Design Document of Application

by Group 54

HCI evaluation

Introduction

The objective of this evaluation is to gather feedback and evaluations of the paper prototype classroom application, in order to design graphical user interfaces that follow the basic principles of human-computer interaction. The evaluation is done with respect to Jakob Nielsen's usability heuristics. The results will be used to improve the current state of the application design, which is a paper prototype. The prototype was created using Pencil (https://pencil.evolus.vn/), an open-source prototyping tool.

The current state of the prototype is:

a. Pages in the prototype correspond to the requirements from the client. That is to say, we have all the views necessary to meet the clients expectations.
b. Certain buttons are interactive, which would allow evaluators to give more.
c. In the actual implementation, we created a "status bar" that would represent the current state of the system, such as whether a request is currently being sent or whether a request was successful. We could not a find a suitable placeholder for this functionality in the prototype.
d. A complex color scheme was omitted. We instead opted for a simplified color scheme, where we simply color specific widgets that behave in a similar manner with the same color

Expert evaluators

The evaluators we recruited are all members of a group currently enrolled in the OOPP course. We have received responses from all of their group members, however not all have responded to their level of expertise. Nevertheless, it can be concluded that most, if not all, members are novice evaluators familiar with the general principles of HCI evaluation, henceforth referred to as "the Heuristics".

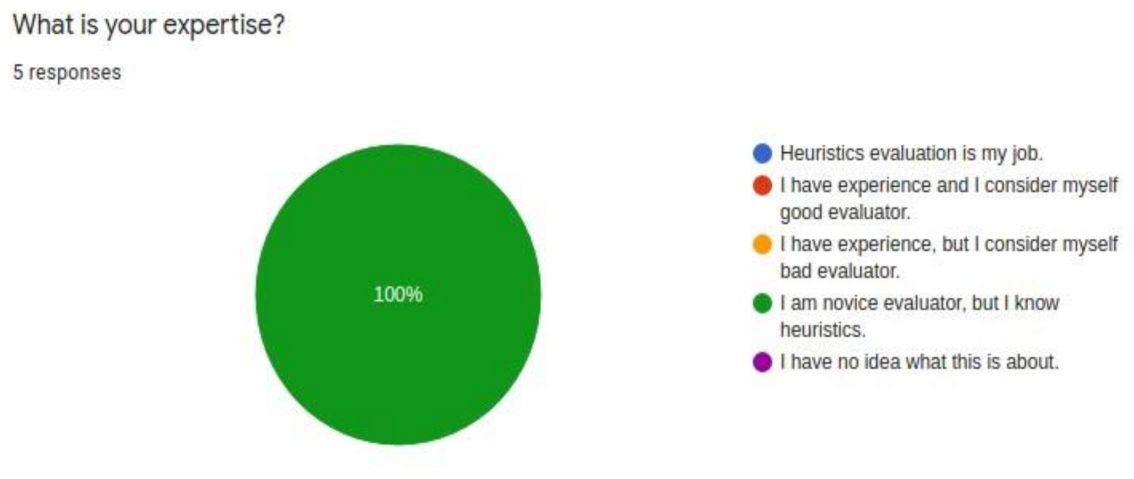


Figure 1 the expertise of recruited evaluators.

Procedure

Each evaluator was provided with our interactive prototype of the application, meaning that different scenes (also known as “views”) were interconnected via buttons provided to us by the Pencil software. This allows our prototype to be as representative of the real application as possible, which we believe would have yielded more precise evaluations. They were asked to briefly interact with said prototype an hour before being asked to fill in our questionnaire.

Each evaluator was asked to perform their evaluation using a questionnaire on Google Forms, where we asked them the following:

1. What their expertise in heuristics evaluation was.
2. Open-answered questions to report any obvious usability issues they were able to find in each of the scenes in the prototype.
3. Internally we had found potential usability issues in specific features in certain scenes, stemming from a design flaw. We ask the evaluator whether they agree that it might actually be an issue. We ask to evaluate our design of the feature from 1 to 5 (1 – unusable, 5 – efficient) and give short explanation for the mark given.

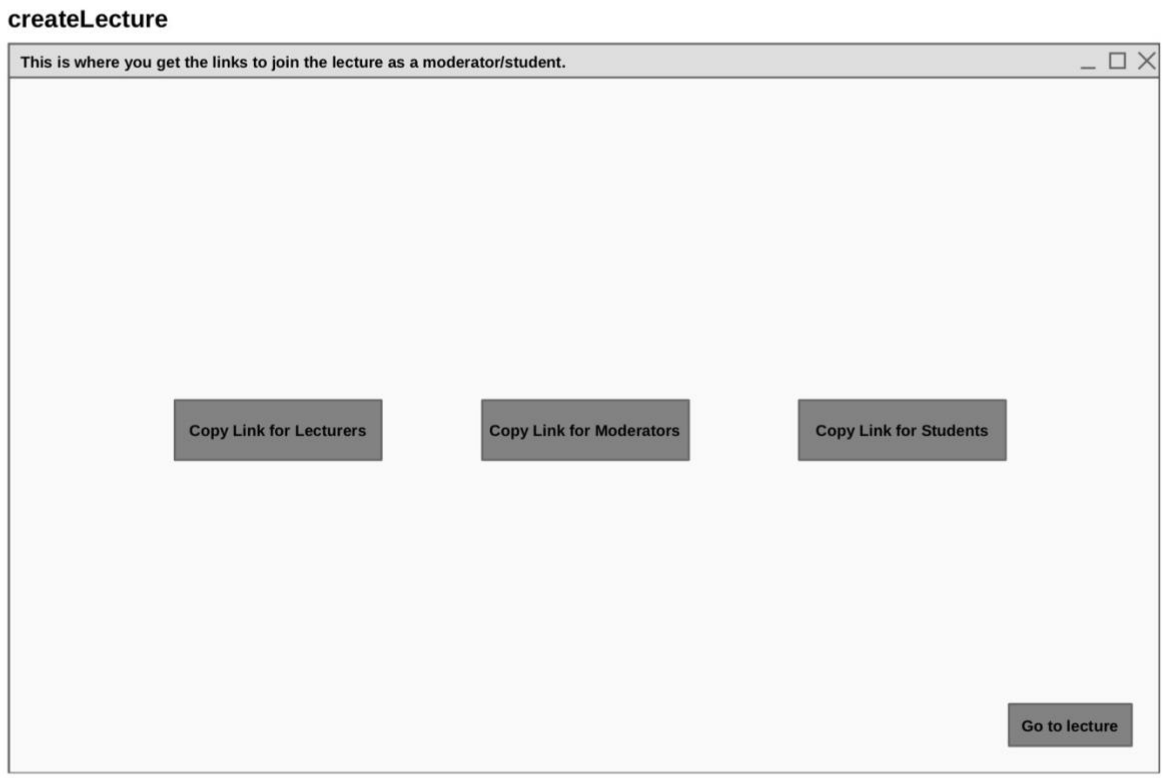
    The thought behind having our evaluators interact with the prototype before actually giving us their responses is so that we do not taint the results of their evaluation. Since we asked them questions on very specific features in certain views, we were concerned that the evaluators may be misdirected from other issues in the design that we hadn’t noticed.

    The method by which we chose the questions was straightforward from our point-of-view: we simply took design choices we made where we were still hesitant and constructed questions in a way that would still allow for fair evaluation.

The question in 2 asked the evaluators to report problems in the following manner:

1. Problem description: a brief description of the problem.
2. Likely/Actual difficulties: the anticipated difficulties that the user will encounter as a consequence of the problem.
3. Specific contexts: the specific context in which the problem may occur.
4. Assumed causes: description of the cause(s) of the problem.

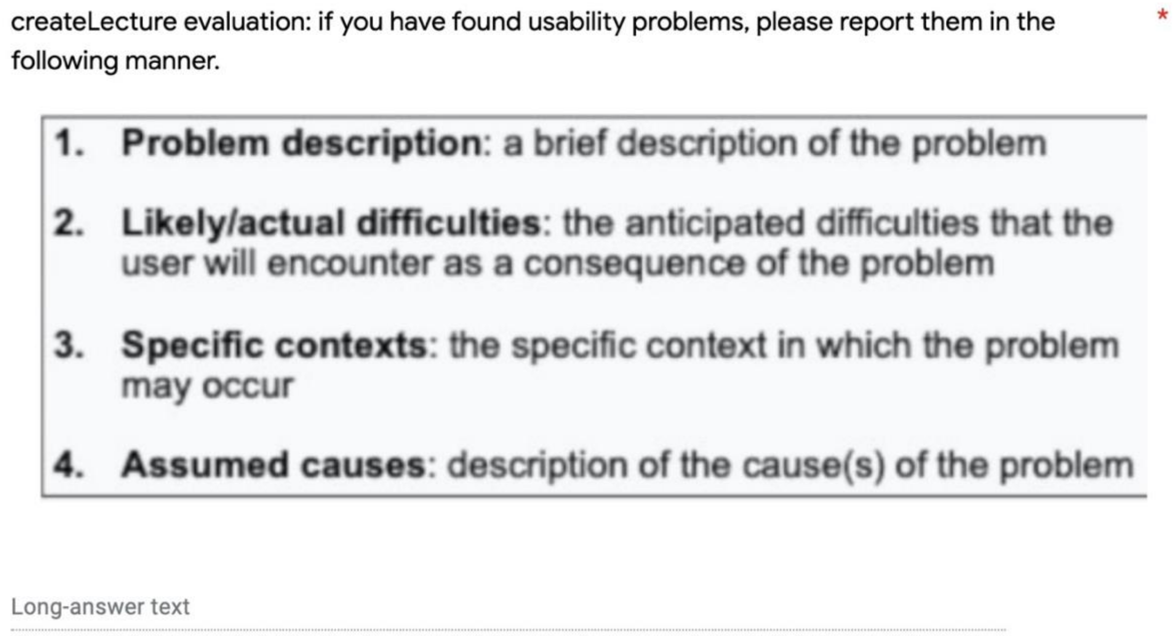
The format of the questionnaire and how the process described above happens can be seen below:



createLecture

This is where you get the links to join the lecture as a moderator/student.

Figure 2 the view that the expert receives.

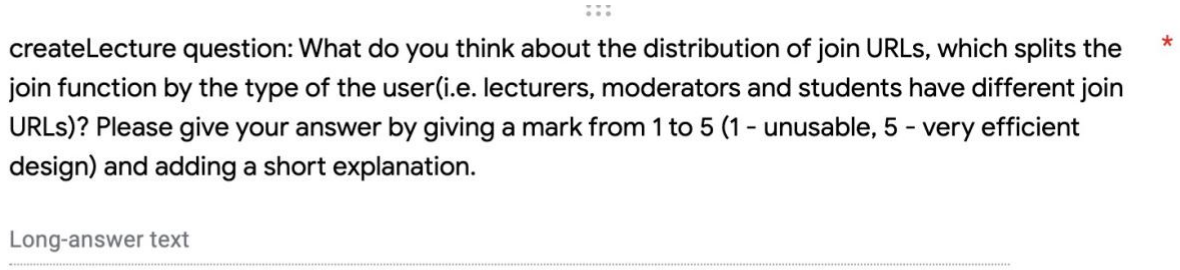


createLecture evaluation: if you have found usability problems, please report them in the following manner. *

1. **Problem description**: a brief description of the problem
2. **Likely/actual difficulties**: the anticipated difficulties that the user will encounter as a consequence of the problem
3. **Specific contexts**: the specific context in which the problem may occur
4. **Assumed causes**: description of the cause(s) of the problem

Long-answer text

Figure 3 the ques-on of type 2.a. which allows expert to openly address the flaws in the design.



createLecture question: What do you think about the distribution of join URLs, which splits the join function by the type of the user(i.e. lecturers, moderators and students have different join URLs)? Please give your answer by giving a mark from 1 to 5 (1 - unusable, 5 - very efficient design) and adding a short explanation. *

Long-answer text

Figure 4 the ques-on of type 2.b which allows expert to focus on specific element of the design.

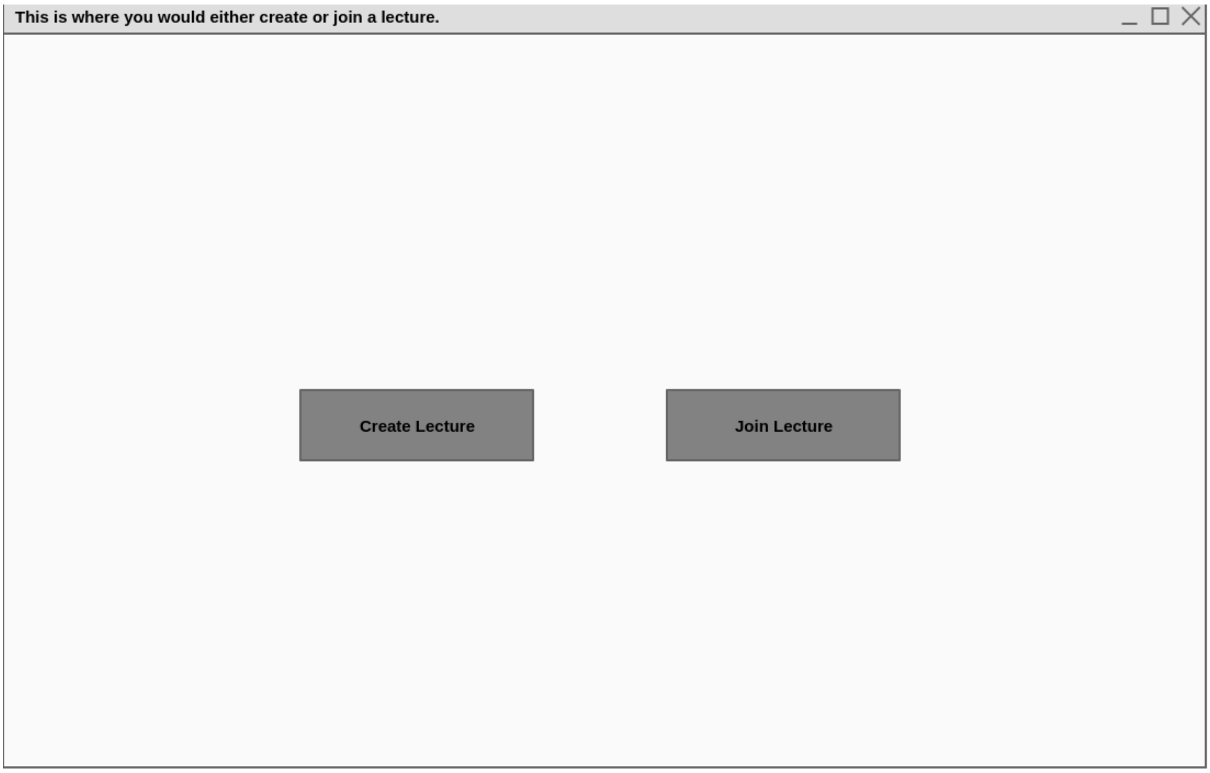
As mentioned in the introduction, we carried out this evaluation with respect to Nielsen's usability heuristics by asking experts to pay attention to them while performing their evaluation. In some of the views we specifically ask about the flaws with respect to Nielsen's heuristics:

- Is there a match between system and the real world? i.e. are the terms used in the view not too technical? (match between real world and the system)
- Are we consistent with the standards? (consistency and standards)
- Is the design pleasing to the eye? (aesthetic and minimalistic design)
- What do you think about the layout of this specific? (aesthetic and minimalistic design)

Results

In this section we will list out the issues that the evaluators were able to identify in our application. We will paraphrase the feedback that has been given to us and leave out all feedback that is derivative of other feedback. In other words, we will not be quoting our evaluators verbatim. We will only report on their combined sentiment towards specific issues.

1. Regarding the create/join lecture scene:



This is where you would either create or join a lecture.

Figure 5 The scene where a user would choose whether to join or create a lecture.

(1) Due to the lack of color, the design is not engaging and generally not aesthetically pleasing. This might take the user longer to figure out what they want to do.

(2) There isn't enough contrast between the button and the text inside said button. This might render the application unusable by users with certain visual impairments.

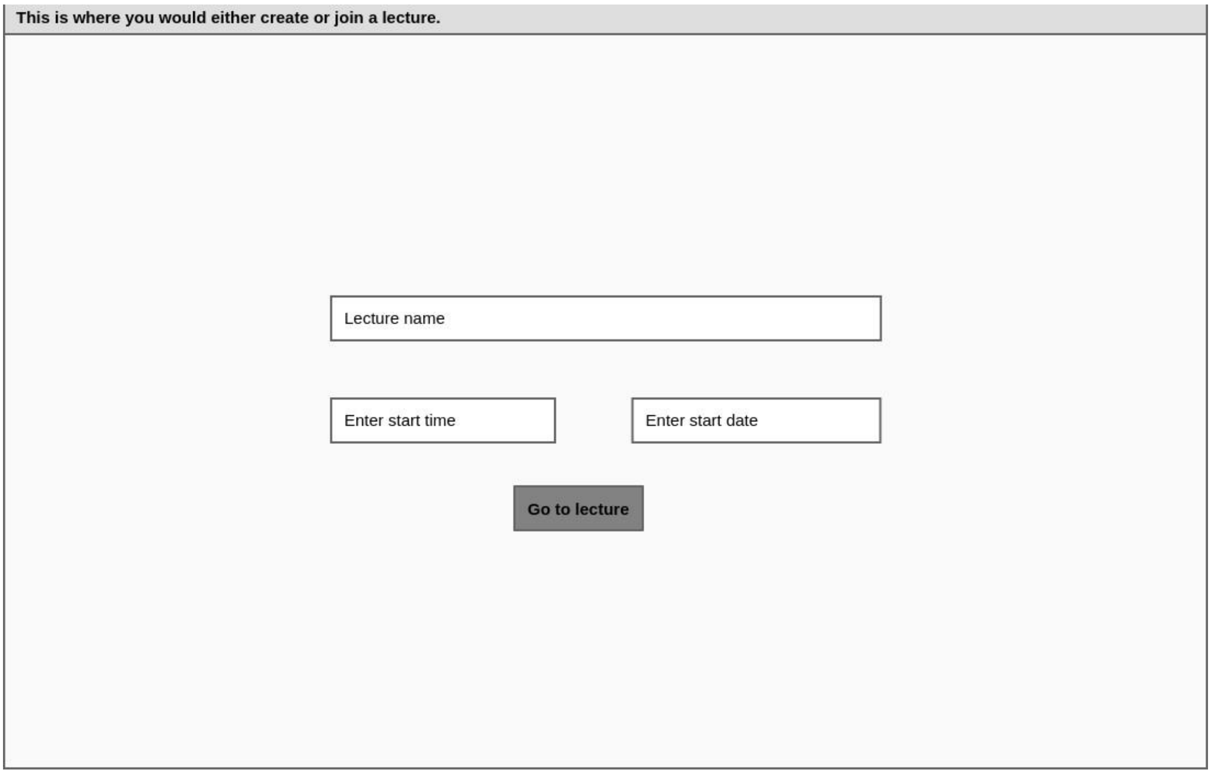
(3) The create lecture button being on the left would be problematic, as other software usually has it at the right side of the screen. Users would be confused by this.

2. Regarding the starting date and time of lecture scene:

Figure 6 The scene where a potential lecturer would choose the start time, start date and name of their lecture.

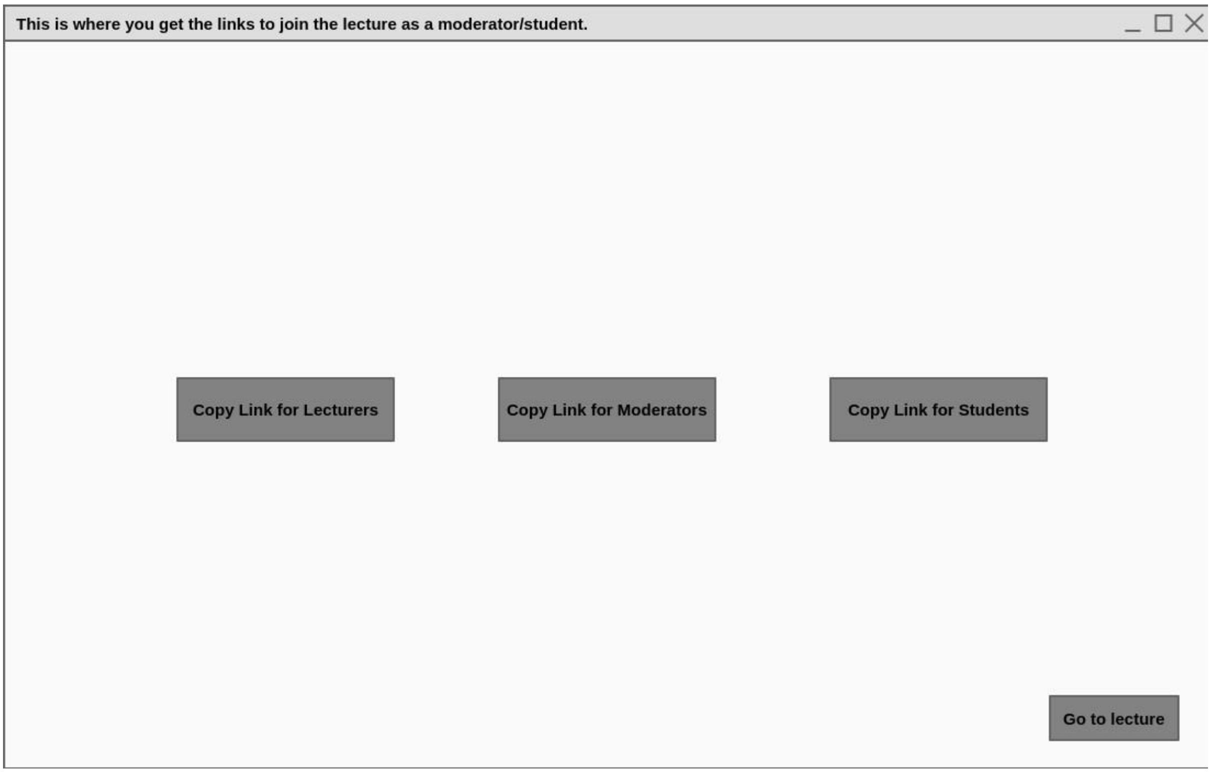
(4) The format in which the time and date is required to be entered is not clear. This would cause the user to be uncertain as to what to actually do in this scene.

(5) Having to enter the time and date manually would be problematic. This is not a robust design and can be easily improved upon by using a calendar widget.



This is where you would either create or join a lecture.

(6) The button is mislabeled, as it does not transition to the lecture itself. Rather it transitions to a scene where the potential lecturer would copy the links to said lecture. This could prove to be rather confusing.



3. Regarding the scene where one copies the links to a lecture:

Figure 7 The scene where a poten-al lecturer would copy the link, which users, moderators and other lecturers would user to join the lecture.

(7) A lecturer would have to create a new lecture if they forget to copy a specific link. This would be highly bothersome to said lecturer.

4. Regarding different join links for different user roles.

In this section we question whether there being 3 different links with which a user can join a lecture as a specific role, namely as a lecturer, moderator or student.

(8) Moderators should have the same abilities as a lecturer. It is unclear as to whether there is a clear difference, if any, between the moderator role and the lecturer role. This could be confusing to the user.

5. Regarding the scene where a user can join a lecture:

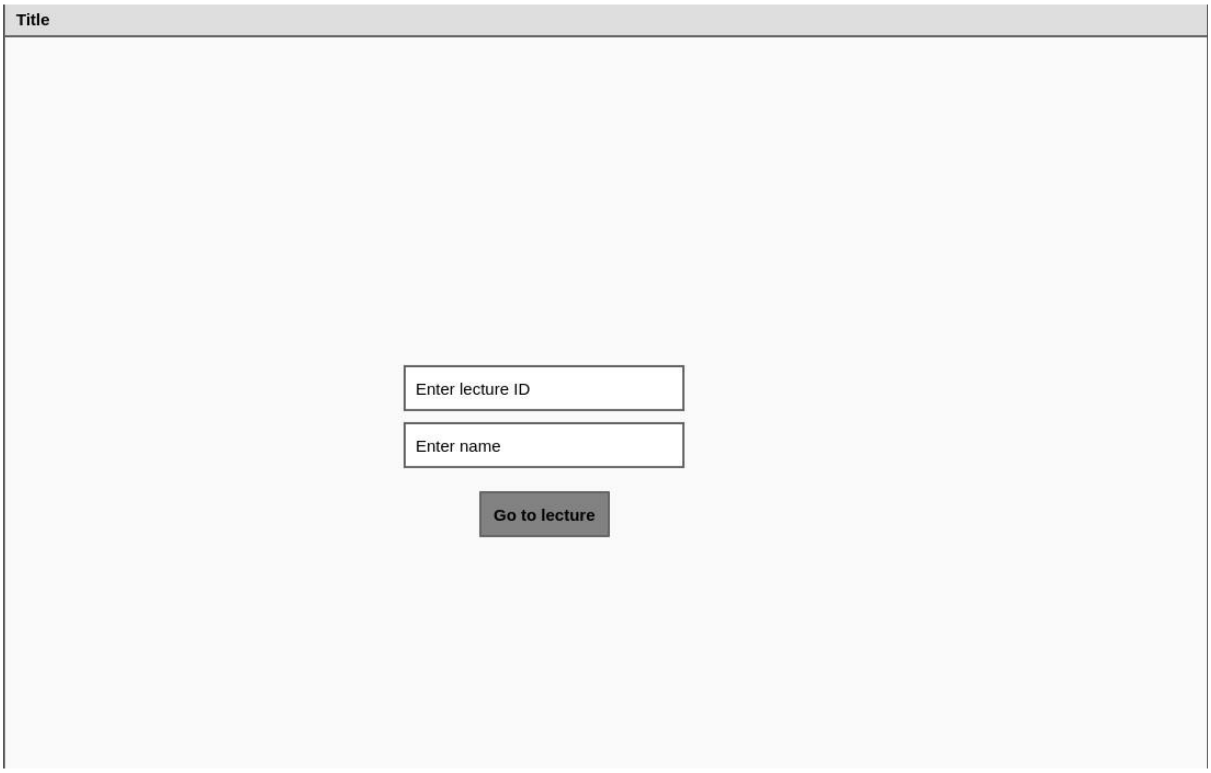
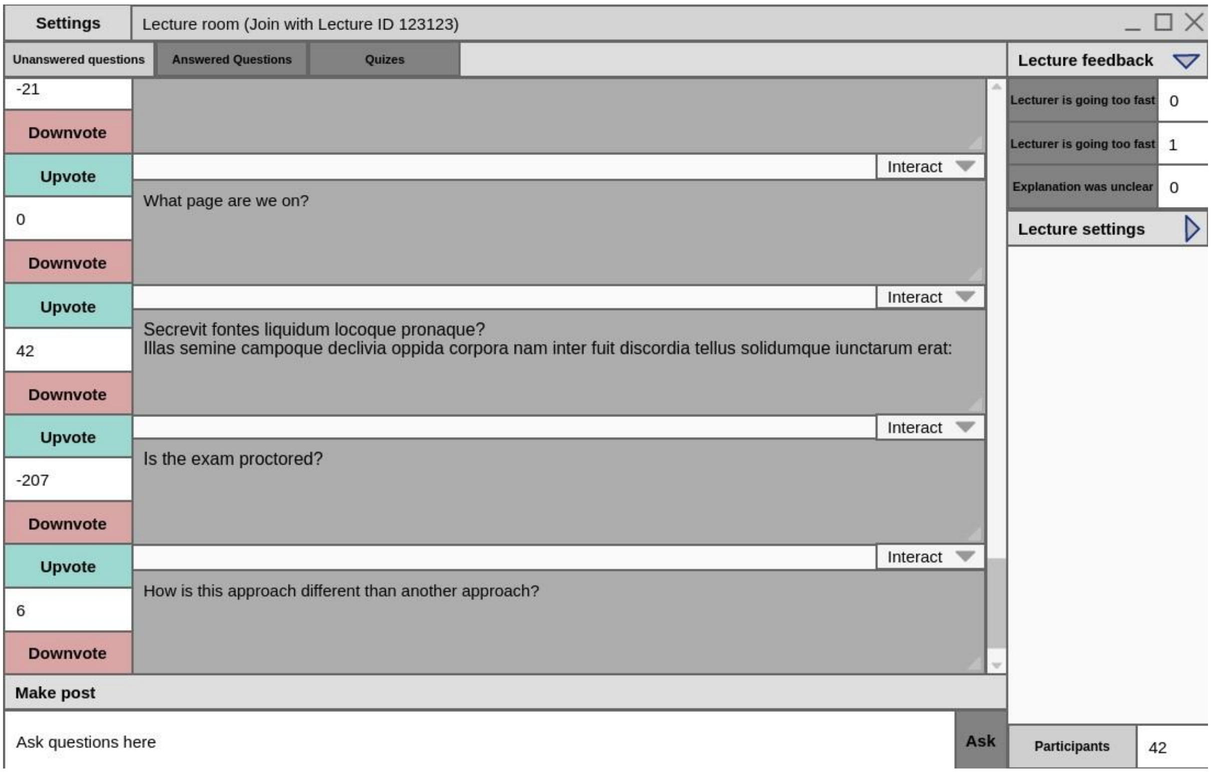


Figure 8 The scene where a user can join a lecture.

(9) It might be unclear to the user as to whether the “Enter name” text field is in reference to the name of the lecture or the name of the user itself. This is due to an inadequate description and could cause people to join a lecture named as the lecture itself.

6. Regarding the lecture room scene

6.1.1. Unanswered questions tab of the lecture room scene.



Votes	Question
-21	
0	What page are we on?
42	Secrevit fontes liquidum locoque pronaque? Illas semine campoque declivia oppida corpora nam inter fuit discordia tellus solidumque iunctarum erat:
-207	Is the exam proctored?
6	How is this approach different than another approach?

Lecture feedback	
Lecturer is going too fast	0
Lecturer is going too fast	1
Explanation was unclear	0

Ask questions here

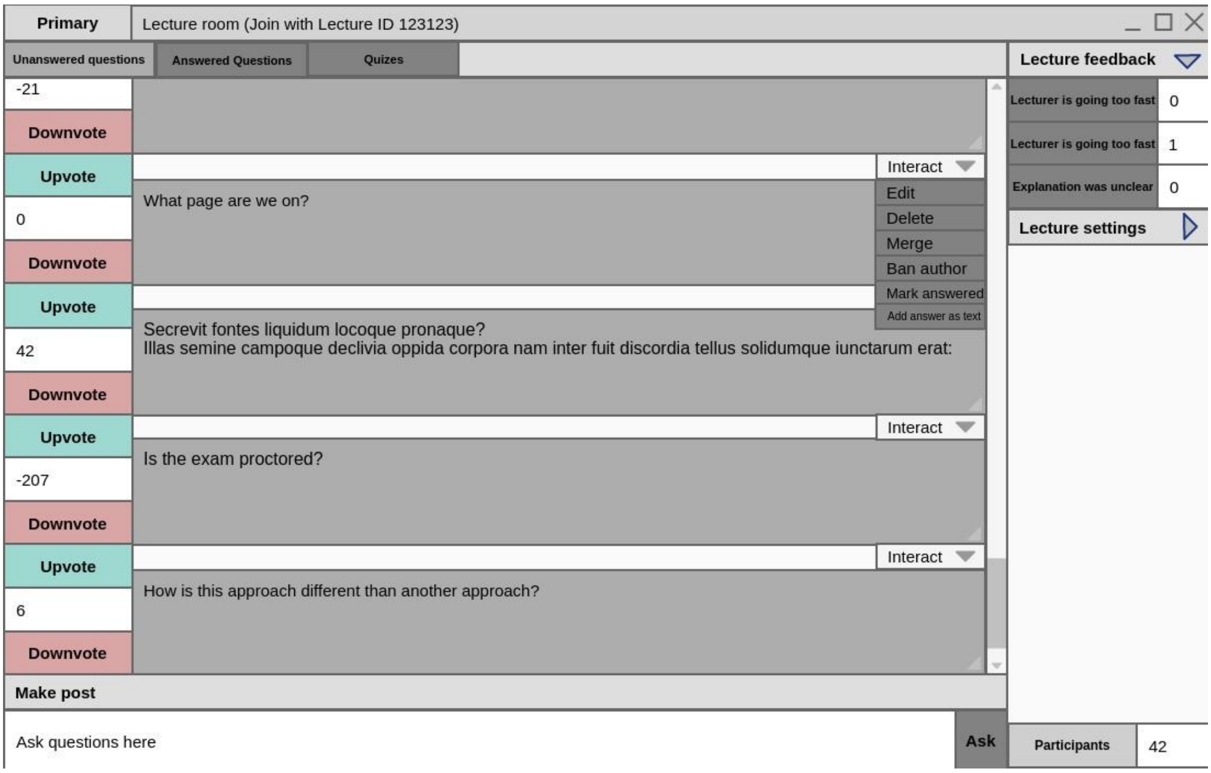
Participants 42

Figure 9 The scene where a user can join a lecture. Note that one of the buLons in the lecture feedback dropdown is supposed to be "Lecturer is going too slow".

(10) It is unclear as to what question the voting buttons belong to. This could cause the students to be confused and accidentally vote on a question they didn't mean to vote on.

(11) The lecturer feedback buttons contain too much text. The user is forced to read in order to understand what the feedback a specific button represents instead of it being represented by an image.

6.2. Dropdown menu of unanswered questions.



What page are we on?

Secrevit fontes liquidum locoque pronaque?
Illas semine campoque declivia oppida corpora nam inter fuit discordia tellus solidumque iunctarum erat:

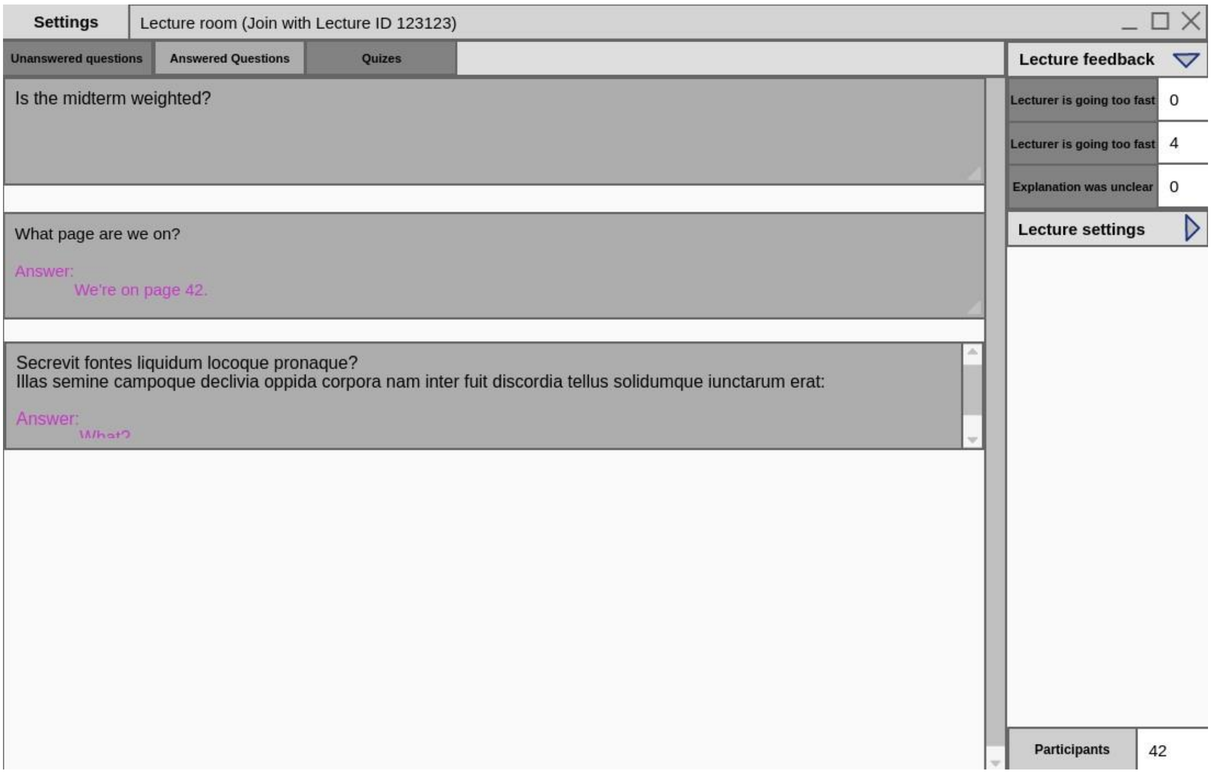
Is the exam proctored?

How is this approach different than another approach?

Figure 10 A demonstration of the question dropdown menu. Note that the merge functionality is now obsolete.

(12) The dropdown is too cluttered. Users would have to traverse all five options to reach the functionality that they require.

6.3. Answered questions tab of the lecture room scene.



Is the midterm weighted?

What page are we on?

Answer:
We're on page 42.

Secrevit fontes liquidum locoque pronaque?
Illas semine campoque declivia oppida corpora nam inter fuit discordia tellus solidumque iunctarum erat:

Answer:
What?

Figure 11 The tab in the lecture room scene where answered questions would be stored.

(13) Having the questions be scrollable, while they are inside a scrollable panel might be inconvenient to use for a user. Especially if we were to implement this tab with automatic scrolling to the latest post.

Conclusions

We are very content with the results of our evaluation. For the most part, the problems that our evaluators found were concerned with the outward appearance of the prototype. Nevertheless, this feedback will be invaluable to our GUI design as we move forward with the actual creation of the application. As far as functionality and feature completeness go, we were happy to see that close to no refactoring would be necessary. Point being, it is a good deal easier to change how the GUI looks, than to have to change the fundamental way in which the application works. Thankfully, we won't need to do too much of the latter.

Improvements made based on feedback

We expected the mediocre reception to the simplistic design of our prototype, so issues such as (1), (2), (10) and (11) do not come as a surprise. We settled for a rather spartan look, since we did not want to invest too much time on the prototype. As a matter of fact, it was meant to be an internal tool with which we can connect all the separate views. We do understand, however, that we should fulfill the Aesthetic and Minimalist design heuristic and that is exactly what we mean to do in our actual implementation.
Even though it would be easy to rectify issue (3), we do not agree with the premise that other applications that fulfill our client's requirements have a standardized placement for buttons that either create or join a lecture. Having said so, we will undertake no action for this issue.

Issue (4) brings up a very valid point, in that not only is the required format unclear from the prototype, but that people from other countries with different standards than European formatting would be affected. This would be a frequently occurring and severe issue. Our application would be in clear violation of the Match between the system and the real world and Error prevention. We rectified this issue not only by being specific with the format in which we expect the time (24-hour format) but we also automatically format any input given to us by the user. We also fixed issue (5) by replacing the text input for the date with a calendar widget, that automatically formats input to whatever format we so desire.

Issue (6) demonstrates a violation of the Consistency and standards heuristic as it is absolutely the case that you do not transition to the lecture room immediately. It is clearly mislabeled, which implies that it would be frequently occurring issue. Even though wit could be argued that it is not particularly detrimental, we rectified it by renaming the button as "Links to lecture".

With issue (7), we violate the User control and freedom and Error prevention heuristic. To amend this issue, we implemented a simple back button, and we also made it impossible for the would-be lecturer to move onto the lecture room until all 3 lecture links have been claimed.

Issue (8) allows us to explain our decision in designing the roles as such. We believe that even though it was not required by the client, it is important to have a distinction between a moderator and lecturer, as although they currently have the same privilege in a lecture room, it is unsure as to whether that will be the case in the future of the application. However, we will be sure to specify the exact abilities of each role in a future iteration of the application, as not doing so would violate the Help and documentation heuristic.

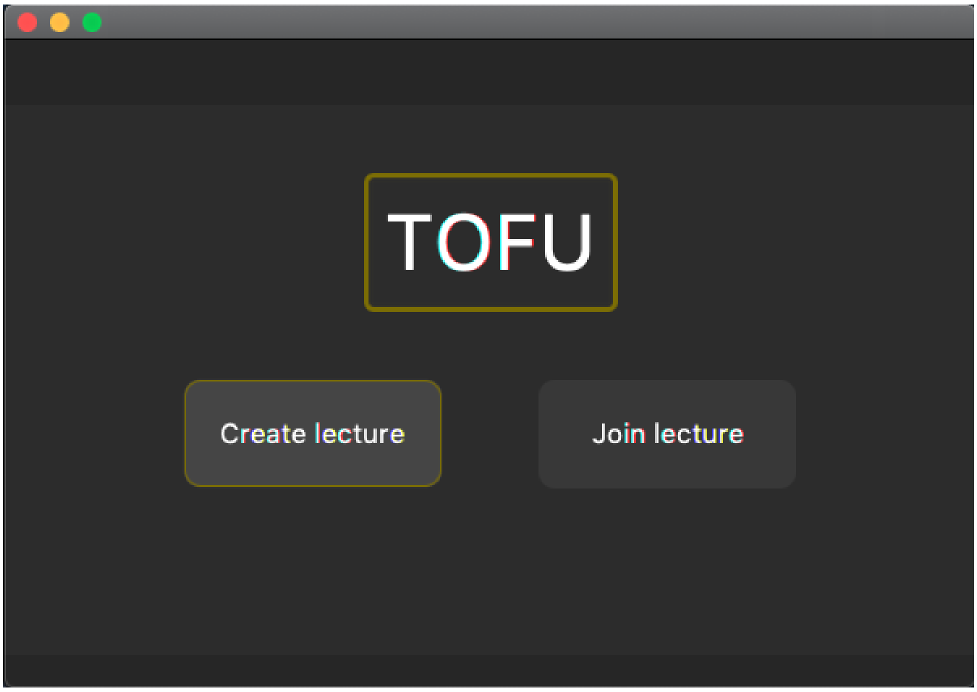
Issue (9) hearkens back to our tendency to mislabel things, which violates the Error prevention heuristic. We will fix this by labeling this text input as “Enter username”.

Having now inspected our initial design with fresh eyes, we agree with issue (12) in that it could be rather bothersome to use. It violates the Recognition rather than recall heuristic, in that you would have to memorize the layout of the dropdown, when you could easily just have all functionality readily available above the question itself.

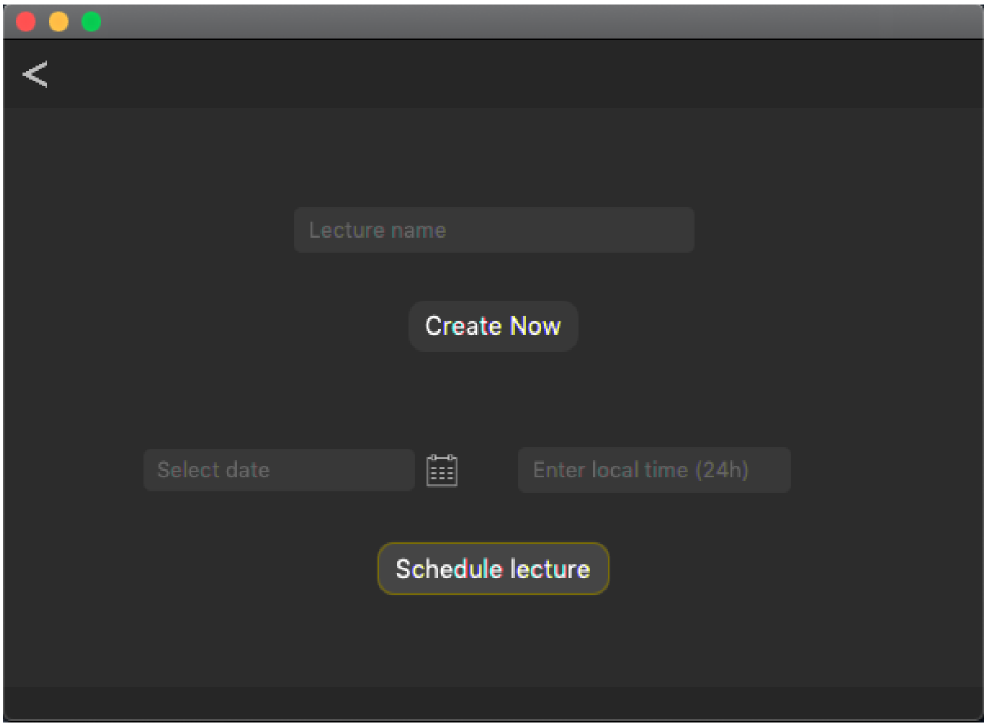
We will address issue (13) by making questions not have predefined sizes, as not doing so would indeed render our application bothersome to use. It would be in violation of the Aesthetic and minimalist design heuristic.

Current state:

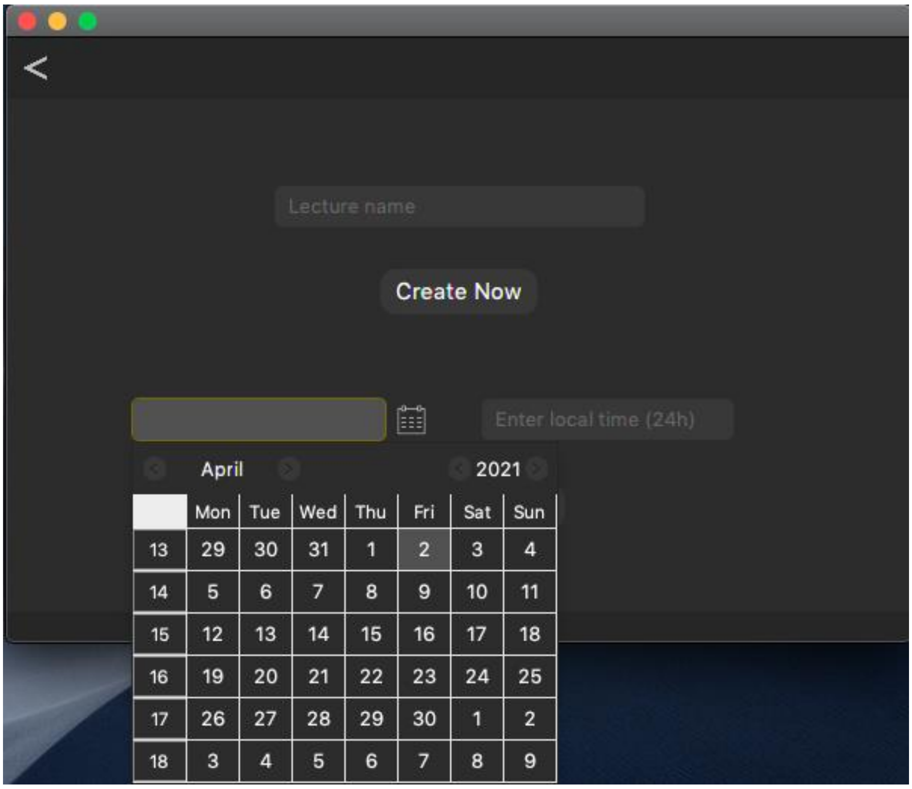
The start screen:



The create lecture scene:

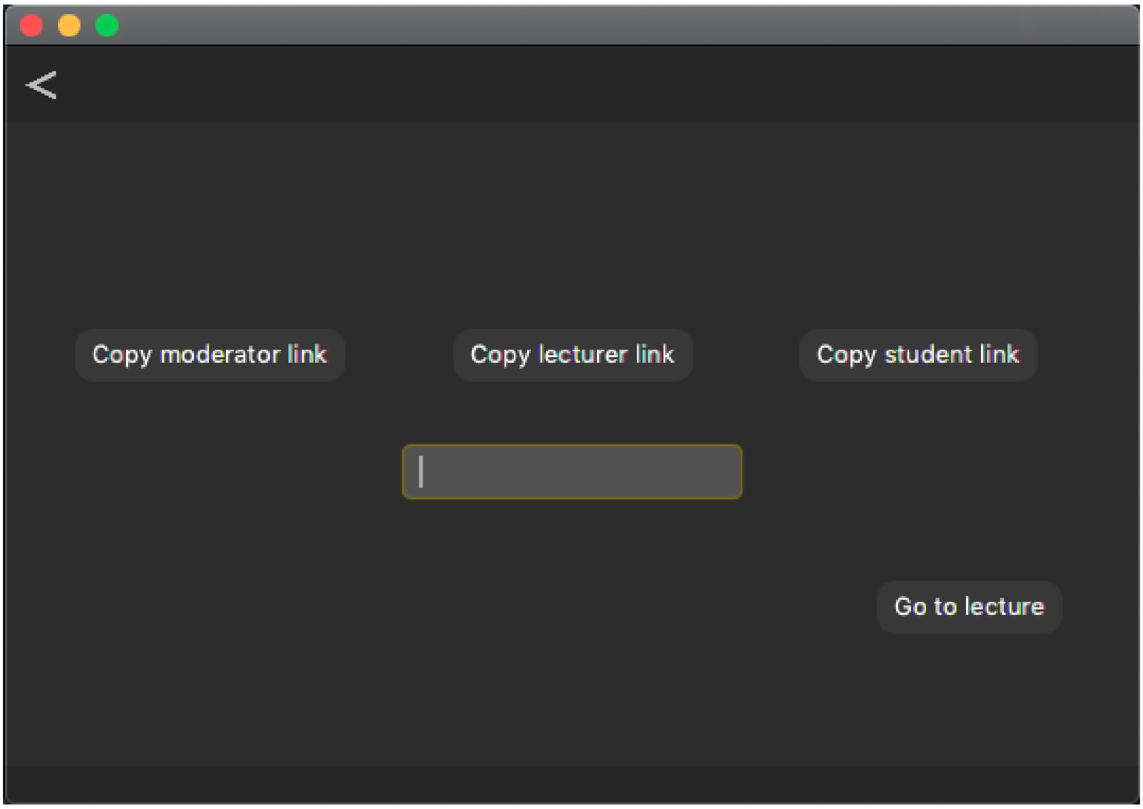


The date pick:

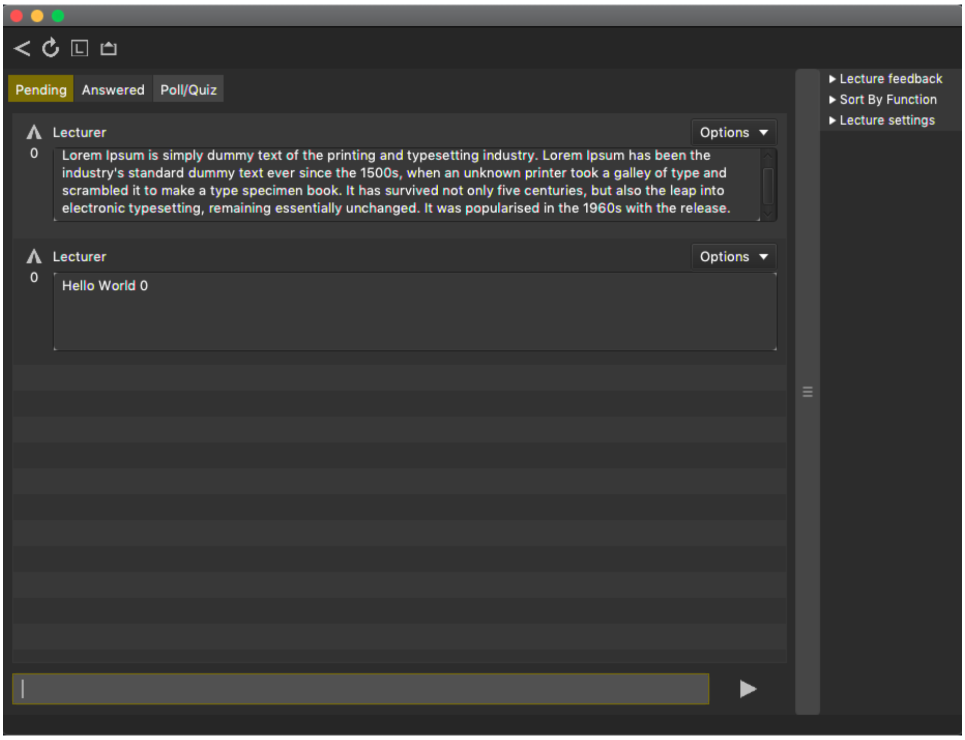


	Mon	Tue	Wed	Thu	Fri	Sat	Sun
13	29	30	31	1	2	3	4
14	5	6	7	8	9	10	11
15	12	13	14	15	16	17	18
16	19	20	21	22	23	24	25
17	26	27	28	29	30	1	2
18	3	4	5	6	7	8	9

Copy links scene:



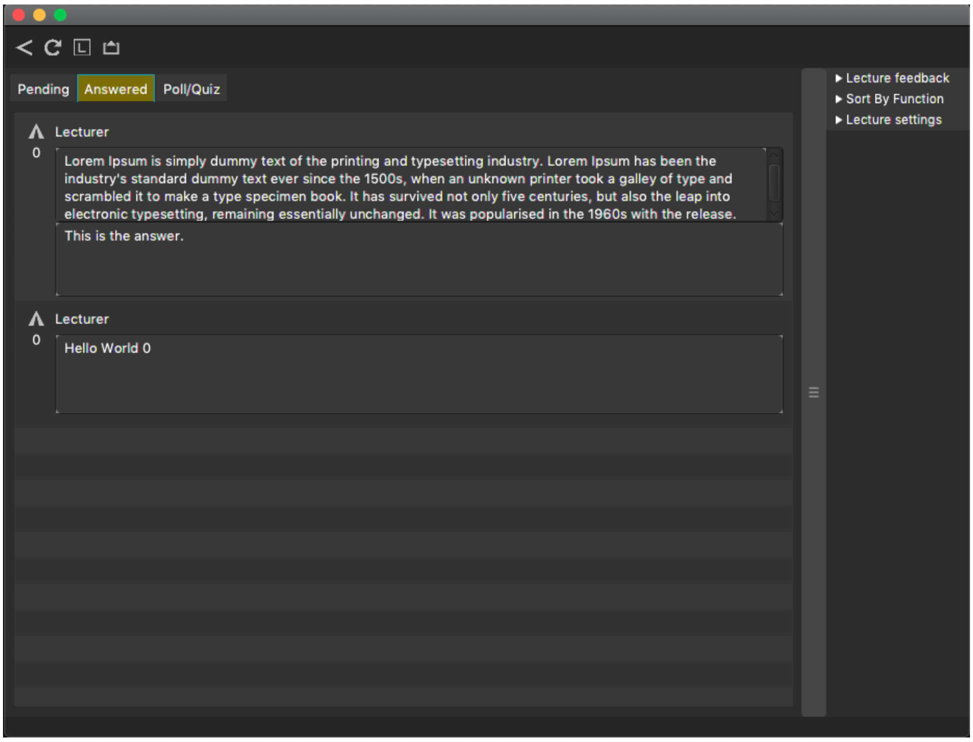
The lecture room scene:



Lecturer
0
Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release.

Lecturer
0
Hello World 0

The answered tab:

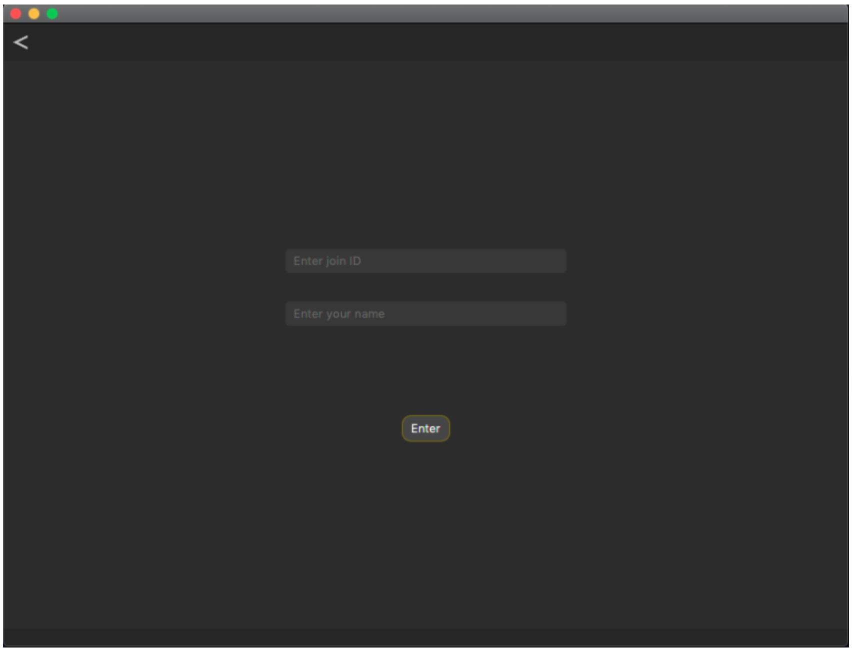


Lecturer
0
Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release.

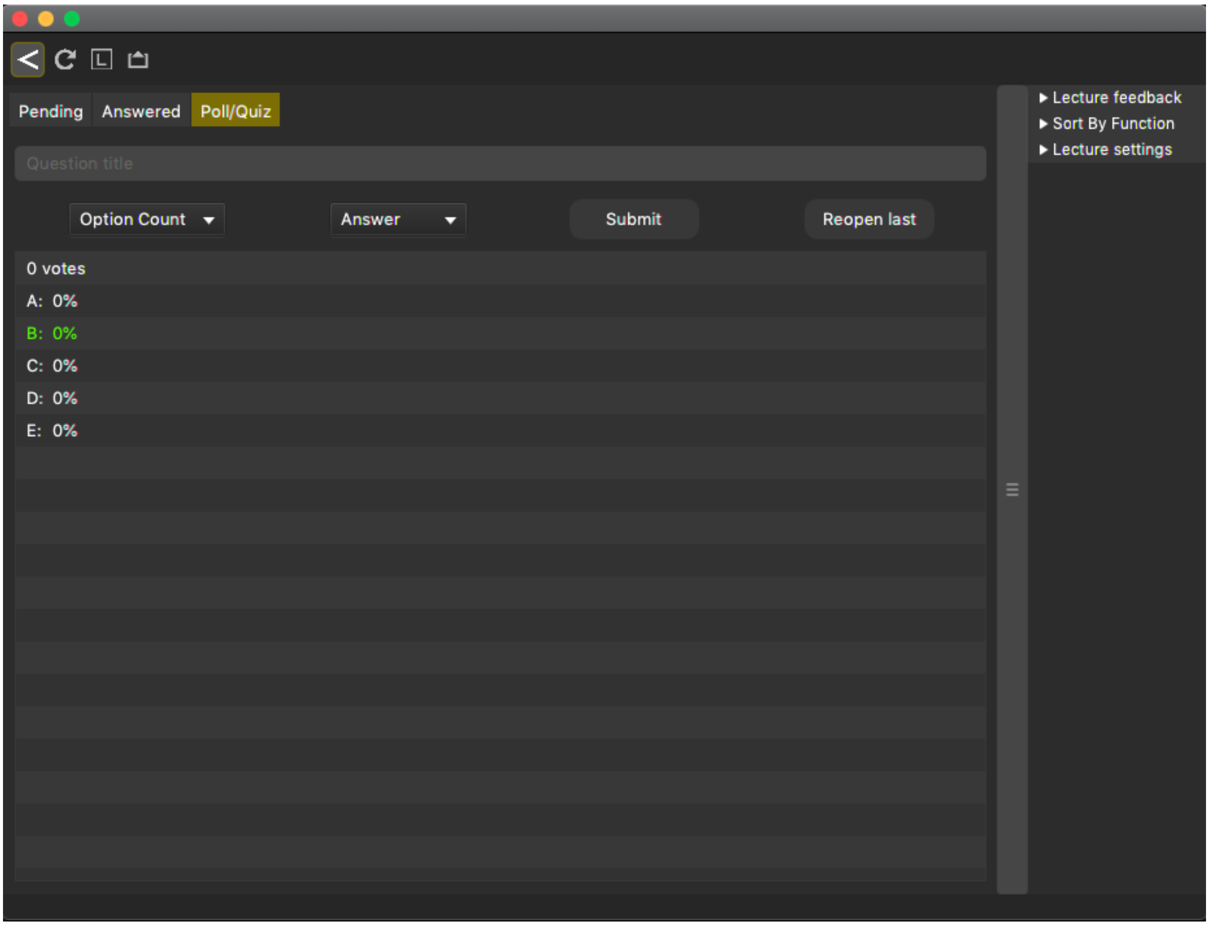
This is the answer.

Lecturer
0
Hello World 0

The join lecture scene:



The poll/quiz tab:



```
0 votes
A:  0%
B:  0%
C:  0%
D:  0%
E:  0%
```

RCS chapter

We were able to recognize 9 different stakeholders with 4 of them being indirect.

Stakeholder	Effect	Direct or indirect
Client	Easier in-lecture communication	direct
Students	Easier in-lecture communication	direct
Teaching assistants	Easier in-lecture communication	direct
Lecturers	Easier in-lecture communication	direct
Administrators (IT helpdesk)	One more system to take care of.	direct
Applicants to the universities	Increased interest in the TU Delft, following from the increased quality in online lecturers of the TU Delft.	indirect
TU Delft	Increased quality of online lectures	indirect
Society	Since quality of online lectures were improved, the cost of having online lectures becomes smaller.	indirect
Developers	Developers are directly related to the project, because they serve the client's needs.	direct
Videotelephony software companies (For example Zoom)	Video conference call software is a complementary good to our application, so there has to be certain compatibility between these software units.	Indirect

The one stakeholder that we choose to explore further in this chapter are video telephony software companies. Our application is meant to be a means of communication during a lecture. So we thought it would be a great idea to introduce the companies that are the platform on which online lectures are held. Having the two software applications will provide a seamless experience to the users.

Ethical Values

These are list a list of ethical values that we presume to be important to the video telephony companies:

-privacy: We know that online interaction and communication leads to privacy concerns among users and it is of utmost importance that the users privacy is not compromised in any way.

-data security: The data stored might contain confidential or private information that needs to be secure and safe from potential threats.

-transparency: It is important to be transparent in the way we store, use or market the data from the users for us to be in compliance with the General Data Protection Regulation (GDPR)

Privacy

The value we have chosen to explore further is privacy, because it is extremely relevant these days. We believe that the definition of the privacy given below is precise in the context of the in-lecture communication between students and lecturers. As explained by Rein Turn and Willis H. Ware (1976)[1]:

> Privacy is an issue that concerns the computer community in connection with maintaining personal information on individual citizens in computerized record-keeping systems. It deals with the rights of the individual regarding the collection of information in a record-keeping system about his person and activities, and the processing, dissemination, storage, and use of this information in making determinations about him.

Learning about privacy

Privacy engineering is a discipline, which aims to provide the methodologies tools in order to deal with this privacy issue. We think that consulting with privacy engineering experts would improve how we deal with the issues that might come up in our application.

Interesting approach we would like to learn more about is Privacy by Design (PbD), where privacy is embedded into the design of the application.[2] This approach is pleasing to us, because minimalistic and efficient design is our goal. As efficient as minimalistic design can be, it sometimes can lead to problems such as data protection and privacy: therefore we would like to discuss with privacy engineers how and which Privacy by Design principles could ensure that our design meets the privacy standards.

To be more specific, we would like to discuss how secure are auto-generated join URLs that video conference software uses, what are the advantages and disadvantages of such design and if there is a possibility to assign different privileges to users by means of using these URLs.

[1] Turn, R., & Ware, W. (1976). Privacy and Security Issues in Information Systems. https://doi.org/10.7249/p5684

[2] Bernsmed, K. (2016). Applying Privacy by Design in Software Engineering - An European Perspective.

Values hierarchy

Privacy

the norms that we can follow are:

- Limited use: the data will only be used for the purpose intended by the user and only as long as it is required
- Personal data should not be distributed any more than is necessary for its legitimate and intended use.
- The organization is responsible for the security and accuracy of the data that it stores/collects.

The following are the design choices we make based on these norms.

- The data from a specific lecture could be deleted once the questions are exported to brightspace.
- All data pertinent to a lecture will not be distributed to other parties. Only lecturers can do so.
- All information will be stored in a secure database.
- There is no authentication required to join a lecture, hence the identity of a user will not be verified and the users cannot be profiled.
- Only users with access to the lecture URL can join a lecture, hence preventing the compromise of the information from a lecture.
- All the information that can be collected on a user, is based on how much the user would like to divulge about themselves. Users have full autonomy over their identity.
- We should have encryption between the client and the server.

Tensions and conflicts

There could be issues arising due to a conflict in our design choices and the design choices that might arise from the values that are important to the stakeholder. Below is the list of a few of them:

1. A videotelephony company may not want the lecturer to have the ability to export thegit lectures. It is possible that they would want to assign that ability specifically to Zoom employees. This would be in direct conflict with the requirements of our client, as that would violate our personal value of privacy. Either the client and the stakeholder reach an accord or we would have to cut ties with said stakeholder.
2. The videotelephony company might want to link the user's account on their platform to our application in order to enter a lecture since they strive for better integration and making the overall product easy to use. This could be agreed upon depending on our client's decision since the client specified that no authentication was needed in our application. However, this means that our application might not be storing user data up to the standards of privacy of said videotelephony companies.
3. A videotelephony software usually has most of the functionalities that the application being designed has. For this reason another conflict, which is not so much related to the privacy, but the competition, arises. if lecturers choose to use our application for polling, asking questions and giving feedback, then the features of videotelephony companies will not be used to full extent. This may lead to increased competition

between our application and videotelephony companies software, which might result in either them stopping the development of the overlapping features or improving the overlapping features.

References

1. Turn, R., & Ware, W. (1976). Privacy and Security Issues in Information Systems. https://doi.org/10.7249/p5684
2. Bernsmed, K. (2016). Applying Privacy by Design in Software Engineering - An European Perspective.