Development of a networked virtual classroom and database driven website providing real time interaction and supporting materials for the purposes of distance learning on the internet

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1. Proposal

1.1 Title

Development of a networked virtual classroom and database driven web-site providing real time interaction and supporting materials for the purposes of distance learning on the internet using

1.2 Problem description

1.2.1 Why do this project?

This project is based on an idea conceived by a company called Altus Education. Altus Education is a company that tutors children to prepare them for their SAT and GCSE maths and statistics examinations. They started off tutoring children on a one-to-one basis for short periods before examination time but soon found that there is a great deal of interest in other forms of tutoring such as, homework help, small group sessions, email support and tutoring designed to allow children to sit their maths GCSE a year early. They now offer a variety of services and due to the success of the email help they offer to all their pupils would like to attempt to teach small groups online via a live whiteboard and chat application.

Due to the wide availability of internet access and a demand for web based services it has now become viable to sell an internet only product. The benefit of a web only product is that it can be offered to large numbers of users for a comparatively low fee – this makes the service accessible to pupils who were not previously able to pay for one-to-one tuition. Clients across the age profile have achieved high levels of success and top grades due partly to the unconventional approach to the teaching of mathematics. Since the company uses activity based concept and knowledge development as opposed to teaching methods of calculation their work is very suited to being delivered over the internet as well as in the conventional lesson setting. This software will allow the company to help pupils who are failing by complimenting the schools work.

This project is also very worthwhile because there is a good chance that the end product will be implemented and used regularly by Altus Education. Market research suggests that demand will be high and market analysis shows that no companies are currently offering real time interactive tuition to the public via the internet. The company’s unique approach in terms of teaching method also gives it a strategic advantage.

1.2.2 Project aims

The main aim of this project is to produce software that will allow the company to provide an affordable, high quality learning experience for all who want to study mathematics at GCSE level and have access to the internet.
In order to make the end product as good as possible I also aim to learn about several technical subjects:

Security – There are several areas of this project that will require secure programming – the supporting website will contain brand new cutting edge teaching material that the company has spent a lot of time and money researching; this must only be accessible to customers who have been personally approved by the company. The virtual classroom will need to access sensitive account and personal information about pupils from the main database – this will have to be done securely. Security is quite a big issue for this project.

User Interface – Some parts of the website and virtual classroom will have a lot of information on the screen at once, since the main customers are children aged sixteen and under the interface must be very intuitive and simple to use. Designing a good user interface could be critical to the success of the applications.

Rapid Prototyping and User Evaluation – The implementation of this project will be done as a series of incremental prototypes that will be reviewed by users and the company before improvements are made to the design of the next prototype. Learning how to create and deploy intermediate prototypes quickly and efficiently will make the implementation much smoother.

1.2.3 Project objectives

The main objective of this project is to create a system that is ready to use that incorporates the following main parts:

Virtual classroom – This will be a stand alone application that will be made available to users once they have registered with the service. This application will be used to give users access to lessons. When run, it will add the user to a waiting room with other users joining the lesson. When the tutor is ready for the lesson to start everyone in the waiting room will be transferred to the classroom. The classroom will be made up of a “whiteboard” drawing area and a chat area. The whiteboard will relay the tutor’s writing and drawings to the pupils and the chat area will allow them to ask questions, volunteer answers, etc.

An essential aspect of interaction is that clients can give instant feedback on understanding by clicking a button to indicate that they do not understand. This will provide the teacher with instant feedback on class understanding without client embarrassment – the company currently uses green, amber and red cards for large group teaching.

Online exams and tests – This will be a web based application that will allow users to check their progress by taking tests and exams that will be marked instantly. It has also been proposed that this application could be used to set assessments to allow a tutor to check the performance of his whole class.

Online resources – The website will also provide a variety of resources to all registered users. It will provide a variety of information including, worked examples, tutorials, revision notes and the option to replay a previous lesson (the system would
record all actions taken in a lesson and make them available for playback to users who were present in that lesson).

Another important aim is that all of these features should be integrated so that the system operates as one product rather than 3 distinct applications.

Since this system is being created for a company it must also be commercially marketable. Including features such as a “demo” facility, user signup, user management and making the whole system secure is also necessary.

1.3 Requirements Specification

1.3.1 Required functionality

The Virtual Classroom

The most important requirement for this component is that the tutor can easily convey ideas and concepts to the pupils. This will be facilitated by the drawing area of the application supplemented by the chat area.

The Drawing Area

• Every action must be recorded and transmitted accurately. This is important because it will ensure that what the tutor sees is exactly what all of the pupils seem, i.e. if a critical point was lost a triangle could become a non uniform pentagon or a hand written character could become unrecognisable.
• It must sample fast enough to allow for smooth freehand curves. Since a curve is recorded as a series of individual linked points, if the sample rate is too low the curve will end up being jagged.
• If a user leaves the room for some reason (crashes/lost connection/etc.), they should be able to rejoin the room and be able to see any drawing that was on the board when they left and any since. Practically this means recording every action in such a way that it can be stored for the duration of the lesson and resend the whole list when a client requests it.
• Pupils should be able to draw on the board when permitted to do so but not at other times.

The Chat Area

• The text should be displayed in such a way that it is clear and easy to read.
• The tutor should be able to scroll back through the chat area to read any questions s/he may have missed.
• It should be clear who is saying what.
• The application should have some way of preventing disrupting behaviour such as spamming or flooding the chat area.

Another feature that the company has requested is for there to be some kind of button on pupil’s screens that will allow them to indicate if they understand what is being discussed or not anonymously to avoid embarrassment.
When the virtual classroom loads there should be some kind of lobby where pupils can wait until the teacher is ready to start. There should be some kind of useful information on this lobby screen that the pupils can read while they wait – possibly some kind of primer information for the coming lesson.

When the lesson is over the pupils should be returned to the lobby which should offer them the chance to go to the supporting web site to view material relevant to the lesson; examples, exercises, tests, etc.

**Online Exams and Tests**

There are two parts to this system, the customer end and the administration end. The customer will go through a series of web based forms answering questions, and then at the end be given a mark. The administration side will allow the addition and alteration of questions, exams, papers and users.

- The pages should have load very quickly since the users will be going through a lot of pages in fairly rapid succession.
- The input should be well validated so that it is unlikely that a correct answer will be marked wrong because of the way it has been entered.
- Papers, exams and questions should be organised in a logical way so that users can find the content they are looking for.
- The system should store detailed information of users past performance and provide analysis and advice features.

**1.3.2 Interface Requirements**

This system is going to be a professional commercial product and its primary users are going to be young children and teenagers, both of these factors make the interface design very important.

- The interface should be intuitive and simple
- The interface should be flexible – the type of content being studied varies a lot, from SAT to GCSE. The interface provided for a GCSE class might need more symbols or special tools, whereas an SAT class will need little more than freehand drawing and straight lines. This would indicate that the layout might benefit from a customisable toolbox based layout.
- All changes required to the interface should be done automatically; the users will often not be competent enough to make the changes themselves.
- The design and colour scheme should be fairly neutral – older pupils would not like a flashy childish interface and younger pupils would find a very plain interface boring.

**1.3.3 Hardware and Software Requirements**

- The system should be able to support at least 20 people in one class with multiple classes going on at the same time.
- The web server should be able to handle a relatively high demand
• The software should be designed to run on a fairly basic computer – many people cannot afford cutting edge computer equipment for their children
• The software should scale for a variety of different screen resolutions; it would not be good if on a high resolution the drawing area was tiny.

1.3.4 Notable Similarities with Existing Systems

The virtual classroom concept is quite similar to that of the Microsoft NetMeeting software; the crucial difference however is that the use of NetMeeting is quite complex, you have to worry about who is the server, what are the ip-addresses, what port is it using and a myriad of other settings – and even after all that it tends to crash quite a lot. The virtual classroom must be simple to set up and use because it is being used by children who wouldn’t be able to follow a long and complex set up process.

The supporting materials website is similar to many other study help websites, the difference here is that this website will work together with the virtual classroom and the exam software to offer material appropriate for each individual.

1.4 Project Plan

1.4.1 Initial Gantt chart for project

Please see the attached pull out chart.

1.4.2 Waypoints and Endpoints

As you can see from the Gantt chart there are several waypoints for this project.

The final end point for the project is 06/05/05 at which time everything will be finished.

If there is some kind of disaster that stops work for a long period of time it would be possible to hand in an incomplete version at any of these points:

Design Finished and Documented - Sun 09/01/05
First Working Documented Prototype - Thu 10/03/05
Finished Implementation and Implementation Documentation - Wed 30/03/05
Full Testing and Testing Documentation - Thu 07/04/05

At each of these waypoints there would be enough material completed and documented to hand in.
1.5 Resources

1.5.1 Topics for research

Virtual Classroom:

Language choice:
- C++ .NET
- C# .NET
- Java

Interface design:
- Human-Computer interaction
- GUI design principles
- Research into children and computer use

Programming information:
- Data structures – for storing drawing information efficiently
- Networking
- Secure programming

Exam Software:

Language choice:
- PHP + MySQL
- ASP .NET

Web page design:
- Advanced CSS
- XHTML

Programming information:
- Data structures – for storing answers
- String functions – for marking text based answers
- Webpage security information

Supporting Website:

Advanced CSS
- XHTML
- Security
- Good webpage design

1.5.2 Books required

Because the topics requiring research are mainstream computer science concepts the university library and general bookshops will be able to provide all book material required.
1.5.3 Computer resources required

For the most part the computing resources available to me will be sufficient for the development of the software – the only additional requirements are:

C# .NET (if this language is selected)

An accessible MySQL database and web server with PHP support

Most of the computer resources are readily available, and those that are not will be procured by Altus Education.

1.6 Supervisor Agreement

I __________________________ agree to supervise this project.

Signed

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