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School of Computer Science

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INTERIM PROJECT REPORT

Academic Supervisor: Meenakshi Mengle

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1.0 Introduction

Currently, there exists a significant knowledge gap between what the average online user understands about online security and easily available information to teach them how they can best secure themselves. Additionally, the information that does exist is in the form of articles and blog posts, which are not very well suited for the average layman to find and properly absorb, much less test their existing knowledge. This can also negatively affect corporations as unintentional breaches by uninformed employees may expose a company's data (Gundu & Flowerday, 2013).

This project aims to develop a Learning Management System that specialises in teaching online security practices. It will allow tutors to create courses, and students to enrol and participate in these courses, with features that accommodate learning theory principles such as objective testing, multimedia content, ipsative feedback, collaborative features, and formative feedback through the use of affective computing techniques, while remaining cross-platform, employing gamification features to support engagement, and offering data analytics to tutors regarding their courses.

If this project is successfully implemented, it should begin to bridge the gap between the plethora of serious online security risks and the average user, or employee's knowledge about them in a way that conforms to educational theories.

2.0 Justification of proposed functionalities

In order to properly define the system requirements, academic research was conducted to better understand what should be included to ensure the system is both useful and usable for eLearning, specifically. Additionally, the system should place engagement as a priority and try to reduce abandonment as much as possible.

Gamification refers to implementing video game elements into non-video game applications (Deterding et al., 2011) and it improves user engagement especially in an educational context (Hamari et al., 2014). In the project, they would be implemented similarly to the sites researched, with lessons that unlocked linearly, progress meters for each module to show how much was completed, and certifications that would be awarded upon completion of a module.

Summative testing is typically administered at the end of a module to gauge content retention (Garrison & Ehringhaus, 2007) and immediate feedback on assessments are beneficial to learning (Kumaraguru et al., 2010). In the project, summative testing would be implemented at the end of modules using objective multiple choice tests to deliver instant feedback to students.

Cross-platform support allows sites to be accessed by at least 75% of the global population (Mcnaughton & Light, 2013). In the project, cross-platform functionality would be achieved using Bootstrap, so that pages are responsive, furthermore, progress would be saved to the database, so it is consistent between devices.

Community features allow social or professional interactions between students and are helpful to the learning process (Knight, 2002). In the project, there would be a forum page for each unit where students could interact and a rating/review system for each module.

A feature not present in any of the sites, but shows promise in regards to e-learning, is affective computing, computing that can influence or be influenced by emotion (Duo & Song, 2012). The typical methods used to detect emotion, such as facial recognition, are outside the scope of this project, however, less complex ways of ascertaining emotions of frustration or boredom are feasible. For example, implementing an idle timer that suggested watching a video lecture instead of reading, once 5 minutes passed which acts somewhat like formative feedback, or suggested going back to the material if idle on a test for more than 10 minutes.

Lastly, all the sites researched had a pleasant user experience, which can positively impact the attitudes of new or experienced learners (Lin, 2011) as well as increase productivity (Johnson et al., 2000). Therefore, there will be a focus on designing a useful and usable interface, using a high-fidelity prototype, as well as conducting heuristics evaluations after development. Furthermore, Single Sign-On will be implemented to reduce funnel drop off, as Ferry et al (2015) suggest that the bypassing of registration forms, as well as eliminating the need to remember additional credentials have a positive impact on user experience.

3.0 Progress Report

3.1 Summary of progress

According to the initial Gantt chart outlined in the EPP, the project is mostly on schedule, as the research has been completed, a risk analysis has been done, and the requirements have been outlined, albeit lacking some detail as to how they will actually function, and finally, most of the design work is completed. However, special care should be taken in the preceding steps, as the programming aspect was highlighted in the risk analysis as a source of potential time overruns.

3.2 Supervisory Meetings

The supervisor assigned to the project is Meenakshi Mengle, who has been communicating using email. Initially, when the EPP was delivered, there were concerns of a lack of complexity which may result in a low mark for the final submission. Therefore, significant changes were recommended and approved by the supervisor such as API authentication, and most importantly the change from a simple eLearning web application, where content would be added directly into the database, to a Learning Management System where content could be added from the front-end allowing many users to develop their own courses or quizzes. Full communication logs are located in Appendix B.

3.3 Completed Work

As stated above, since the project is mostly on schedule, and only lagging behind slightly, some sections of the development process have been either completed or mostly completed. It will be broken up into broad sections for easy analysis.

3.3.1 Requirements and Specification

In order to arrive at somewhat final requirements, academic research has been conducted into some learning theories, as it is a project based around education. This research was used to find out what specific features and functionalities should be implemented that would directly assist in its eLearning purpose. For example, objective, ipsative, and formative feedback were now justifiably included in the requirements list. Additionally, research into other LMS was conducted to determine what features they employed and how they could positively impact this project, if implemented. One example would be Social media API authentication. Table 1 outlines a list of the requirements, albeit without very much detail.

3.3.2 Design Phase

Initial designs for both the back-end and the front-end have been completed as of now. For the front-end design, wireframes were constructed for each major page, subsequently, a low-fidelity prototype was built to properly exemplify how the application would work and how each page linked to the others. Screenshots of the prototype are included in Appendix D.

The back-end design was developed by iterating through a logical schema, database schema, then finally arriving at a somewhat complete Entity Relationship Diagram. The use of the ERD allows the relational nature of the database to be easily visualised and understood. Furthermore, what data each page of the application requires from the database can be better understood as well. The ERD is outlined in Appendix C.

3.3.3 Back-end Development

As implementation has not yet begun, there hasn't been any real progress in this aspect besides the creation of a few of the tables outlined in the ERD. However, the SQL queries that will need to be executed by the PHP on the back-end have been mostly developed so that they only need to be plugged into each page, once they are coded.

3.3.4 Front-end Development

Similarly, no real progress has been made on this front, since coding has not expressly begun. However, some research was done into existing Bootstrap templates that closely matched or could be easily adapted to, the wireframes that were created earlier.

Table 1: Showing the Requirements List for the Project.

Reference Number	Requirement	Permissions Required
FR1	Registration with username, email and password field	User
FR2	Captcha on registration	User, Tutor
FR3	Choose a student or tutor account	User, Tutor
FR4	User or Tutor login	User, Tutor
FR5	Social Media API login and registration	User
FR6	Assign the user a username based on email if using API	User, Tutor
FR7	View available courses	User
FR8	Search for a course using keywords	User
FR9	View course details, creator etc.	User
FR10	View course ratings and student reviews	User
FR11	View other courses by that same tutor	User
FR12	Enrol in a course	User
FR13	View course content	User
FR14	Differentiate between viewed units and unviewed units	User
FR15	Take the quiz and view the result instantly	User
FR16	View previous results and time taken	User
FR17	Post in the unit specific forum	User, Tutor
FR18	Search all forum posts	User, Tutor
FR19	Upvote others' posts	User, Tutor
FR20	Sort posts by newest, oldest, most upvotes	User, Tutor
FR21	Rate a course and leave a review	User
FR22	Embed videos from links	Tutor
FR23	Create a new course	Tutor
FR24	Create a new unit	Tutor
FR25	Link quiz to unit	Tutor

FR26	Locking a quiz if the previous quizzes haven't been completed in a course	Tutor
FR27	Upload content for a new course (PDF, PPT, Video)	Tutor
FR28	Develop a new quiz	Tutor
FR29	Edit or delete course content and quizzes	Tutor
FR30	View list of students currently enrolled or previously completed the course	Tutor
FR31	Add tooltips for affective computing modal windows, with a hyperlink to the relevant unit in that course, relevant to the quiz	Tutor
FR32	Dashboard with current personal progress (progress bars)	User
FR33	Update profile information, bio, and forum flair as well as choose new username if assigned one because of API Registration	User, Tutor
FR34	Expanded dashboard with course specific details for tutors such as average time taken per unit or quiz among students, the completion rate of developed courses	Tutor

4.0 Ethical Considerations

According to UH regulations, any primary research conducted must first be approved by the Ethics Committee. In this case, no primary research will be conducted, as the approval process is lengthy and will impact the completion dates of the project. However, primary research in the form of questionnaires such as a heuristics analysis is extremely useful tools for evaluating an application. Therefore, a heuristic evaluation will be done only by the author/developer with special care to compensate for any innate biases toward or against the artefact.

5.0 Project Plan Review

The Project plan has been mostly followed to date, as the design is almost completed and development is carded to begin, which is in accordance with the Gantt chart produced in the EPP. However, with the benefit of hindsight, there are some worthwhile changes that should be made to the Gantt chart, and the overall project plan, that will probably increase the likelihood of project success.

Firstly, the supervisor meetings portion of the Gantt chart should be either revised or removed. The supervisor has communicated that the preferred method of communication is email, since it allows for a much easier record, as well as there hasn't been an effort from the author to organise any formal meetings. Therefore, instead of trying to schedule formal meetings, there will be more of an effort to communicate much more regularly through email and better leverage the support offered to the project by the supervisor and improve accountability in the event of skylarking.

Secondly, the 3 weeks allocated for completing the project report should be increased as the marking scheme and assignment brief has revealed that the majority of the marks for the module are allocated to the success of the project report, not the software artefact. Therefore, the new project plan will have 5 weeks allocated to the report and the build time will be slightly decreased by a few days. A revised Gantt chart can be found in Appendix A.

Additionally, there would be another change made in regards to the overall development methodology selected for the project, if it wouldn't severely impact the completion time and overall organisation of the project. A problem became apparent when trying to define the requirements, which caused more time than should have been needed to properly define them, as it was final and not easy to change once design or development began. For example, the requirements are final once they have been defined, according to the waterfall method of development, which may prove detrimental to project success if a

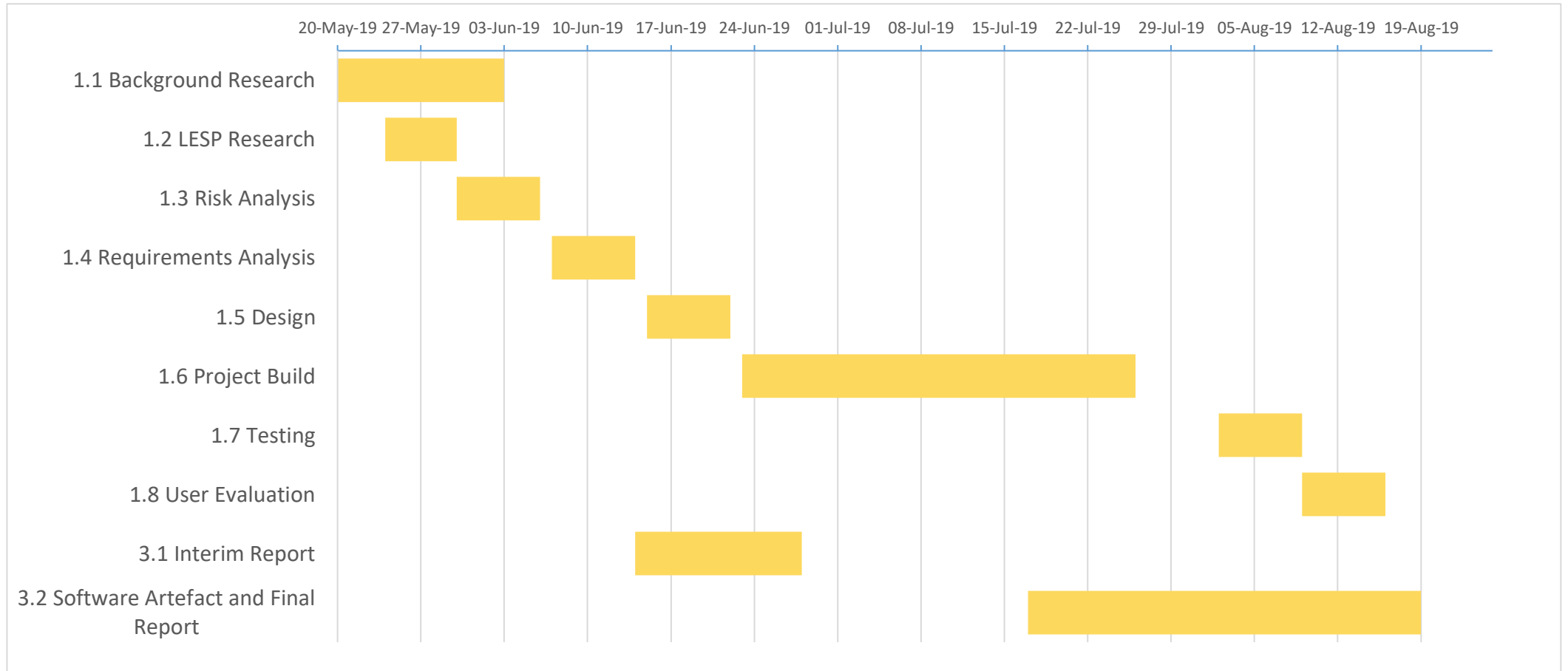
defined requirement becomes too complex to actually build. This could be more easily controlled for using a more contemporary software development methodology such as Spiral, Rapid, or Prototyping.

Appendices

**Appendix
A:
Showing
the
Updated
Gantt
Chart**

Task	Start Date	End Date	Duration (days)	Predecessor
1.1 Background Research	20-May-19	03-Jun-19	14	
1.2 LESP Research	24-May-19	30-May-19	6	
1.3 Risk Analysis	30-May-19	06-Jun-19	7	
1.4 Requirements Analysis	07-Jun-19	14-Jun-19	7	
1.5 Design	15-Jun-19	22-Jun-19	7	1.4
1.6 Project Build	23-Jun-19	26-Jul-19	33	1.5
1.7 Testing	02-Aug-19	09-Aug-19	7	1.6
1.8 User Evaluation	09-Aug-19	16-Aug-19	7	1.8
3.1 Interim Report	14-Jun-19	28-Jun-19	14	
3.2 Software Artefact and Final Report	17-Jul-19	19-Aug-19	33	3.1

Interim Project Report



Interim Project Report

Appendix B: Email correspondence with supervisor.

Leandro Dos Santos <dossal1905@gmail.com>

Introduction and Initial Instruction for Final Project Module

Leandro Dos Santos <dossal1905@gmail.com> Tue, Jun 4, 2019 at 4:04 PM To: Meenakshi Mengle <m.mengle@herts.ac.uk>

Dear Meenakshi Mengle,

My name is Leandro dos Santos and I am in the BSc Information Technology program. My project idea is meant to be an e-learning application that instructs users on basic online security such as strong password selection and recognising phishing attempts. In addition to the typical features of the average e-learning web application, such as objective testing, there is a plan to implement formative feedback by using techniques that mirror affective computing. I have attached a list of core and advanced functionalities as well as project milestones as requested. Furthermore, I have some fears about my ideas so far not being complex enough to get a high mark, even if they are implemented successfully. If you need me to expand on my idea or provide any clarification, please let me know. I really look forward to your feedback.

Thanks, Leandro dos Santos

Virus-free. www.avast.com

On Mon, Jun 3, 2019 at 4:23 AM Meenakshi Mengle <m.mengle@herts.ac.uk> wrote:

Dear student, I am the supervisor for your project, which you are doing in Semester C as part of the Final Project module. As starting point for our communication, please respond to this email with a short description of your project. I will have a look at the Project Proposal and About You documents that you have uploaded, or will upload on Canvas, and will give you feedback whether you have a good project, or if you have to add things to it, to make it a good one. Please state your degree title in your response (either BSc Computer Science, or BSc Information Technology). We will have online meetings if necessary (30 minute meetings over Skype or Adobe Connect), and we will communicate via email for any questions that you might have. For now your task is to create a detailed and well described list of system requirements (or system functionalities), in order to produce a system specification. Then you should already have a project plan from the proposal you created in the previous semester. If you don't, then the aim is now to create one (schedule and Gantt chart). Start by devising 5-7 project objectives, which should be measurable and to span the whole project period. So to summarise, your first tasks are:

To create a product specification through a detailed list of system functionalities (core and advanced) To devise 5-7 project objectives (milestones) for your project, which are descriptive and measurable To review the project plan you have created, or to create one if you haven't

Once you have prepared these, please send them to me via email, and then we will take it from there.

Thanks and Regards, Meena Mengle

Project Specification and Milestones.docx 8K

Interim Project Report

Leandro Dos Santos <dossal1905@gmail.com>

Re: Introduction and Initial Instruction for Final Project Module - Feedback

Meenakshi Mengle <m.mengle@herts.ac.uk> Wed, Jun 5, 2019 at 12:01 PM To: Leandro Dos Santos <dossal1905@gmail.com>

Hi Leandro,

Sorry to start my email on this note, but unfortunately I have to agree with your fear, this project can only take you as far as 50% or bit more. You must have read Gani's email by now on creating E-Learning Platforms. But on a positive note, I can see some good advance features in your proposal which can be further enhanced to do some data analysis and then you should be good to go ahead.

Although, if Cyber security is your topic of interest there are quite a few projects you can choose from such as an encryption algorithm (for cloud platform may be), Image Transfer or file transfer using cryptography/ encryption algorithm, Phishing Website Detection, or maybe Image password authentication system, fingerprint recognition system. Think about it.

As for your current project. Why have you restricted your e-learning platform to teach only basic security topic? I can see no problem in extending this to teach any topic. How I see it after reading your document is that you are trying to create something similar to small version of Canvas, correct me if I am wrong here. Where tutor can upload the learning material, lock or unlock these modules depending on learners progress, they can set assessment, provide feedback. Some of your advance features mentioned:

Progress meters for each module with percentage complete - Good, how will this be represented, using graphical bar or chart. Can a learner notification feature be included here to send out email if they are lagging behind schedule?

A unique forum page for each unit within each module for users to have discussions or ask questions - again a very good collaboration feature, who create these discussions, who monitors these discussions? will learner have limited rights or will you provide user freedom to choose what access rights to be set for these discussions? Think further on this. Reviews and ratings for each unit and modules as a whole - who can this information be further used?

User accounts, Potential social media login using APIs - good

Achievements for completing modules - Again can the learner scores or feedback be analysed to spot weaker topics and suggest topic to revise for final assessment.

What about including a student profile section for changing settings, progress analysis etc..think about it.

Look out for group email I will be sending out soon regarding literature review (Background research).

Have a nice day.

Regards, Meena Mengle

Interim Project Report

Leandro Dos Santos <dossal1905@gmail.com>

Re: Introduction and Initial Instruction for Final Project Module - Feedback

Leandro Dos Santos <dossal1905@gmail.com> Wed, Jun 5, 2019 at 3:13 PM To: Meenakshi Mengle <m.mengle@herts.ac.uk>

Hi Meena,

I really appreciate your feedback, even though I have so much to improve upon. I read Gani's email earlier as well and I realise that I will probably have to include functionalities on the front end for "teachers" to be able to add their own content, instead of it being added by me directly into the database. Furthermore, I will definitely be adding some kind of dashboard functionality so that users can view their progress and can change profile settings etc. I still do want to stick with an e-learning project at least, instead of switching to something purely relating to cybersecurity.

I originally chose basic cybersecurity as a way to narrow down the scope of the application, however, I see now that might be a drawback. You are correct in that the application would be similar to canvas, however, I intend for it to be more automated, so that it does not require any teacher to student interaction outside of teachers setting the material and quizzes, and the students consuming it. Unlocking units would be pre-set so that upon completion of a previous quiz, the subsequent units would then be unlocked for that user.

Regarding progress meters, they would be represented using a bar with a visible percentage similar to [freecodecamp.org](https://www.freecodecamp.org) for each course the user is enrolled. Users could potentially be notified if they haven't been active in recent weeks, however, I intend for users to be self-regulated so there wouldn't be schedules per se.

The forum idea is not intended as a dedicated forum, but more like a "chatbox" where users can ask or answer questions relating to each specific unit or quiz, again, similar to [freecodecamp.org](https://www.freecodecamp.org). Additionally, there wouldn't be any moderation outside of Google Captcha, but I could try to develop this idea further. Maybe user roles so that a teacher of that module can be identified by their "flair" similar to [reddit.com](https://www.reddit.com).

Reviews and ratings are intended to be used for users to more easily choose a new course to begin, exactly like [udemy.com](https://www.udemy.com).

The achievements feature would probably be integrated into the dashboard, with certificates awarded for completion of each module.

Again, I really appreciate your feedback and I hope that the changes outlined are at least a start in improving my idea to an acceptable level. I'm sorry for such a long response as well.

Thanks again, Leandro dos Santos. [Quoted text hidden]

Interim Project Report

Leandro Dos Santos <dossal1905@gmail.com>

Re: Introduction and Initial Instruction for Final Project Module - Feedback

Meenakshi Mengle <m.mengle@herts.ac.uk> Thu, Jun 6, 2019 at 4:49 AM To: Leandro Dos Santos <dossal1905@gmail.com>

Hi Leandro,

Please don't be sorry for the long email. Email is our main communication method and more you can explain me better I will be able to guide and support you.

As suggested earlier, make it a Virtual Learning Environment for online courses (automation feature is good) but do not restrict it to teach only one subject. You can use the cyber security content as your dummy data, but it should be broad enough for client to create any course on this platform.

Please do not underestimate the scope of this project, choose your development environment and technologies and get started. Also do not get distracted with getting the UI perfect to start with (this can be sorted later as well) get the functionalities working.

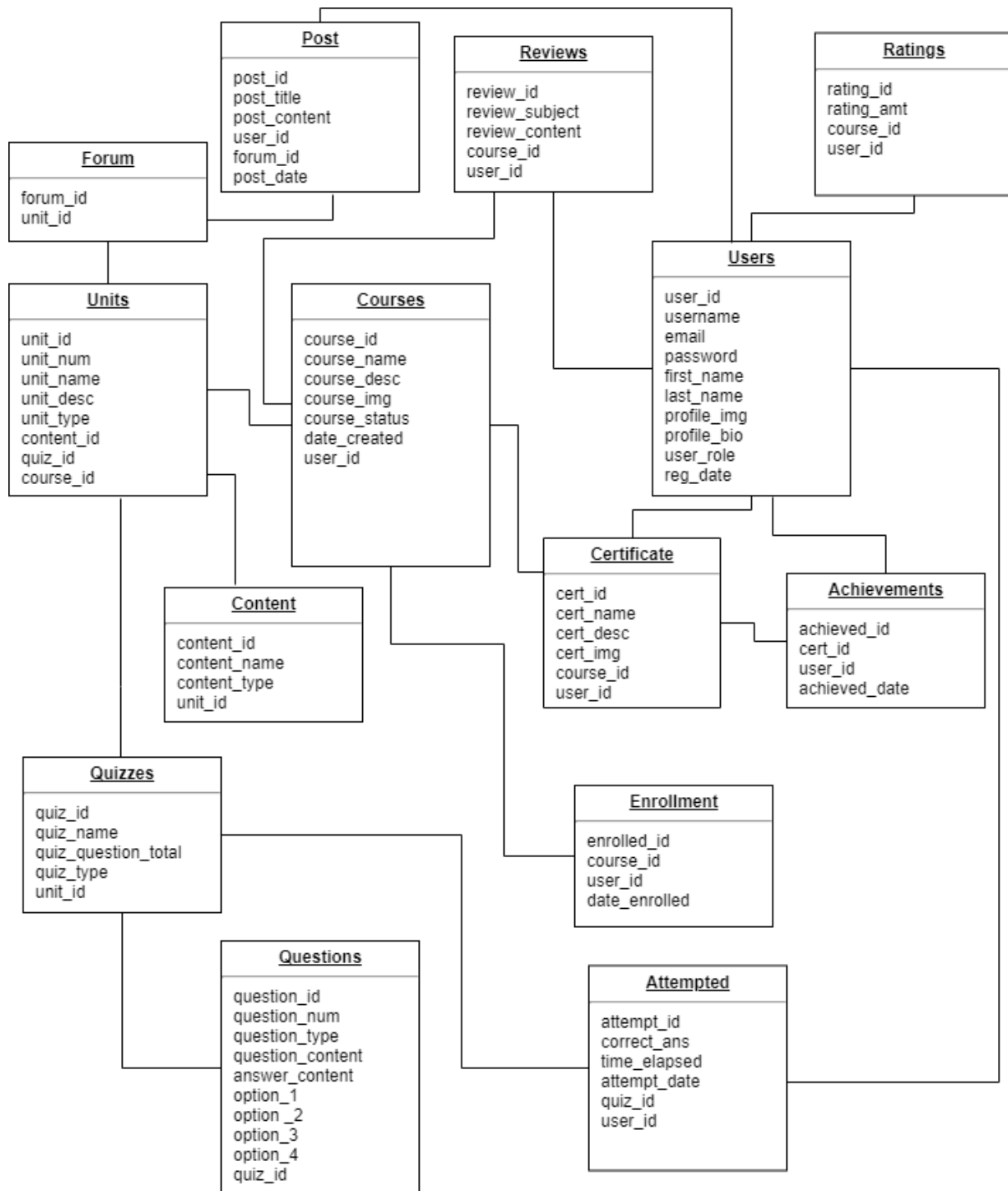
All the best and keep in touch.

Regards, Meena Mengle

From: Leandro Dos Santos <dossal1905@gmail.com> **Sent:** 05 June 2019 20:13 **To:** Meenakshi Mengle **Subject:** Re: Introduction and Initial Instruction for Final Project Module - Feedback

[Quoted text hidden]

Appendix C: Entity Relationship Diagram



Appendix D: Screenshots of Low-fidelity Prototype

Register

<input type="text"/>
<input type="text"/>
<input type="password"/>
<input type="password"/>
<input type="text" value="Student"/>

Register

Login with Google

Login

Login

Login with Google

Dashboard

Anti-Phishing	50 %	<div></div>	Go to Course
Password Managers	68 %	<div></div>	Go to Course

Courses

Anti-Phishing

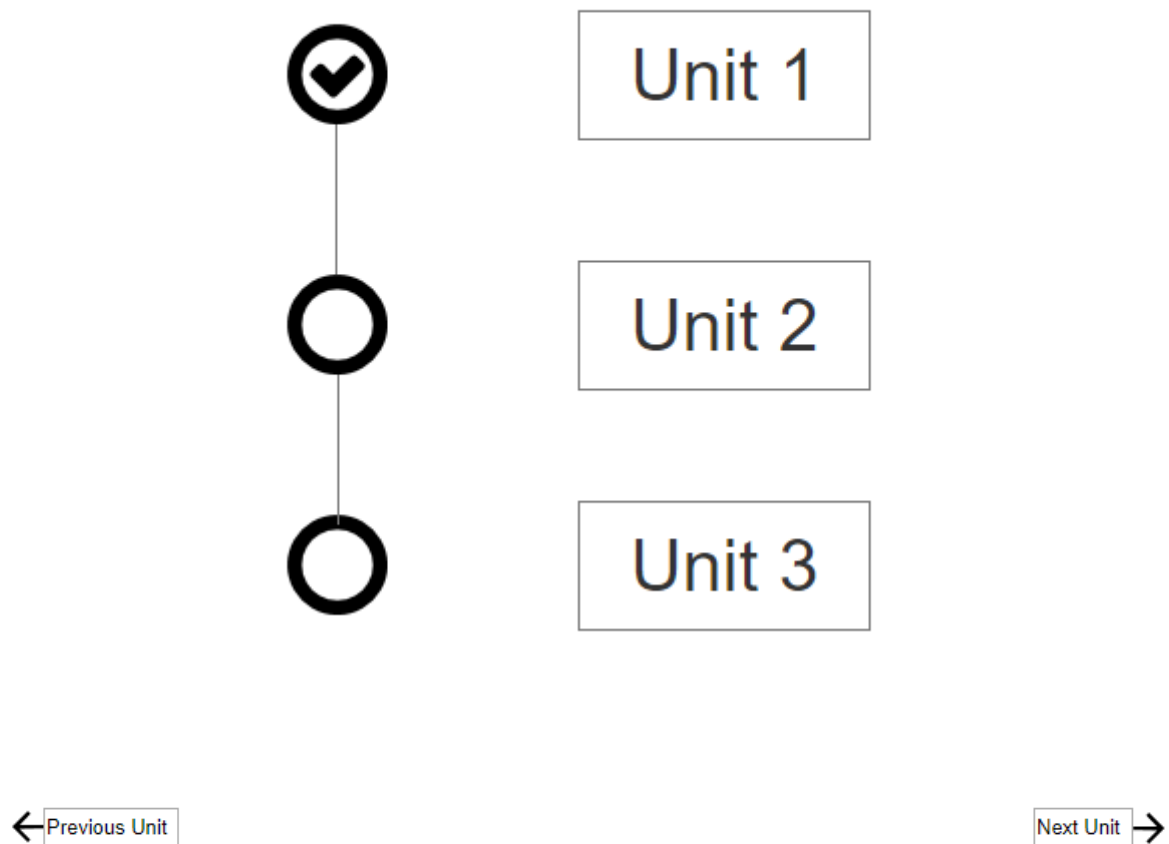


A course developed by an InfoSec expert on how to avoid becoming a victim of phishing attacks.

Password Managers



An introduction into the different applications that can be leveraged by the average user to secure their online accounts



Quiz 1

Quiz that covers the previous unit of content

Previous Result **80 %**

Start Quiz

← Previous Question

Next Question →

Question 2

- ☐
- ☐
- ☐
- ☐

Select

Next Unit →

Your Result

100 % 

Previous Result **80 %**

Restart Quiz

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