

Knowledge Bomb

Interactive learning support with smart mobile technologies

by

Group 5

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Introduction

Some schools throughout Cardiff University have invested in equipment to allow students to provide feedback to their lecturers whilst in lecture theaters. Our client Professor David Marshall saw how this equipment is difficult to setup and generally unused despite its high cost, and so brought us this task. The task is to create an interactive lecture support application, utilising electronic devices that students regularly bring to lectures to improve on the current method of feedback. David has left a lot of the project open to our own interpretation, the only major direction is that it should be accessible to a variety of devices such as laptops, smartphones and tablets. We hope that the final product will help to enhance the educational experience of students in Cardiff University and potentially other universities.

The interactive lecture support application shall provide a better way for students to communicate to lecturers. Students can use the app to ask lecturers questions anonymously when they do not understand, or if something is unclear. Questions can be voted up and down by others so that the highest voted question will move towards the top of the list. Lectures can be rated to how helpful or useful they were by other students which will hopefully result in high attendance for the high rated lectures and lower rated lectures to be improved. Lecturers can use the app to make questions and quizzes for students to answer during lectures which the lecturer can view the results to see if what they teach is being understood. Students can choose to be anonymous when answering the questions to overcome shyness.

While it is true that students attend a variety of learning environments; lectures, labs and tutorials, our client and ourselves have focused solely on the use of the app in lectures.

System Requirements

System requirements at their most basic are what the app needs to do. These can be categorised into functional requirements that are essential for the use of the app, i.e. a student is able to view questions, and non-functional such as the quality of the code i.e the app runs smoothly and consistently. Functional requirements can then be further categorised using the MoSCoW methodology. This stands for must have, should have, could have and won't have; representing descending importance of each requirement. A lecturer's ability to ask questions is one of the core functions of our app and is therefore classified as a must have, whereas student login is a feature that is not necessary to the app itself, but further down the line may be something to add in version two. This is therefore classified as a could have. There is no acceptance criteria for 'won't' requirements as these are out of scope for our current project.

When deciding what features and in turn our functional requirements for our application we decided to ask directly. We created a questionnaire for students and a separate questionnaire for lecturers, the results of which can be viewed in full in appendix A.

Functional Requirements

Requirement One - Must Have	
Requirement	Lecturer can ask the students questions
Description	The lecturer is able to ask the students questions through the app during lectures.
Acceptance Criteria	Lecturers can create questions by inputting the question title, question text, question type (radio buttons, drop downs, text entries or checkboxes) and possible answers. A link/QR code to the question is returned. When students answer the question on their devices their answers are recorded. The lecturer can view the aggregated results.

Requirement Two - Must Have	
Requirement	Students can ask the lecturer questions.
Description	At the end of a lecture students are able to ask the lecturer questions through the app.
Acceptance Criteria	Students can submit questions at the end of a lecture and all questions are recorded.

	The lecturer can see the questions on their device.
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Requirement Three - Must Have	
Requirement	Ad-hoc grouping
Description	Students using the web app are able to join their preferred team and be able to work together in a group using their own devices.
Acceptance Criteria	<p>Creating groups - Students can create groups of up to a given number of people set by the lecturer prior to the exercise.</p> <p>Once a student creates a group they automatically join it.</p> <p>Joining groups - Students can see and join groups created by other students.</p> <p>Usability - Helpful pop-up messages on user actions.</p>

Requirement Four - Must Have	
Requirement	Web Link
Description	Students are able to access the app using the web link to the app on their devices.
Acceptance Criteria	Correctness of links - When the web link is opened on a student's device the appropriate page is shown.

Requirement Five - Must Have	
Requirement	QR Codes
Description	Students can quickly access the app using QR Codes through their QR code readers on their devices.
Acceptance Criteria	Correctness of QR codes - When scanned the QR code successfully open the appropriate page.

Requirement Six - Must Have	
Requirement	Lecturer Login
Description	To start a session, the lecturer should login in the app first.
Acceptance Criteria	<p>When given a correct username and password the app successfully logs the lecturer into the system.</p> <p>Ease of usability - Helpful pop-ups on a bad login attempt.</p>

Requirement Seven - Should Have	
Requirement	Content Management System (CMS)
Description	A CMS will be developed to allow white labeling of the product.
Acceptance Criteria	A wide range of styling options can be used to give the interface a specific look. Option to add a logo.

Requirement Eight - Should Have	
Requirement	Forum Boards of Questions
Description	Students are able to vote up or down on questions which have been asked by other students.
Acceptance Criteria	Dynamic score calculation - When a student votes a question up or down, this is properly reflected on a counter next to the question. Sorting by score - The highest rated questions appear at the top of the list.

Requirement Nine - Could Have	
Requirement	Rating Lectures
Description	After completing a lecture, students are given the opportunity to rate the lecture given through the app.
Acceptance Criteria	Rating a lecture - Students are presented with the ability to rate the lecture from 1 to 10 and leave comments. Results calculation and presentation - The results are correctly calculated and stored for the lecturer to view on his own or discuss with the students. Privacy - All students' personal information remains hidden.

Requirement Ten - Could Have	
Requirement	Student Login
Description	Students must login before having access to the app for attendance but can choose to make their session anonymous.
Acceptance Criteria	<p>When given a correct username and password the app successfully logs the student into the system.</p> <p>Choice of anonymity - A student must be clearly be presented with the option to log in anonymously without having to enter any personal information.</p> <p>Ease of usability - Helpful pop-ups on a bad login attempt.</p>

Requirement Eleven - Won't Have	
Requirement	Notification of questions
Description	The device of a lecturer is notified when a question from a student arises using their own device.

Non-Functional Requirements

Requirement One	
Requirement	Software reliability
Description	All major functionality of the app must be bug-free, with only a few or no minor bugs present.
Acceptance Criteria	<p>Correctness of functionality - The app must have no major functionality-breaking bugs.</p> <p>Fault tolerance - The app can have up to a few minor bugs that it can cope with so that they do not impact the user experience significantly.</p>

Requirement Two	
Requirement	Efficiency
Description	The app must not waste a significant amount of system resources and must run smoothly for all users.
Acceptance Criteria	Low response time - The app must consistently load without any significant delay when accessed through a wifi connection and must be responsive on modern mobile devices.

Requirement Three	
Requirement	Maintainability
Description	The system should be easy to maintain and expand on for future growth.
Acceptance Criteria	Easily usable development tools - Create and use a software framework.

Requirement Four	
Requirement	Security
Description	Students and lecturers must have specific user rights. Student login information must be kept safe.
Acceptance Criteria	Controlled access - Students should not have access to features intended for use only by lecturers. Students should not be able to spam questions or answers and thus reduce the quality of the overall user experience. Data safety - Any passwords that we store must be salted and hashed (aka not stored in plain text). Any personal information must be stored in a secure MySql database that is not vulnerable to SQL Injections.

Requirement Five	
Requirement	Software reliability
Description	All major functionality of the app must be bug-free, with only a few or no minor bugs present.
Acceptance Criteria	Correctness of functionality - The app must have no major functionality-breaking bugs. Fault tolerance - The app can have up to a few minor bugs that it can cope with so that they do not impact the user experience significantly.

Requirement Six	
Requirement	Privacy
Description	Private student information must not be shown or kept.
Acceptance Criteria	If a student choose the option to login with their Cardiff University credentials, their answers to questions will not be saved after the conclusion of the session and none of their personal information will be shown.

Requirement Seven	
Requirement	Cross platform support
Description	The app must run on all major mobile platforms and on laptops
Acceptance Criteria	The app is fully functional and consistent across the following mobile operating systems – Android, iOS, Windows Phone and PC operating systems - Windows, Mac

System Scope

1. Lecturers will be able to create questions of various styles to ask the students.
2. A code (qr or otherwise) is available for students to join the room.
3. Students are able to submit answers to questions.
4. Lecturers are able to view answers.
5. Students are able to ask questions to lecturers which are stored until the end of the lecture.
6. Students are able to view other student's questions for the purpose of upvoting them.
7. App is available for multiple platforms i.e. chrome, android, ios.
8. Students are able to form ad hoc groups to answer questions.
9. The app must run consistently and reliably.

System Boundaries

1. The project will not address any hardware reliability issues that might affect the performance of the app.
2. Any efficiency-influencing factors outside the software implementation itself, e.g. internet connection, are not taken into consideration.
3. Physical security of the servers on which the information is stored is not taken into consideration.
4. Support for any platforms outside the ones listed is not guaranteed.
5. The app is meant to be used in lectures only, support for labs and tutorials is not part of the project.
6. The app will not have any accessibility features.

Benefits and Risks

The stakeholders are all the people who are involved directly or indirectly to a project. All interested parties will benefit from the project in different ways. In the case of our group the project is about the development of an app which with the use of tablets, smartphones and laptops the students will be able to have a better communication with the lecturers by giving feedback, answering quizzes and asking questions to the lecturer. The main stakeholders who are involved in this project are the students, the lecturers, the client and the project team members (our group).

Students

The people who will be affected most by this app are the students. The students will face a new education experience that will help to increase interest during lectures. The use of quizzes or questionnaires will help the students to better understand the lesson and to be more involved. Even students who are shy or nervous talking in front of the class will have the chance to participate more and feel more comfortable. Also this app enables the students to leave feedback about the lectures and this can be really helpful because the lecturers will have more opinions and the different views of the students and what they really need. Additionally, through this app students will have the option to ask questions anonymously and can be either viewed by the class or only on lecturer's device. We also hope to implement an upvoting system for questions, this way if someone has already asked a question and others agree with it, it gets pushed to the top of the list. This will save a lot of time because imagine if all the students want to ask questions the lecture would never end. Generally, we can see that this app will make the lectures for the students much more fun and enjoyable. As we all know the attendance of the students in the lectures is relatively low, so this app can be a boost and an extra motivation for the students to be more interested and promote consistent attendance.

Lecturers

Another group of people that is directly interested in this app are the lecturers. Firstly, this app will make the teaching much easier and the communication with the students will be more direct. As I mentioned above the use of feedback will give the chance for the lecturers to understand what the strengths and weaknesses of their lectures and try to improve their lectures according to the students' needs. Moreover, the answers on the questionnaires can help the lecturers to ascertain if the students understand the lectures and if it is needed to explain something again. In addition, the use of this app will help to make higher quality lessons through greater collaboration between lecturers in planning and preparing resources. It shifts the classroom experience from the sage-on-a-stage approach to a more harmonic environment.

Project Team Members

The project team members are our group and we are responsible for the development of this app. First of all, I believe that being part of a group will help you develop your interpersonal skills such as listening and speaking as well as team working skills such as leadership. Also working closely with other people helps you to better know yourself and identify your own strengths and weaknesses. It gives the chance for the students to have a better structured learning experience that can prepare students for the difficulties and environment of the workplace, working with people from different countries with different cultures and approaches.

Furthermore, another main benefit for the members of the group is that they will develop their skills in programming. Because this is a web based app, standard web languages will be used like html, PHP etc. and this will help them to be more familiarised with coding and the development of various programs.

All the skills that are developed during group projects can be very useful throughout your academic career especially when you come to write your CV or complete job application forms and help develop skills valued by employers.

Client

The client is the person who set the project and directly benefits from it. Clients can range from large organizations to small companies or individuals, in the case of our project the client is an individual. The client is the one who pays for the development so everything must be under his supervision and guidance and made to their specific standards. The job of the client is to coordinate all the procedures during the project development in order to achieve the desired aims and objectives. The group must have regular meetings with the client in order to show him the progress of the project and to gain the client's views and input on the process. The client benefits from either the use of this app in their day to day operation or by selling it, in our case to different universities that are interested. In order to achieve this, the client has to first promote the product in order for the universities to see what it offers and if it meets the requirements that they need.

Others

Other parties that are involved in the project are the supervisor and the module leader. These are not strictly stakeholders and do not really benefit from the project, but they have a role in the project providing our team with help and support for the sake of the module and report rather than the app itself. The supervisor's job is to ensure that everybody in the group is working and they are attending in the meetings. The module leader is responsible to monitor all the groups and be in a continuous communication with the supervisors so to make sure everything moves smoothly.

Risk Analysis

Our risk analysis aims to identify the significant hazards that are present with the development of our project and aims to aid in the management of these hazards. Below we have stated some, if not all, of the physical and mental problems that may hinder the development of our project as a whole. We have also highlighted each of the risks in an easy to read risk map of potential risk severity.

Risk ID	Risk item	Probability	Impact Level	Effect	Risk management technique
1	Team member falls ill	Medium	Marginal	Team member is unable to complete his assigned work	Reassign the ill team member's current task to someone else
2	Team members feel overwhelmed by work in other modules	High	Serious	Team members don't have time to complete their work for the project	Create a Gantt chart to clearly mark all deadlines and ownership of different tasks, update it frequently
3	Poor organization of tasks	Medium	Serious	Uneven distribution of work across group members	Hold weekly meetings and make sure no one is overwhelmed or left without any work to do
4	The group misinterprets the client's intentions	Low	Serious	The finished product does not satisfy the client's needs	Use the Agile development method
5	Accidental deletion or corruption of our work	Low	Critical	Failure to complete the project	Create backups of all the work we do so that if there is a problem with the master copy we

					can update it with a backup version
6	Team member not completing work assigned to them	Low	Serious	Portion of the project remains incomplete	Ensure all members are contributing with regular meetings and help struggling team members
7	Poor use of group information management techniques	Medium	Serious	Access to shared group information and code becomes difficult	Use appropriate version control tools
8	Lack of exposure to and/or experience with technologies being used	High	Serious	Team members struggle to accomplish various tasks	Make sure each team member has a task appropriate for their skillset
9	Inconsistencies across different platforms	Medium	Serious	Not all students can use the full range of features of the app	Make sure the app is compatible with all intended platforms and test frequently
10	Students abuse their anonymity in the app to spam lecture ratings or questions	High	Marginal	Quality of student and lecturer experience is reduced	Limit the rating and question asking/answering features to one per device

Risk Map

Potential scale of impact	Likelihood of occurrence			
		High	Medium	Low
	Critical			(5)
	Serious	(2), (8)	(4), (7), (3), (9)	(6)
Marginal	(10)	(1)		

Quality factors

We have chosen not to explicitly define requirement quality factors because the fulfillment of most of the requirements is boolean and cannot be measured to a degree of quality. Wherever the extent to which a requirement should be fulfilled can actually be meaningfully measured, this has been reflected appropriately in the acceptance criteria.

Legal, Social, Ethical and Professional Issues

Below we have identified all of the legal, social and professional issues which can occur in the development of our application. Each of these points are necessary to consider when creating our application because there are many points in which we need to follow to make sure we create our application in the most effective and appropriate way.

Legal

When creating a piece of software there are many legal issues which must be adhered to. For example there are many things which you should look at throughout the Data Protection Act 1998 which will protect everything within the software which you are creating.

An example of something from the data protection act is that any kind of personal data should be processed fairly and lawfully. This means if there is any kind of personal information which is used or processed within the software it is protected as well as possible and no one can gain unauthorised access to it.

Protection of the software should be obtained straight away, there is no registration needed. The specific form of the program is protected, not just the general functionality.

Another legal issue which you must make sure you look at when creating a piece of software is to protect all the functional aspects of the software. This even comes down to protecting the algorithms. The only issue with this is that it can be a high cost and a lot of effort to obtain securely. This can be done by using RSA. This is an efficient way of keeping data/information secure. RSA is an algorithm which is used to either encrypt or decrypt data/information. It contains a public and private key which enables you as a developer to decide who is able to view the information. A special technique is done by using both of these keys to enable this to happen. This type of technique is essential to use when looking at legal issues as it protects the data/information from any kind of unauthorised access.

If you create a piece of software which is saving data which has been inputted from a user, You need to make sure you are keeping that data and information as secure as possible. This can be done depending on how you plan to use the data you have been provided. If this data needs to be kept safe and protected it needs to be stored somewhere so only authorised users are able to access it. This is due to the Data protection act. Appropriate technical measures shall be taken against any kind of unauthorised or unlawful processing of personal data.

Another legal issue which could occur within software development could be when using Open source code would be that you are not allowed to put any restrictions on the code for users who use your modification/copy. This could cause problems within the software development if you wanted to put your own terms and conditions for your software. This could mean that you may be restricted in certain ways when using the OSS (Open Source Software). Due to this you will have to take this into consideration when deciding whether to use Open source code or not.

Social

As the age of technology dawns more and more people's data is being stored online, from people's Names, hobbies and interests (Facebook etc.) to their very personal information (banking details). If this information falls into the wrong hands a whole array of bad things can happen to whoever's data is stolen. For example data could be deleted, changed, used for blackmail or even used to create a false identity.

When developing our software we plan on taking the correct protocols to prevent our user's data from being stolen and used in a malicious manner. We will do this by not collecting cookies via our software, no storage of plaintext passwords (use password hashing etc.) and coinciding with data protection laws such as the Data Protection Act.

Some other issues that we must take into consideration are disability access to our software. We may include compatibility so that magnifiers, text readers and dyslexia support for our software. For example a visually impaired website user may be able to 'read' the website using a screen reader on our webpage. This is made possible by describing images under the 'alt' tag in an html document. This gives a brief description of the image along with reading the text that is present on the screen. The Equality Act 2010 (EQA) came into force October 2010. This came with the intention of dealing with the issues of disability discrimination.

Ethical

There are many ethical issues involved with software development. For example, you need to make sure you are using legal software to help create the new application.

If a company is caught using an illegal piece of software to make a program it could cost the company a lot of unnecessary money and costs.

There has been a legislation put into place by Business Software Alliance (BSA) that if a company is found using illegal software to create a program, there will be costly consequences. This is why it is essential you have all the right and necessary agreements for the software which you are planning to use to create the program. This could save a lot of money and time.

Another ethical issue which needs to be adhered by when creating a piece of software would be using open source code. For example when using any type of open source code to develop a piece of software you will need to make sure you have credited the original source code properly. Within the project which we are creating, we will not be using any kind of open source code. All of the code which we will be using throughout our project will be our own code, this means we will be able to use all of our code in any way we want to.

The first example of an open source code would be licensed source code. Licensed source code may have a GPL (General Public License) or even a LGPL (Library General Public License). If you are using this type of code you will need to check The GPL or LGPL

beforehand to find out what kind of legislations are to be done so you are able to use that code as you will. It will explain exactly how the code is allowed to be distributed, copied and even modified. If these legislations are not adhered to consequences can occur. There has been a project launched by the Free Software Foundation called the GPL Violations project. This is very efficient and necessary because it is there to make sure companies who are using open source projects within their software are adhering and referencing against the GPL correctly.

Another type of open source code would be credited source code. This is code which can be published if the author of the code has been credited for it and has also been given the author's consent.

The final type of open source code is public domain. On the other hand Public domain code will not cause any kind of ethical issues to the programmer when creating a new piece of software. This is because there is no obligation to provide credit for use.

This is code which is within the public domain which means that the original author of the code has been relinquished of the rights to the code. This means that the code can be used by anyone.

Professional

As we plan to one day white label our software to distribute it widely amongst other universities and education facilities, we must consider professional issues when developing our software. Some of these issues may be market. The term market I will be discussing using the four P's system, product, price, place and promotion. 'Those selling a product must develop a product that meets the needs of the target market, set a price for the product, get it to a place where the consumers can buy it (distribute it), and inform the target market about it.'[1]

What exactly is our product? It is important to exactly know what our product is and what it will be doing for the user and client. We will achieve this by following the client brief closely and having frequent meeting with the client to make sure they are happy with our progress. We must follow what the client needs while also taking inspiration from our target market research (student surveys) to develop our software and define the functional and non-functional requirements clearly.

Price will also be a factor if we decided to distribute our software. How much will we be charging for our software for other universities to use? What will this price entail, will it include the app being changed to coincide with their university logos/colour schemes? All of these points must be considered. Adjusting the price can often have a profound effect on the profit we obtain from the software, make it too high and universities may see it to be too expensive for their facilities and make it too low and we may as well distribute it for free, and if we were to distribute it for free how would be pay for server space? (Assuming that we cannot always use the university servers).

Place is easy for us to define as we have already been given this by our client, Cardiff University. Cardiff University will be the first place in which the software will be implemented and if and when we decide to distribute our software. 'Various strategies such as intensive distribution, selective distribution, exclusive distribution and franchising can be used by the marketer to complement the other aspects of the marketing mix.'[1]

'Promotion represents all of the methods of communication that a marketer may use to provide information to different parties about the product. Promotion comprises elements such as advertising, public relations, personal selling and sales promotion.'[1] As we are considering this a university project we can assume that the software may be tried and tested within our school of computer science by our lecturers at no cost. There are also schemes set in place like student enterprise that encourage business ventures from university students that would be happy to offer us information on promotion and advertising. We can also assume that if the software is successful that lecturers may spread the good reviews amongst themselves and it will grow in popularity amongst schools.

'Software Reliability is the probability of failure-free software operation for a specified period of time in a specified environment.'[2] How complex software is often determines how many things can go wrong with a defined software application. A successful application of a software plan is one that delivers effectively the main goal of the software without incurring any bugs or errors. It is important that our final delivered software is error free as errors can completely ruin the professional aspect to the software. If we are looking to be as industry standard as possible we must deploy sufficient error testing before we finalize our project.

It is also important for our group to remain professional with each other and our client/supervisor. Professionalism within the group will determine how productive meetings are, whether deadlines are met on time and whether we finally meet our client's demands. These can be accomplished by remaining professional and concise in meetings, staying on the topic of work along with mentioning everything that needs to be mentioned in said meeting. It is also important everything is taken down and noted during meetings to avoid data loss, this is especially important whilst in client meetings as what the client wants determines the final outcome of our software. Other professional practices that we have set in place is only working via Google docs. This allows anyone in the group to work/edit our project from any location with an internet connection.

Software Development Process

As a group we have decided to use and integrate the agile methodology into our development process. There are several reasons as to why we feel that the agile development process suits our needs more so than an alternative such as the waterfall development process.

One of the main factors in us deciding to go ahead with the agile methodology is down to our modular approach with the software. We plan to have multiple iterations of the software that could all run and be fully functional without all of the features. An example of this would be having the software up and running using the feature of ad-hoc grouping without actually having our “forum” integrated into the system. This allows us to dummy launch the product to test each feature without needing everything to be completed at once. A great benefit of this is that we can assign different tasks to different groups of people and allow multiple deadlines depending on the complexity of each task and still be able to test the features whilst others are in development.

Another added bonus of using agile is that it allows the client to always be able to have an input and enables us to ensure that the client is getting the product that they are after. This could be looked upon as a downside as sometimes too much client interaction can be a bad thing, however as a group we feel that both we and the client are on the same page when it comes to what we want this product to do.

As the development cycle progresses we will be able to incorporate any changes that we feel may benefit the product. Some of our ideas may not work the way we want them to, so we may need to find a new way to make some of these features work. Agile allows us to do this whereas if went with the waterfall methodology we would need a much more rigorous software design stage and essentially need to know exactly how the final product would work before we even start to move on to the implementation. The flexibility that the agile development process gives us allows us as a team to be much more creative and push for ideas that may or may not work whilst minimising the risk/consequences.

On a final note, the agile development process also suits us as a team. We would much rather get stuck in to the development of the product then spend weeks on a specification. It works for us, it works for the client and most of all it will ensure the end user gets the best experience possible.

Future Deliverables

For our next submission (12/02/2016) we plan to have the majority of the framework completed. The framework behind this product is what is going to allow us to make a truly modular system that allows developers to easily add new features whilst allowing everyone else to easily understand their code (assuming that they have knowledge of the framework

created). The framework will enable pages to be created easily whilst following the same style as the rest of the product so that everything is coherent.

With the majority of the framework completed we would also like to have the ad-hoc grouping feature functional and ready for testing. This is the core feature of the product so once we get this working the rest of the features will be relatively simple to integrate into the product.

Time permitting we would also like to have the base of the CMS (content management system) created. This is what will allow us to white label the product and change the style easily from a web based interface. Some examples of the features that we would like to have up and running by this point would be the customisation of font colours, background colours as well as adding a logo/branding.

For our final hand in (29/04/2016) we plan to have all of our features implemented and working. The features that we currently plan to include are as follows:

- Framework
- CMS (Content management system)
- Ad-hoc grouping
- Multiple question types to be asked by the lecturer (Radio buttons, drop downs, text entries, checkboxes)
- Allow the student to ask questions at the end of the lecture (Possible voting on the questions so the most popular ones rise to the top)
- Cross platform support (mobile devices are imperative, laptops are lower on the priority)
- Allow students to join “rooms” via QR code as well as a text based code
- White labelling of the product
- Presentation demonstrating the product and its features

We may find that some of these features may take too long to implement and are quite low on the priority list e.g. white labelling. However regardless of this we want to have a product that works, is bug free and is in a state where it could be launched inside the university.

Work Plan

Stage one of our project was very difficult to plan for, an ad hoc group was thrown together randomly and many of us did not know each other which made things very slow to start. After a few group meetings and our initial client meeting we had a much better idea of our group, our strengths and weaknesses and what we were actually required to do in order to create our project.

Prior to our client meeting everyone in the group was tasked to write down at least two questions each which they should then ask our client. We set up a Facebook group that we

could use to contact each other and share information. We also set up a Google document that we all had access to and could add and share information.

After summarising the minutes from our client meeting our group came up with several ideas that we wished to include in our application and a few ideas about how to approach the task. This became the basis of our functional requirements.

Before we could start to build anything we had to do some base research. Using our criteria sheet for the project we split this into distinct sections and members of our group were allocated different tasks to focus on, functional requirements; acceptance criteria; legal, social, ethical and professional issues and planning. We also decided to create consumer based surveys to identify what features we should definitely endeavour to include in the final product, everyone contributed questions to this in an identical manner to the client questions.

Now that we had begun to conduct independent research there was a lot of information that was harder to share, we repurposed our existing google doc and created a master document that contained links to everyone's individual research. This was also a great tool for version control.

During this phase a Gantt chart was drawn up, Gantt charts are very useful tools used extensively in business and are very effective to plan and achieve tasks and set deadlines. The Gantt chart contained information about all our group, client and tutor meetings, everyone's individual tasks and deadlines and 'milestones' such as hand in dates for work, we also used this to create 'soft' deadlines to give ourselves some extra time to sense check and collaborate our work. The Gantt chart is included in appendix B.

Stage one of the project was focused very much on the initial group project and not so much on actually building our product. Using our criteria sheet once again and utilising the same group members that had conducted the initial research we then allocated the sections of our group project that we would all work on individually and also allocated an individual to write an introduction and conclusion and another member who would compile the work at the end. To share this information we used our master Google document to share our links to our contributions.

After going through all these processes for stage one we are much stronger as a group and are in a much more comfortable place to be able to plan ahead for stage two of the project. We are going to further split our Google documents to reflect each stage of the project, this will make it much easier to navigate and make the document less cluttered and it will be much easier to find the information you are looking for.

We also have the criteria for phase two of the report. This has been divided already into sections that will be assigned to individuals or pairs that wish to undertake them, many of these tasks are extensions of stage one tasks so in the interest of continuity these will be performed by the same people.

Stage two is more focused towards building the project, this will be split up into distinct tasks and allocated to different group members based on their strengths and preferences in a similar manner that the research tasks were allocated in stage one.

As a group we will decide on these tasks and milestones as well as tasks for writing the interim report, these will then be turned into a stage two Gantt chart that will be utilised for everyone to easily follow and be able to track their own tasks as well as both individual and group deadlines.

During stage one everyone was left to their own devices and was allowed to work at their own pace, this worked reasonably well and while not all of our self-imposed deadlines were hit everything was still completed with enough time to check before the actual deadline.

For stage two of the project we will use our Gantt chart much more effectively and review it at every group meeting to make sure that everyone is contributing and will hit all of our soft deadlines. As we will now start to build our project alongside writing a report of similar size and content to this one we will need to ensure that everyone optimises their use of time. An unforeseen issue arose in stage one in the form of deadlines for other work due at the same time. As our group members do not have identical modules we also have some coursework that differ and are set and due at different times.

For Stage two we are now fully aware of this problem and we will integrate all our coursework timeframes with our project plan to ensure that everyone has a fair and equal amount of time to focus on not only the group project but their own individual work outside of the project.

Conclusion

After much research and planning on this project we feel that we are now ready to begin stage two of the project; making a high quality product. Through market research in the form of questionnaires, we determined the requirements of the system. This has helped to shape our project and give us a much clearer idea of what we need to develop, focused on the needs of the user. We have researched social, legal and ethical issues which all play a large part in a piece of software designed to collect data from large amounts of users. This means that we can go forward knowing that our software will conform to the necessary standards. allowing us to work without worrying about compliance and having to change things further down the line. This has allowed us to minimise the risk of problems arising and will give us more time to try and include as many of our non essential features as possible. We have also planned out each stage of development, and when each one needs to be completed; the gantt chart that has created will prove vital to ensuring that we meet each of these deadlines. From this initial stage and in writing this report we have learnt many lessons about effective communication and time management. These issues have slowed us down at times during the initial stages of the project, but having overcome them through planning and collaboration we are in a much stronger position and will be able to avoid these pitfalls in stage two.

References

- [1] Source: Boundless. "The Marketing Mix." Boundless Business. Boundless, 21 Jul. 2015. Retrieved 27 Oct. 2015 from
<https://www.boundless.com/business/textbooks/boundless-business-textbook/marketing-and-the-customer-relationship-14/marketing-strategies-92/the-marketing-mix-433-3332/>
- [2] http://users.ece.cmu.edu/~koopman/des_s99/sw_reliability/

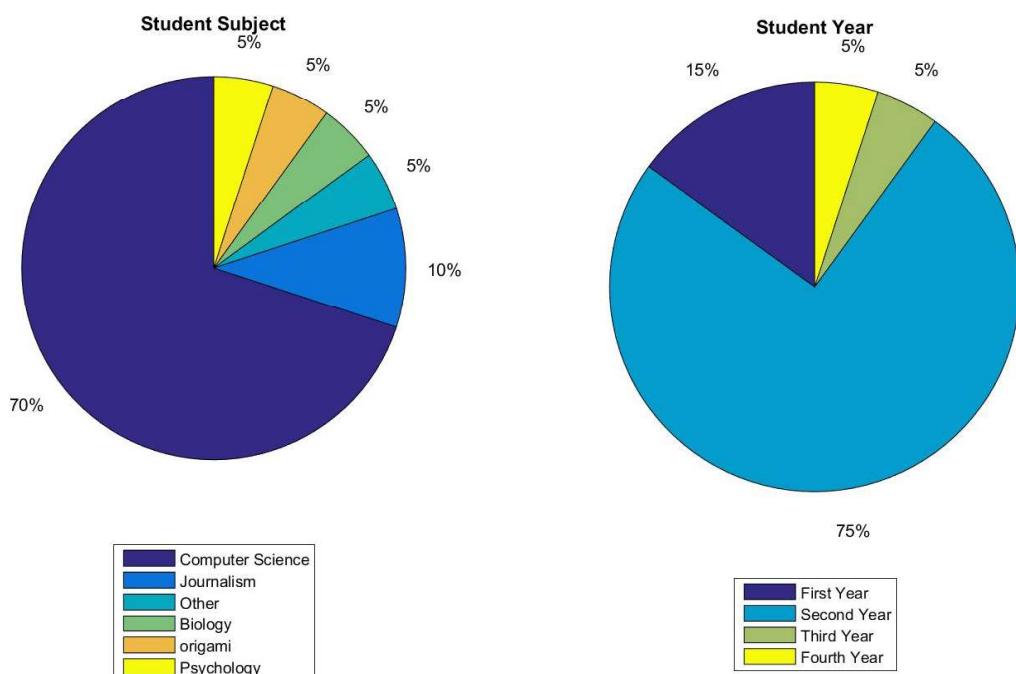
Appendix A

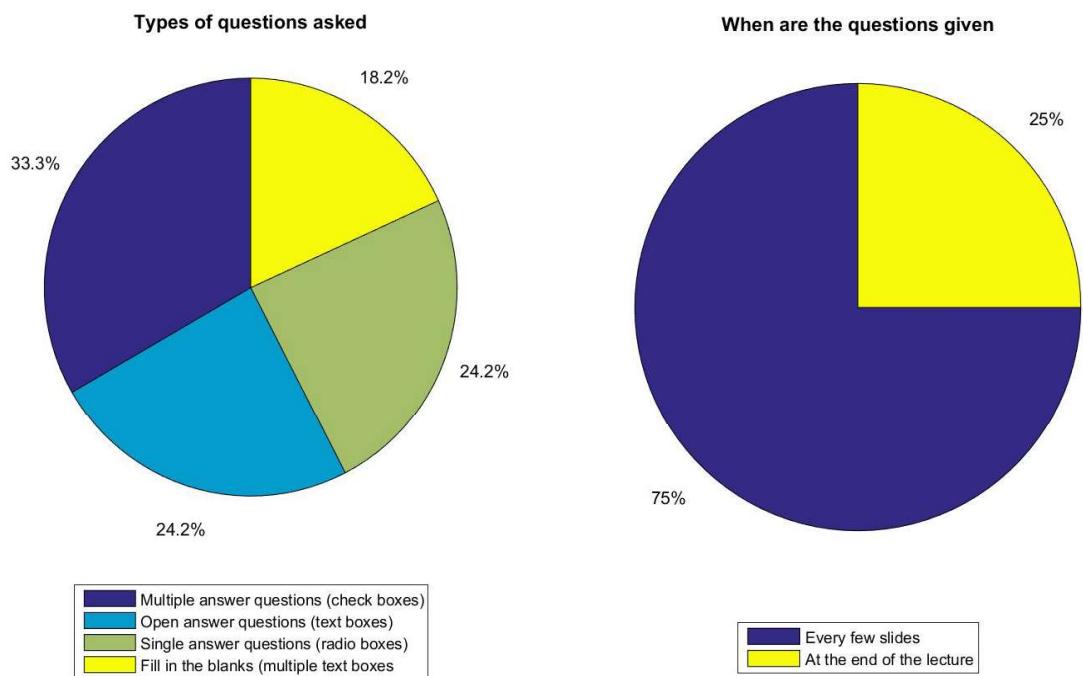
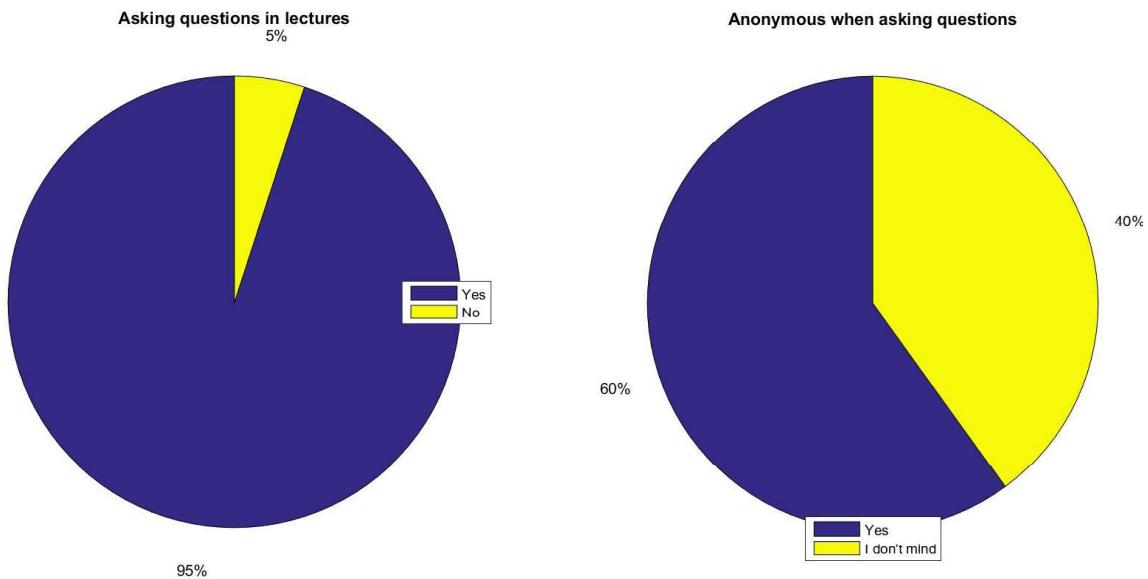
Student Analysis

We created a survey to be completed by students from different years and course studies. In total we were able to conduct and collect fifteen pieces of data. To maintain integrity of the surveys, we have kept and analysed all data and produced a chart per question. Some answers were not what we expected, however we are now aware of these issues and improvements can be made to future surveys.

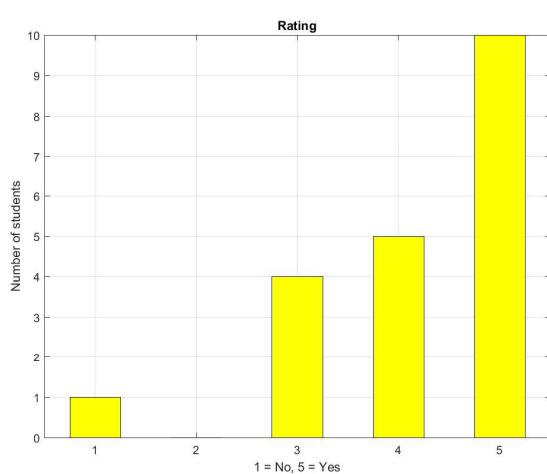
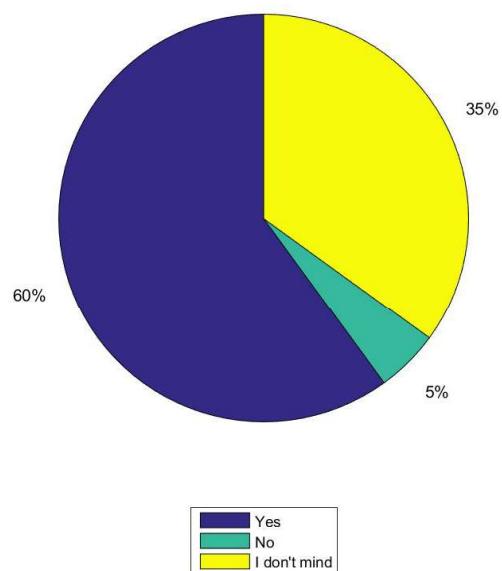
The first thing that can be noted with our survey is that most students who completed the survey were from Computer Science year two. This is due to the fact that we were have good access to our peers and housemates. The majority of the surveyors liked the idea of asking questions through the web app using their devices. They also preferred to be anonymous when asking and answering questions on their devices. When asking questions through the device, they would like to be able to give their questions for every lectures, however, there is still a bit of division when it comes to the types of questions asked. The students were also in the range of unsure to yes when it comes to rating lectures allowing lecturers to indicate if the lecture needs improvement.

The students who have completed the survey liked the idea of increased interaction between lecturer and themselves through their devices. This would allow them to have greater and more personalised interaction with the lecturer.





Anonymous when answering questions

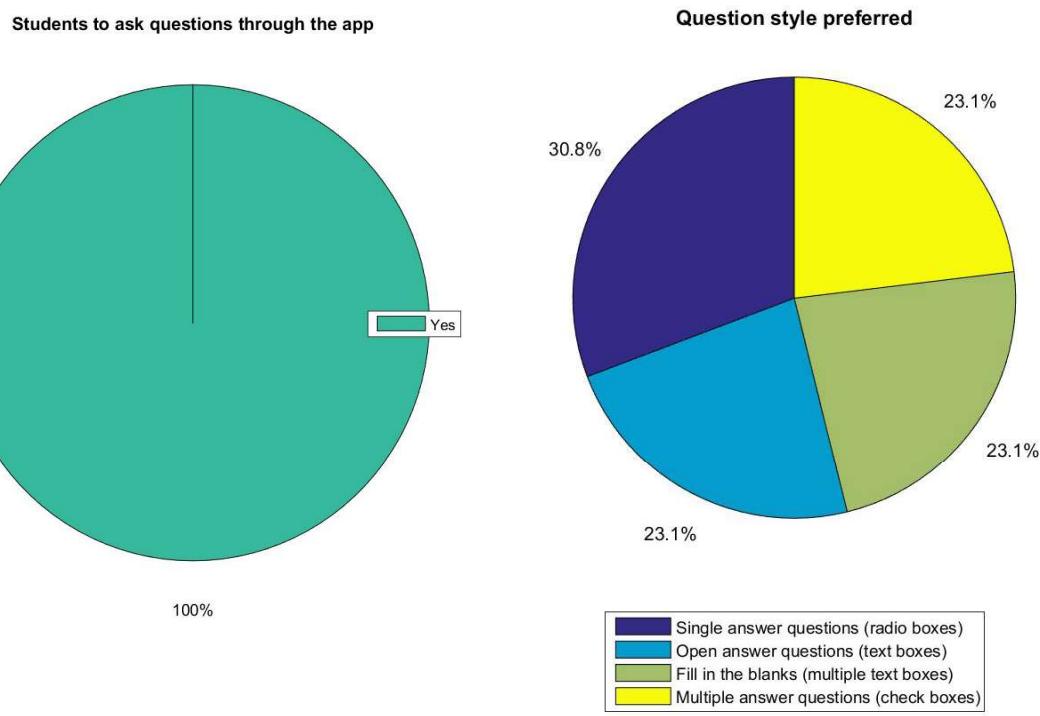
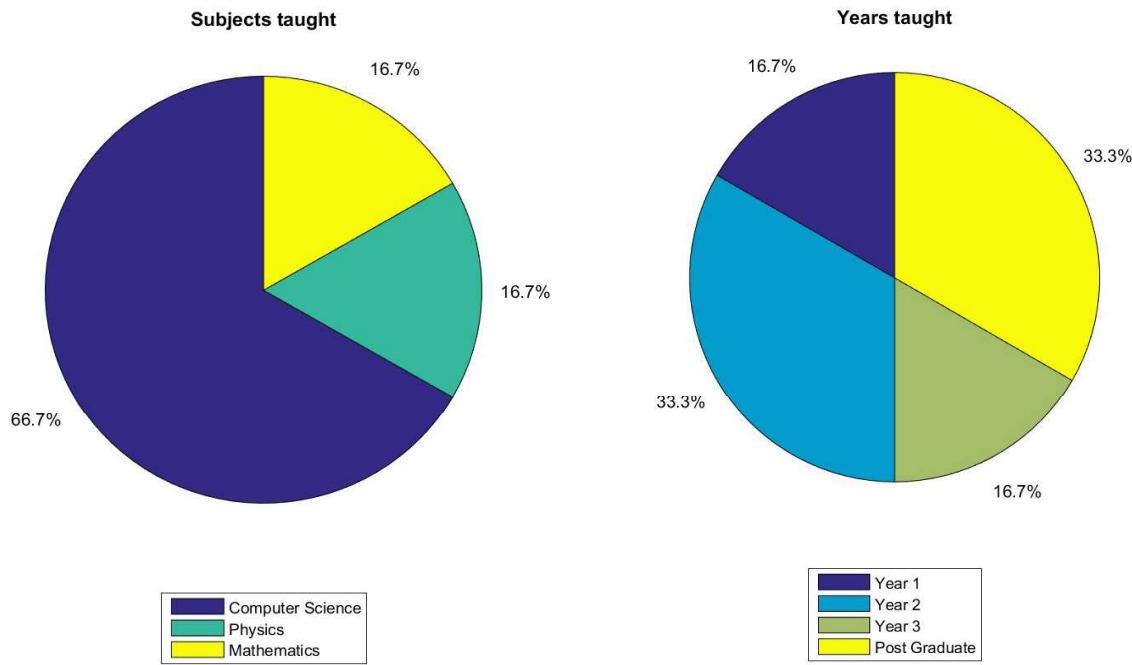


Lecturer Analysis

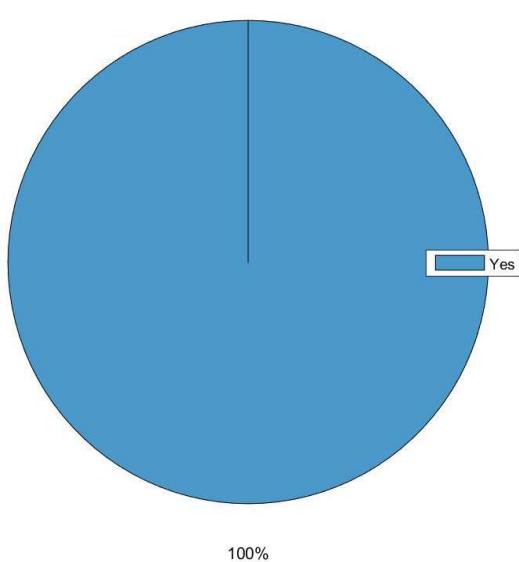
We also created a separate survey for lecturers and have analysed our findings. Due to time constraints and busy schedules of the lecturers, it was very difficult to get the surveys completed. Whether, asking the lecturers to complete the questionnaires in person or through email, it was a difficult task for the group. We were able to get results from four lecturers which may not be enough, however it still gave some indication of how our web application we will be used from the results that we have gathered.

All lecturers teach Computer Science at various years while some lecturers teach other subjects as well such as Physics and Mathematics. There are unanimous decisions in the surveys such as the ability for a student to ask questions in the app, the ability to review student answers when completed and the ability to group students using the web application. There is also division in the preferred type of questions asked similar to the results from the student survey. The majority of the lectures would like students to be able to ask questions through their device, but only half of the lectures would like to know who asked the question. Most of the lecturers chose to have questions from students to be given to their device at the end of the lecture and also they would like to have control when using the app. i.e by disabling the app on command. In terms of rating, the lecturers would like to be given feedback on their lecture performance so they are able to evaluate their teachings styles and when reviewing student results , it is to their desire that it be displayed as graphs rather than plain text or tables.

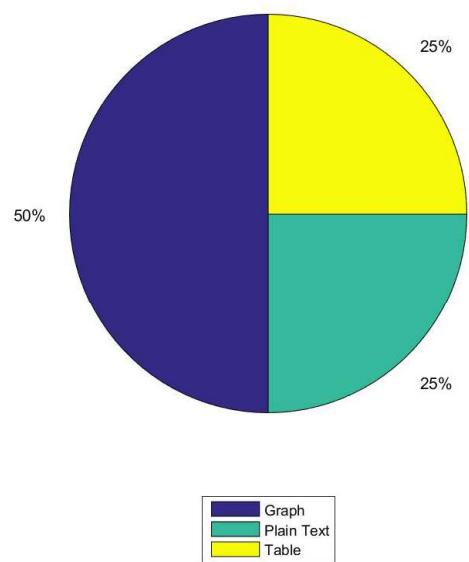
We were also given additional comments by one lecturer. It is quoted that "Students should be able to get automated feedback on their individual answers as suitable. Format of the questions can vary a lot and may ideally be provided as plugins to the system where plugin specifies questions as well as how to process answer. Note, I'm only using solutions where code is available in a GPL v3 compatible manner and it can be self-hosted."



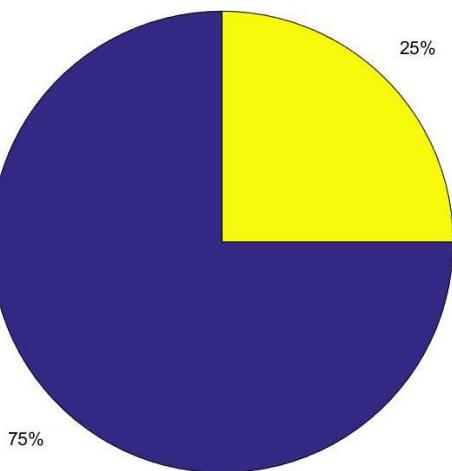
Review Student answers



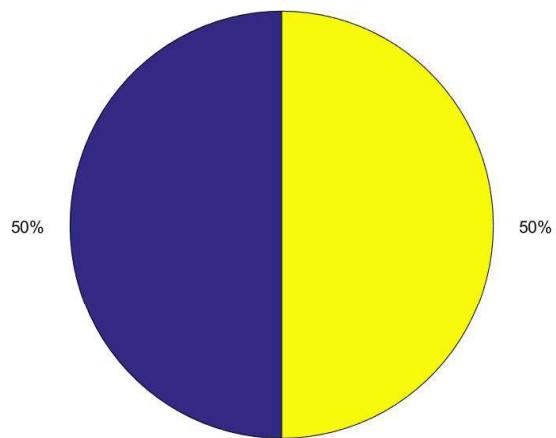
Preferred Display



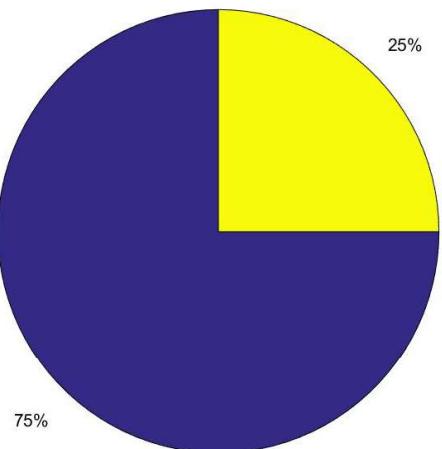
Students to ask questions during lectures



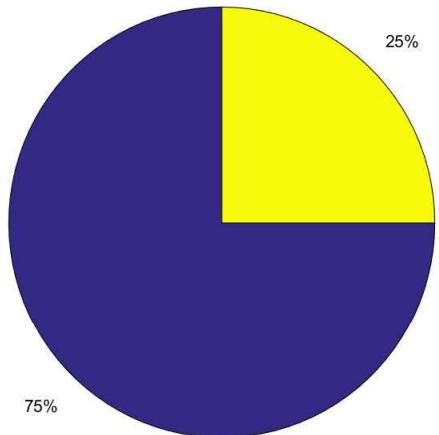
Knowing which student asked the question



Preferred question time on device



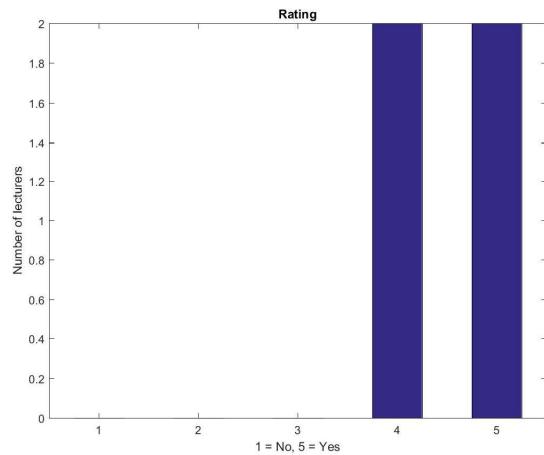
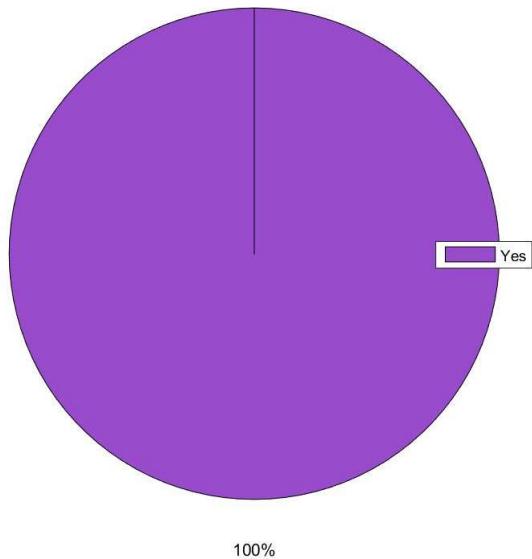
Disabling the app



[At the end of the lecture
[During the lecture

[Yes
[I don't mind

Ad hoc grouping



100%

Appendix B

