
The work process of the development of the Web Application consist of three distinct parts: creation, implementation, connection and optimization of the database. These parts fall under the category of a back-end work. Here the initial steps were to create the models, conceptual data model [1-3] and logical data view [1-4], which will reflect the client's requests.

The approach that was selected for the implementation of the database relies solely on the observations which were drawn from the client's description of needs. Due to the student's busy schedule the interviews and the surveys, predesigned to help have a better understanding of what the core idea and essentialities are being expected in the final product, had to be undertaken by other clients. However this has had little influence for the development of the application due to the fact that the substitute clients had a precise understanding of what the students struggle with and have needs of.

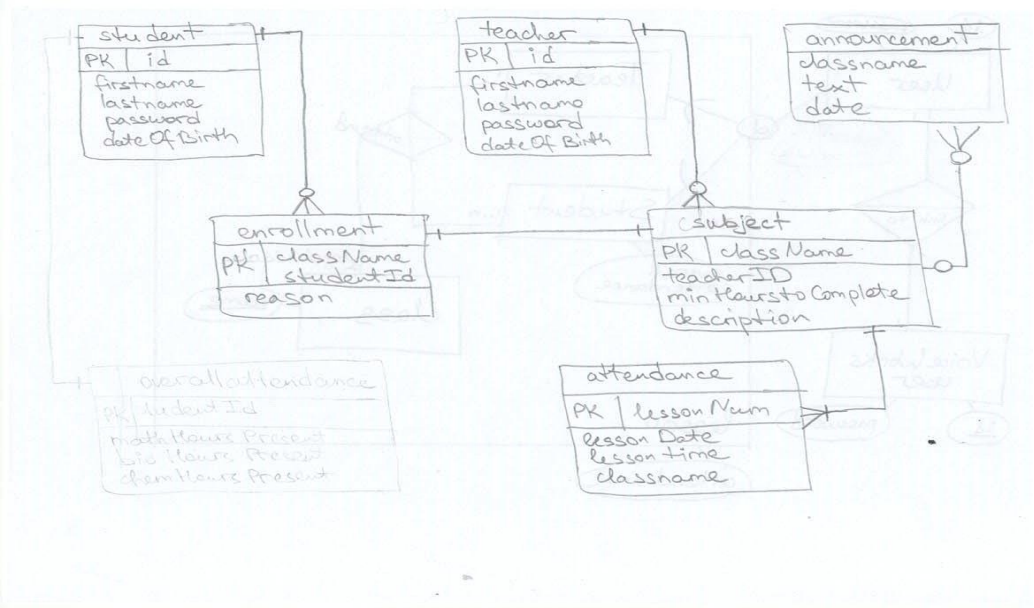
Firstly, the conceptual data model [1-3] of the database was created using the gathered information. The conceptual data model, was drafted after the detailed analysis of the most important needs that must be included in the database. Then once reached a final conceptual data model, the process of translating the conceptual data model into the logical view has proceeded. Once the logical model has been completed the process of normalization began. In the process of

normalization the implementation of the most important aspects that the databases were sustained as must have in order for the database to be well-functional.

MySQL [6-06], which is a relational database management system, was chosen as the main language to build up a database, develop queries and help maintain the database. For the reason that a real data was not provided during the research, a database was created. The database was developed and filled with a sample data, by writing scripts which reflected the logical model.



Conceptual Data Model [1-3]



Logical View [1-4]

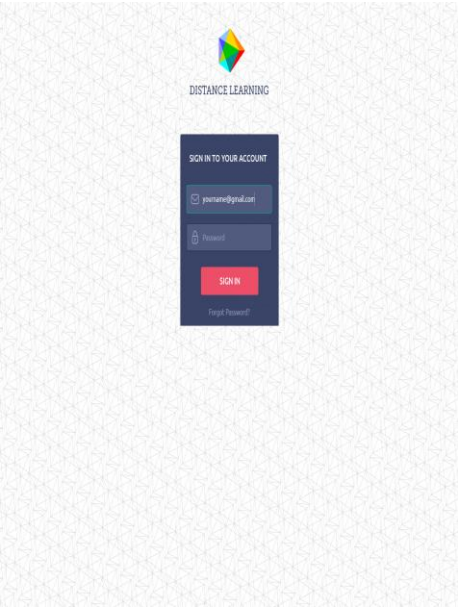
The steps that were taken to develop the data access, which is the connection between the online application and the database, were divided in two parts. The first part was established by using PHP {7-07}, server-side scripting language, to create a connection to the database. The second part was to create a set of SQL statements to access data from the database.

After the establishment of developing the data access the development of the back-end work has continued. Likewise mentioned a part of the necessary implementations was already provided by VoiceWorks. It includes various JavaScript functions which use VoiceWorks libraries to connect to the VoiceWorks services and provide a user with VoIP services. The other part of the back-end work was solely done by the students. This part included the displaying of the necessary data from the database, its maintenance and automatic updating with request of the user. Also the insertion of SQL statements to the cod and compel a working environment with the other part of the code; optimization of loops and securing updating functions.

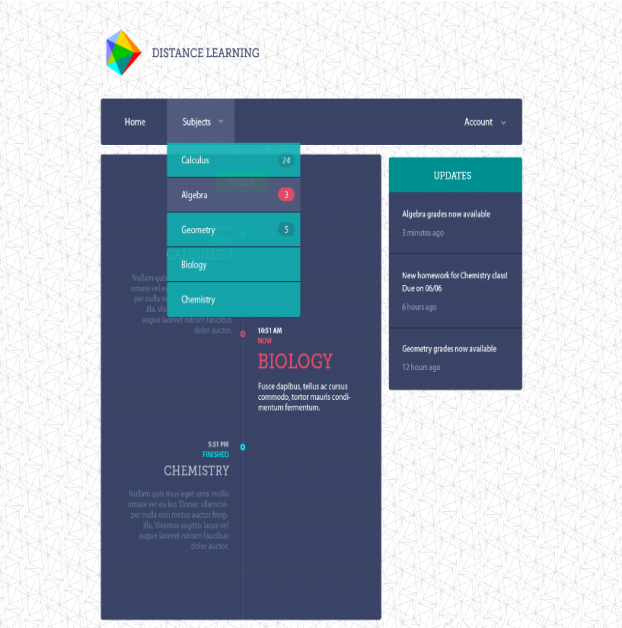
4.2 – FrontEnd Work Development

Initially, the development of the frontend work for the Web Application was supposed to be divided into four parts:

Post of the development of the software a UI design {9-09} for the Web Application was created. The design was initiated after the data of descriptions, which were gathered during the initial research. The UI design was fashioned modern and pleasant looking, so that the students will have a more enjoyable experience with the Web Application. The UI of the Start-Up Page [1-5] was designed with a lively background and well matched colours that make the reading easier. As well the UI for the Home Page was also designed with pleasant pastel colours for the background while the foreground had vivid colours to emphasize the content on the page. Then once the UI design was approved by everyone the first phase of the frontend work began to develop.



UI Design – Start-Up Page [1-5]



UI Design – Home Page [1-6]

The first part in the development of the frontend work was to create a template for the Web Application. In order to create a HTML5 {10-010} template the

research used Bootstrap {11-011}. With the Bootstrap Framework, the layout of the foundation of the Web Application was created.

Secondly the frontend work had to implement AngularJS {12-012} to HTML code. The AngularJS framework works by first reading the HTML page, which has embedded into it extra custom tag attributes. Then once read AngularJS interprets those attributes as commands to bind input or output parts of the page to a model that is characterised by the JavaScript variable.

The last step of the development is combining the frontend and backend work. This is done by assembling together the AngularJS codes, which is the UI, with the PHP code, which is connected to the database.

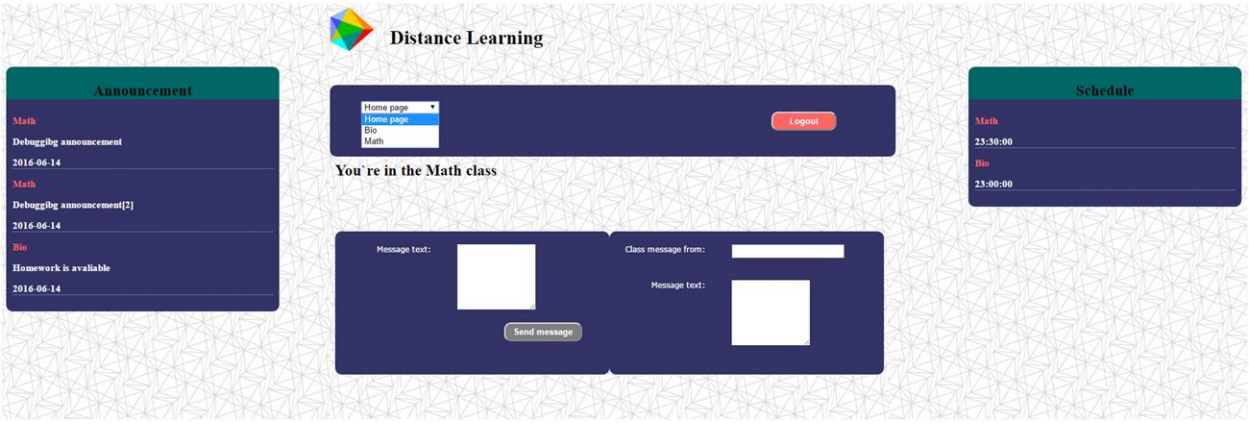
During the work development process the lack of human sources and knowledge have appeared. Due to these unforeseen circumstances the technique of developing the final UI web design has been changed. Therefore the user-friendly interface was created solely with CSS and HTML. The approach that was taken to develop the current frontend was by dividing pages into blocks. Then afterwards an austere design was written in the CSS file.

5 – Results

One of the aims of the research paper was to provide students with a chance to education. This operability of having access to remote live access to lectures via Internet, with the students being away from their Schools in foreign countries or even hospitals, and their subject class, in Helen Parkhurst School located in Almere. The research paper has therefore been used to provide and develop a Web Application prototype which will help students overcome their impracticalities.

In completion to the work process the development the Web Application, which is used for distance learning, is lacking. This application was supposed to provide student with a remote access to classroom lectures. Unfortunately, the VoIP feature had experienced difficulties, could not implemented into the code properly, during development. However, the user-friendly interface as well as access to the information from database were established. You could find some models of Web Application in Section 1[1-7] and Section 2[1-8].

Section 1[1-7] – Login Page



Section 2[1-8] – Home Page

All in all, this Web Application definitely needs further improvements on the JavaScript part, whereas data access and front-end parts can be used as a functional Web Application.

6 – Conclusions

Due to illnesses or extracurricular activities a lot of students miss classes, thus numerous absences lead to a lot of problems. A solution which can solve this problem is the development of a Web Application. The Web application can provide students with a remote way of being able to keep up with their education while they are away.

Throughout the closing stages of the work, which was put in to developing and implementing a prototype of a Web Application, can be seen. The personal information about the students, such as their names, date of birth, enrollment to the subjects and attendance, who use this application, is stored in the database. As well as the personal information about the teachers, their names, the subjects they teach, the announcements they set and the lessons, which teachers are able to create by themselves. The database is created and maintain by using MySQL and it is connected to the Web Application with PHP. The Web Application was made by using JavaScript with special libraries. The user-friendly interface was created by implementing a dexterity in the collaboration between coding languages, some of which are CSS, AngularJS and numerous other techniques. The student's attendance during classes will not only be monitored by the status tracker but also when the student is having a live interaction with the class during the lecture.

However, the Online Application still lacks some functionalities such as providing video calls for the group of students. This part is still under development and further work is necessary. As well, the UI design developed during the research is not a satisfactory one, thus further development is needed to be implemented. The research concluded that special resources and specialists are needed to develop the VoIP feature as well as the UI interface of the Web Application.

7 – Recommendations

The following recommendations are offered as possible ways to be implemented as an up-grade in the next development of the product.

1. Have implemented a chat conversation, this is where students can ask questions or share opinions on different topics and have feedback from their fellow colleagues and teachers.

2. Record the live lectures, and have them available to students who are incapable to attend class at the same time as the live lecture is occurring, due to time difference or other circumstances. Thus if the recording will be available to students at any given time, they will feel less pressure of always trying to be at the same time online as the live lecture.

3. Implement a reward system, such as for every minute the student watched a video lecture they will be awarded points. These points could then be related to the attendance, making the system of learning more disposable and not needing a physical presence.

4. In the next up-grade, another very important feature that will help enhance student's educational skills will be a topic related pop-up questions. The pop-up will appear during the playing of the recorded video, and will have questions that the teachers predesigned. Once the student enters or chooses the right answer the video will keep on playing, however if the student will choose a wrong answer the video will be rewound to a specific point in the video.

5. One of the last implementation recommendations is adding a calendar to the main page of the Web Application. The calendar will hold all important information such as the upcoming due date of each assignment, as well as the upload date of assignments. This will help students keep track of all of their class time and lectures while they are away.

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9 - References to the Research Papers

[1-1] See attached a copy of the interview

[1-2] See attached a copy of the survey