Bogazici University
SWE 573 Software Development Practice

ColearnApp

Project Report

Mustafa Çağatay Tulun

May 31, 2022

github.com/mustafacagataytulun/bounswe573-2022
v0.9

https://colearnapp.mustafatulun.com/

HONOR CODE

Related to the submission of all the project deliverables for the Swe573 2022 Spring semester project reported in this report, I, Mustafa Çağatay Tulun, declare that:

- I am a student in the Software Engineering MS program at Bogazici University and am registered for Swe573 course during the 2022 Spring semester.

- All the material that I am submitting related to my project (including but not limited to the project repository, the final project report, and supplementary documents) have been exclusively prepared by myself.

- I have prepared this material individually without the assistance of anyone else with the exception of permitted peer assistance which I have explicitly disclosed in this report.

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Overview

ColearnApp is a web application which provides users a colearning platform. In this colearning platform, users, who are keen to learn new things with their peers, can manage their learning effort and learn collaboratively without the concept of lecturer and lecture.

In ColearnApp, likeminded people can create new Colearning Spaces to have a dedicated space for a specific topic to contain required learning materials. Learning materials can be created within the Colearning Space. Users can create and edit articles, prepare quizzes, ask, and answer questions. In addition, each Colearning Space has a glossary to be filled by colearners.

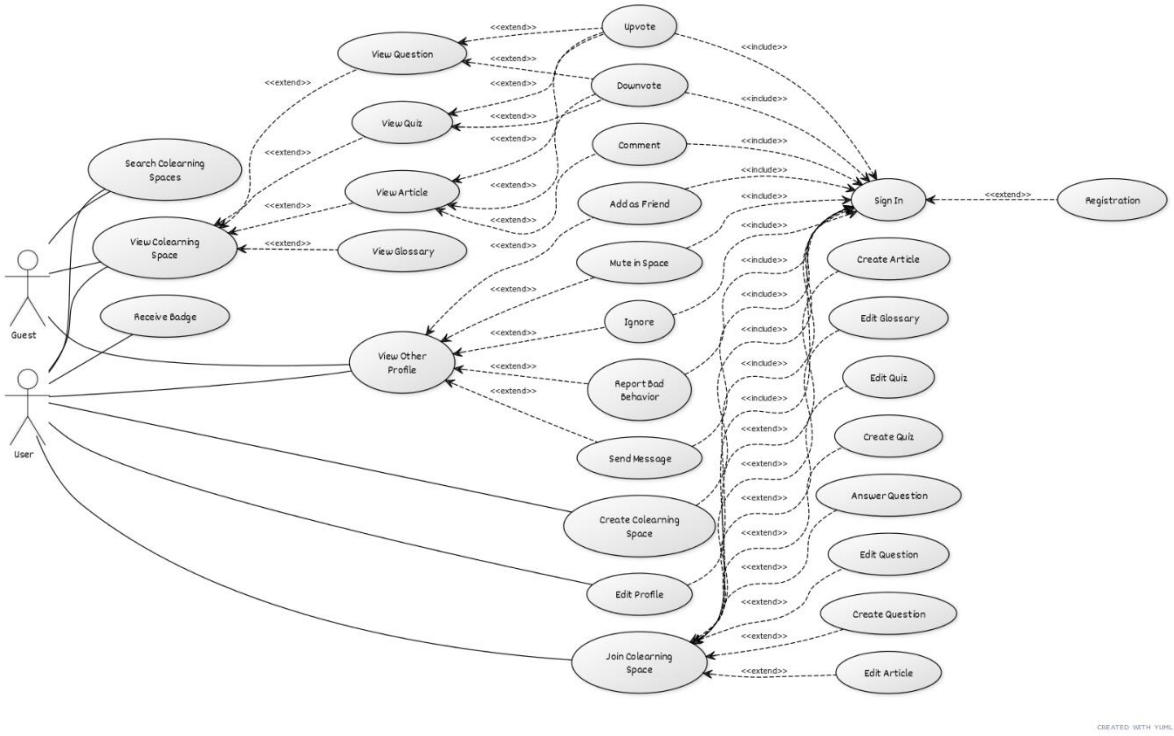
Software Requirements

- As a guest, I want to register to the system without email verification, so that I can use all features of the application instead of just browsing.
- As a first-time registered user, I want to select my user interest, so that the application shows recommended learning spaces to me to join.
- As a user, I want to fill my profile, so that other users can see who I am.
- As a user, I want to change my interests in my profile, so that the system can recommend me learning spaces according to my new interests.
- As a user, I want to create learning spaces, so that other like-minded users can join my learning space and we learn together.
- As a user, I want to join learning spaces, so that I start to contribute to co-learning effort in that space.
- As a user, I want to ask questions, so that I can get answers for it.
- As a user, I want to answer questions, so that I can help someone to learn that specific topic.
- As a user, I want to give feedback, so that the related item will become better.
- As a user, I want to receive badges, so that my time and contributions are rewarded in the platform.
- As a user, I want to upvote content, so that the content quality and helpfulness can be seen better.
- As a user, I want to downvote content, so that the bad quality content can be seen immediately.
- As a user, I want to edit content freely, so that I can feel the co-learning effort instead of just solitary learning.
- As a user, I want to report users with bad behavior, so that the platform can be free of malevolent users.
- As a user, I want to add multimedia to the platform, so that users who is not good with reading can benefit from different learning techniques.
- As a user, I want to specify recommended prerequisites for content, so that other users can understand the level of that content better.
- As a guest, I want to search learning spaces, so that I can find out if there is an existing learning space for my topic.
- As a guest, I want to view inside the learning spaces, so that I can figure out if I can benefit from that space.
- As a user, I want to add tags to learning spaces, so that other users can find the learning space easier.
- As a user, I want to add tags to content, so that other users can find content easier.
- As a user, I want to create quizzes, so that other users can measure their knowledge.
- As a user, I want to solve quizzes, so that I can measure my knowledge.
- As a user, I want to ignore other users that I selected, so that I can be not bothered by them.
- As a learning space owner, I want to mute users that I selected, so that they cannot disturb other users.
- As a user, I want to add items to the glossary of the learning space, so that new users can learn meaning of certain terms about that topic.
- As a user, I want to see learning spaces I joined in home page, so that I can quickly dive into them where I left.
- As a user, I want to add other users to my friend list, so that I can follow them better.

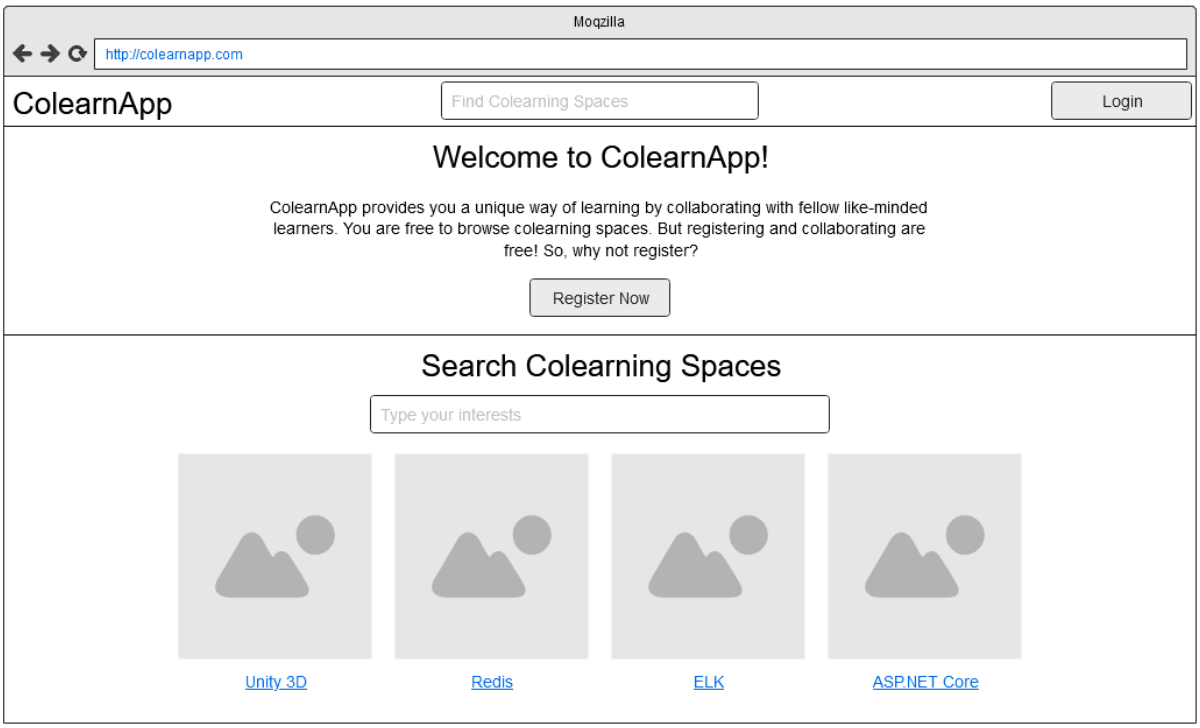
- As a user, I want to send direct messages to other users, so that I can communicate them.
- As a user, I want to see a list of co-learners in the learning space, so that I can see who is with me.
- As a user, I want to see a list of online co-learners in the learning space, so that I can see what they are doing right now.

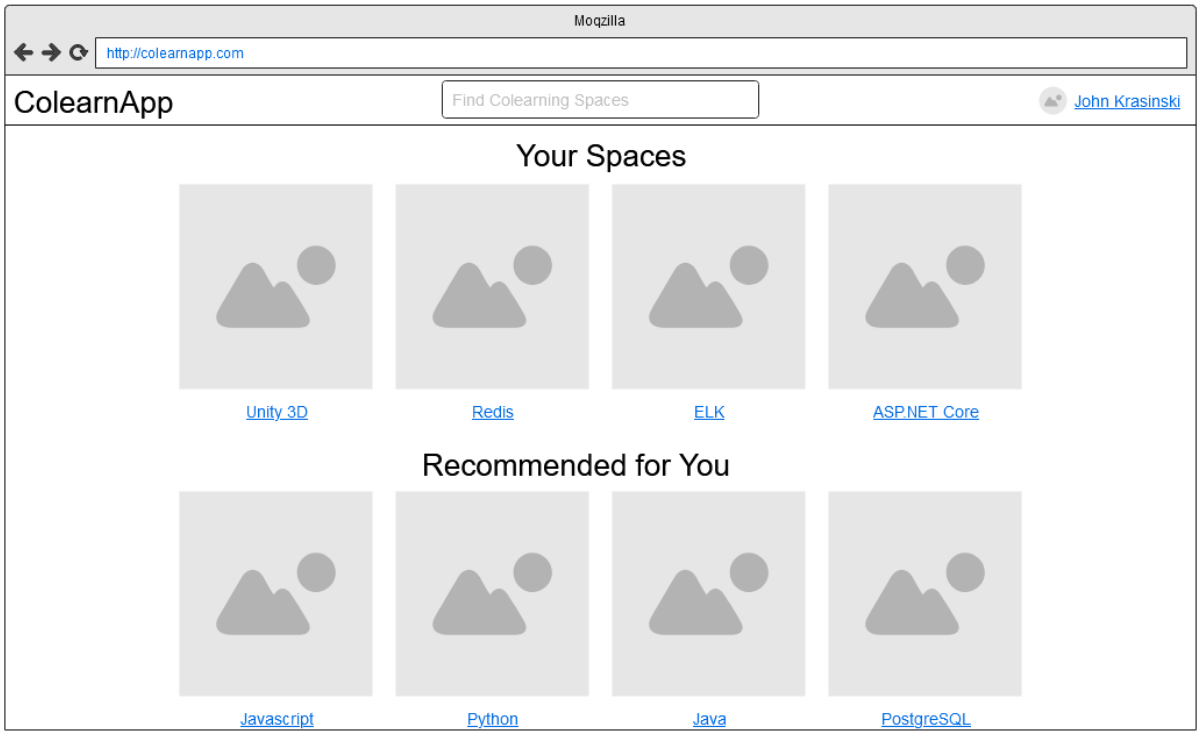
Design

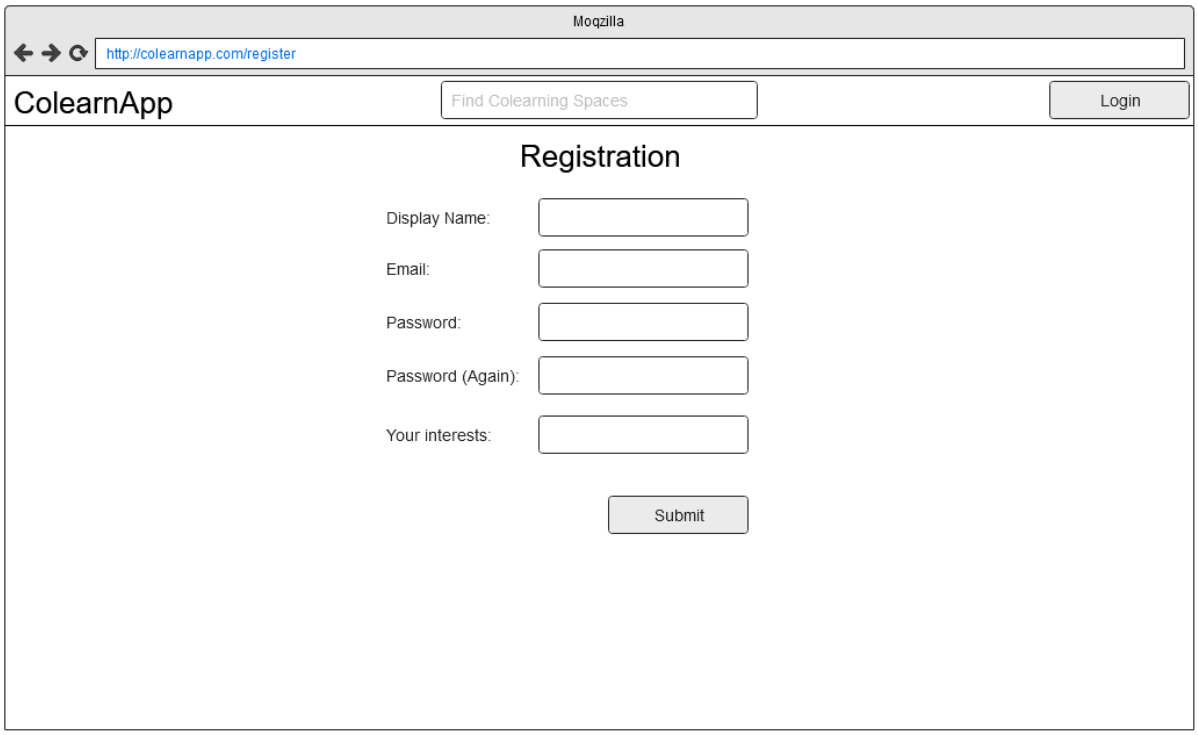
Use Case Diagram

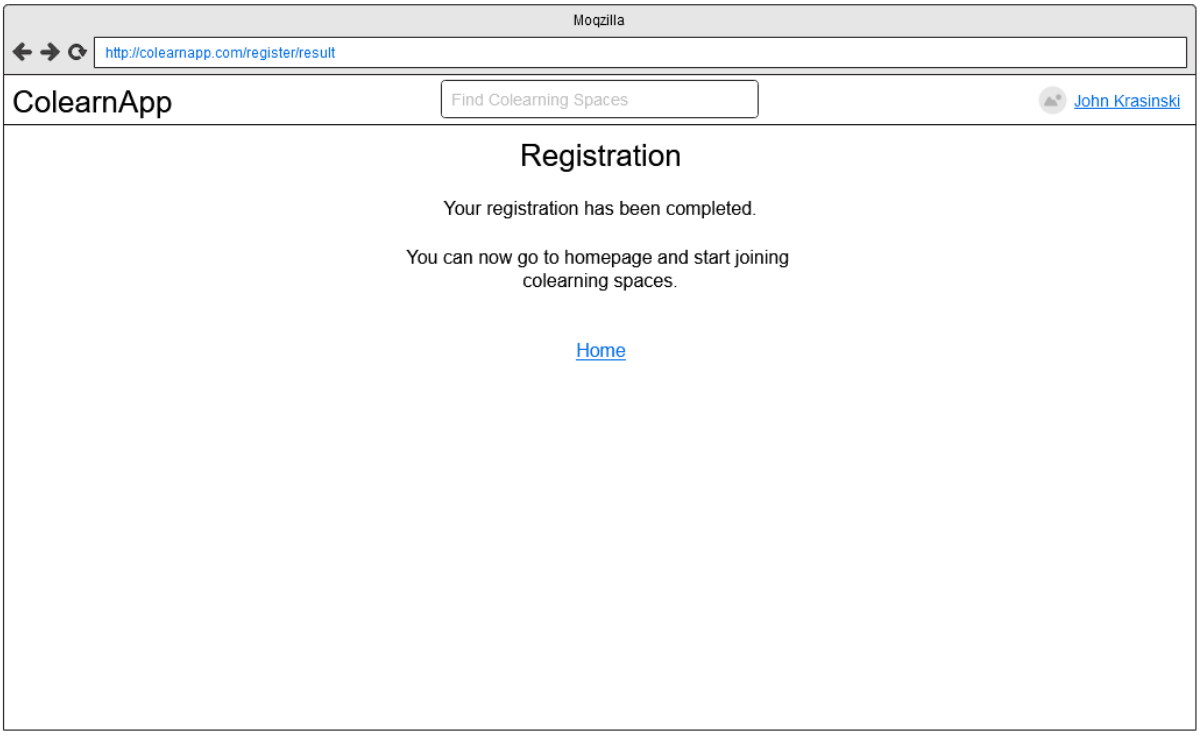


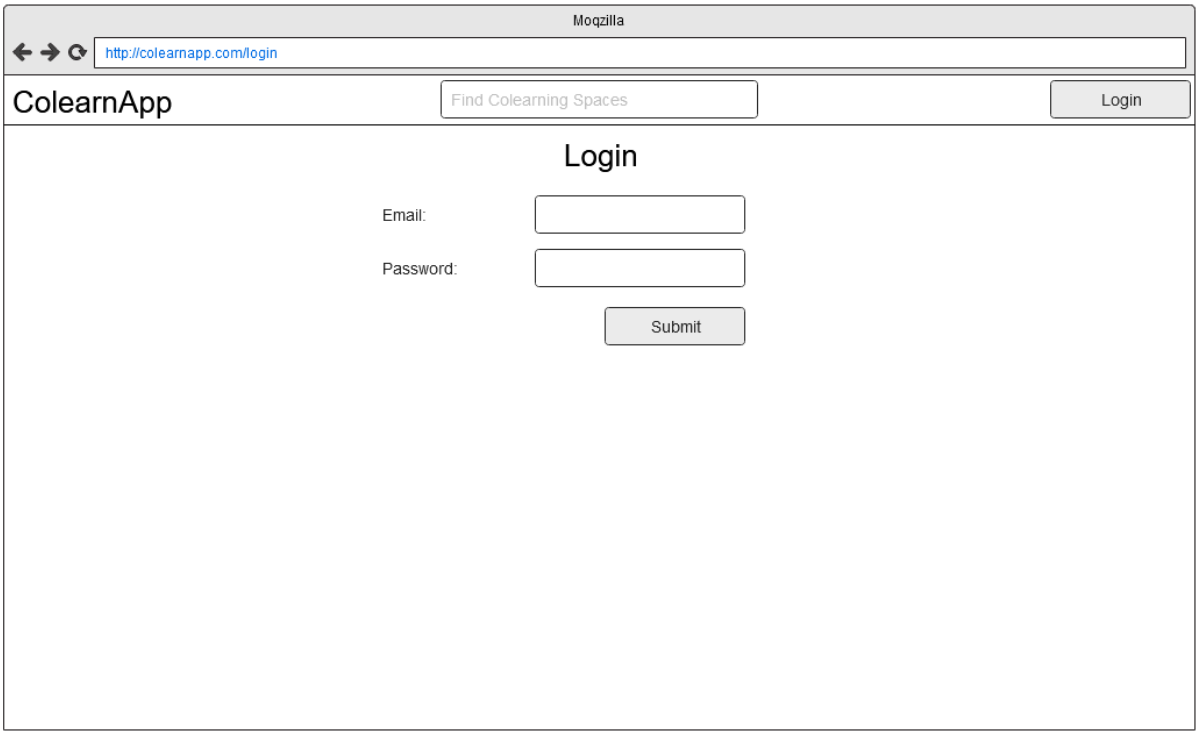
Screen Mockups




Moqzilla
http://colearnapp.com
ColearnApp
Find Colearning Spaces
John Krasinski
Your Spaces
Unity 3D
Redis
ELK
ASP.NET Core
Recommended for You
Javascript
Python
Java
PostgreSQL


Moqzilla
http://colearnapp.com/register
ColearnApp
Find Colearning Spaces
Login
Registration
Display Name:
Email:
Password:
Password (Again):
Your interests:
Submit


Moqzilla
http://colearnapp.com/register/result
ColearnApp
Find Colearning Spaces
John Krasinski
Registration
Your registration has been completed.
You can now go to homepage and start joining colearning spaces.
Home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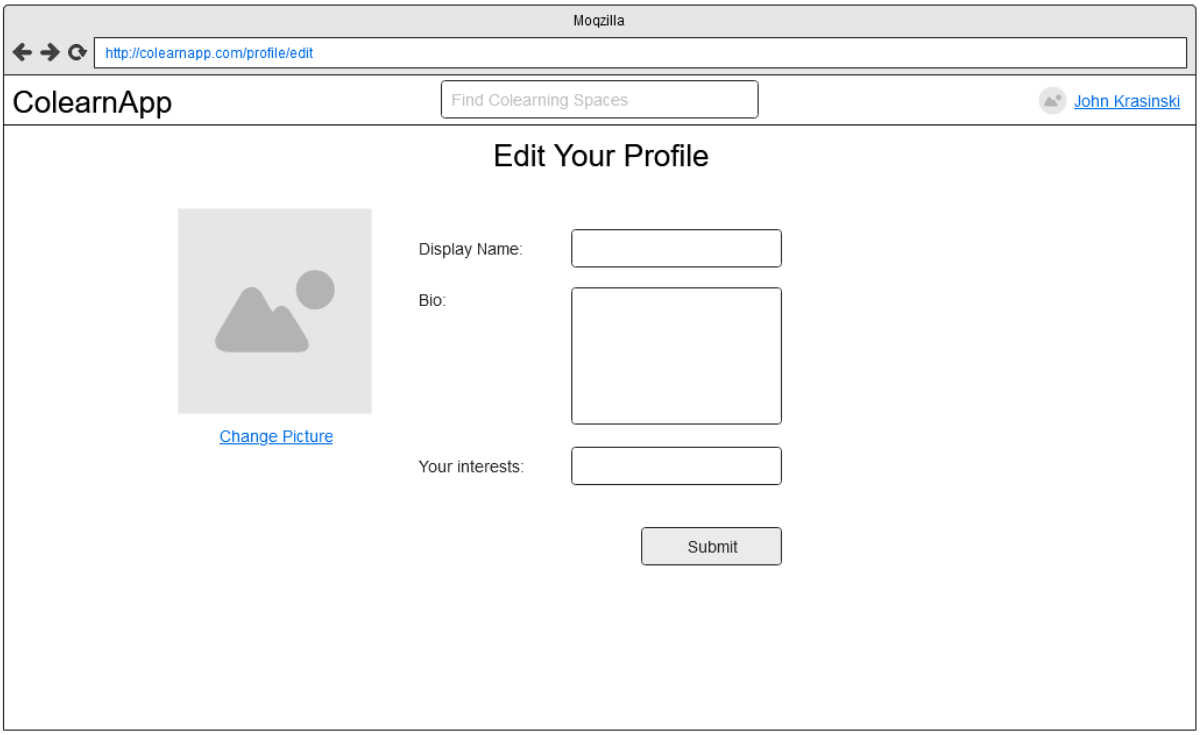
ColearnApp
Find Colearning Spaces
Login
Login
Email:
Password:
Submit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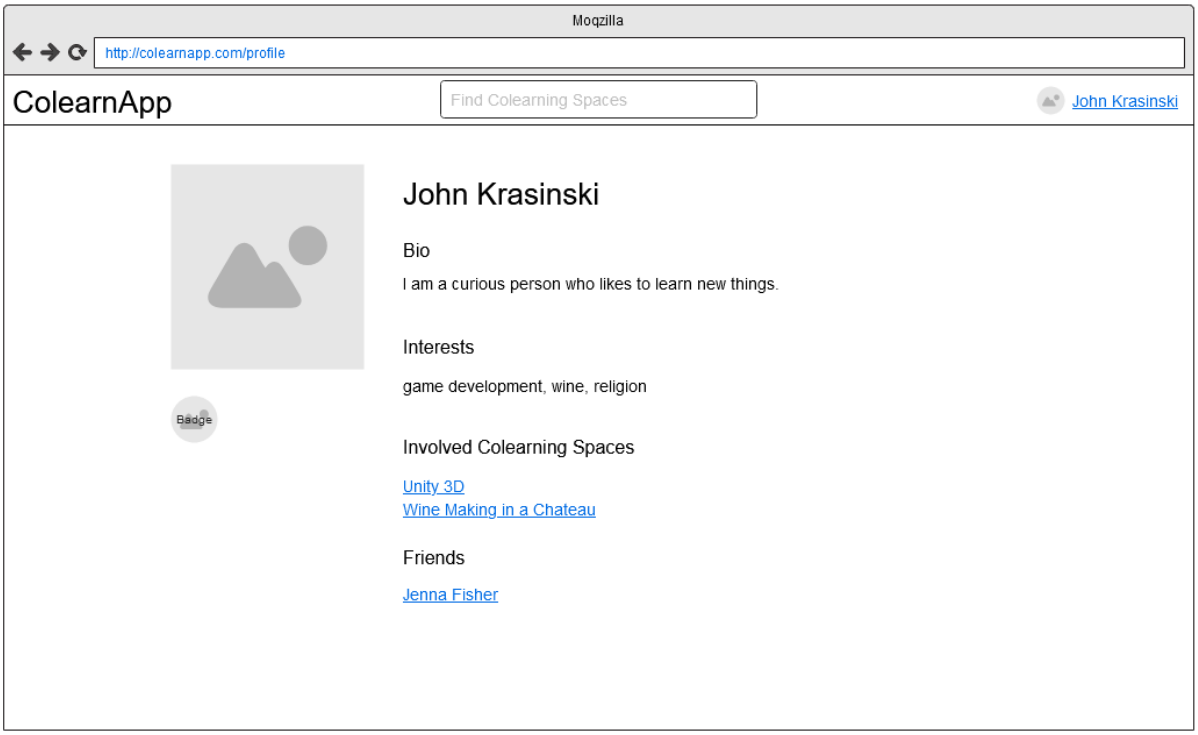
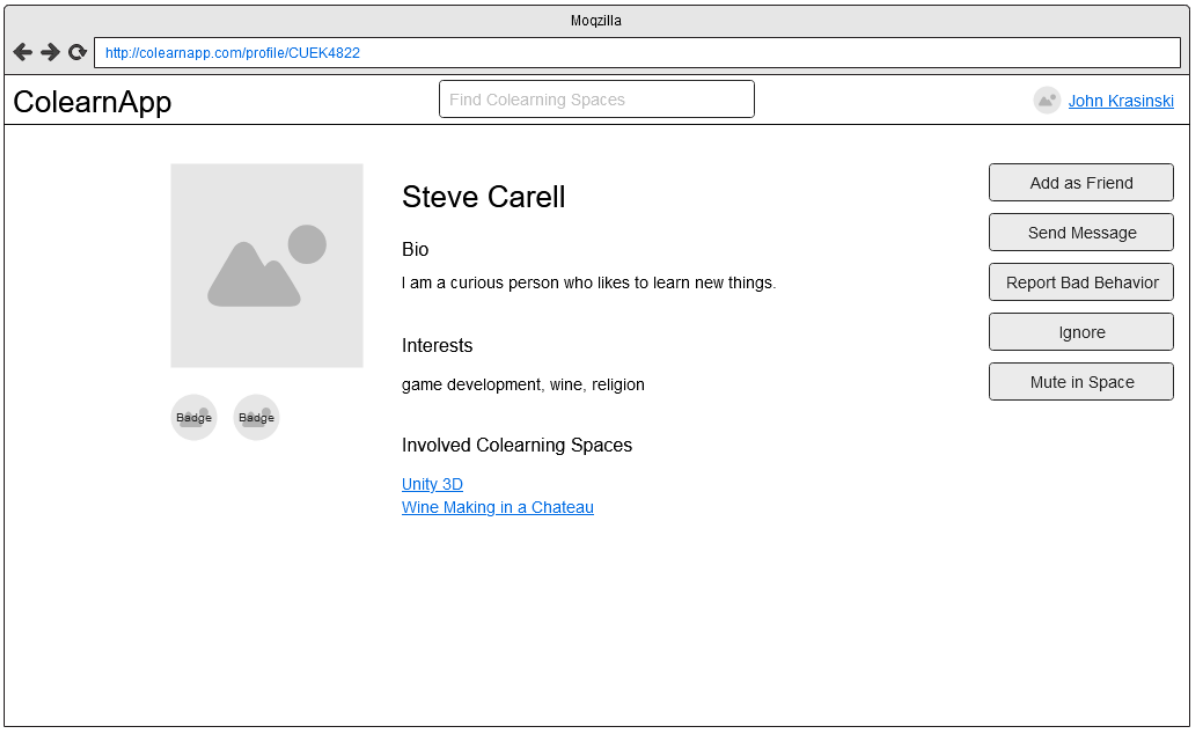
ColearnApp
Find Colearning Spaces
John Krasinski
Edit Your Profile
Change Picture
Display Name:
Bio:
Your interests:
Submit


Moqzilla
http://colearnapp.com/profile
ColearnApp
Find Colearning Spaces
John Krasinski
Badge
John Krasinski
Bio
I am a curious person who likes to learn new things.
Interests
game development, wine, religion
Involved Colearning Spaces
Unity 3D
Wine Making in a Chateau
Friends
Jenna Fisher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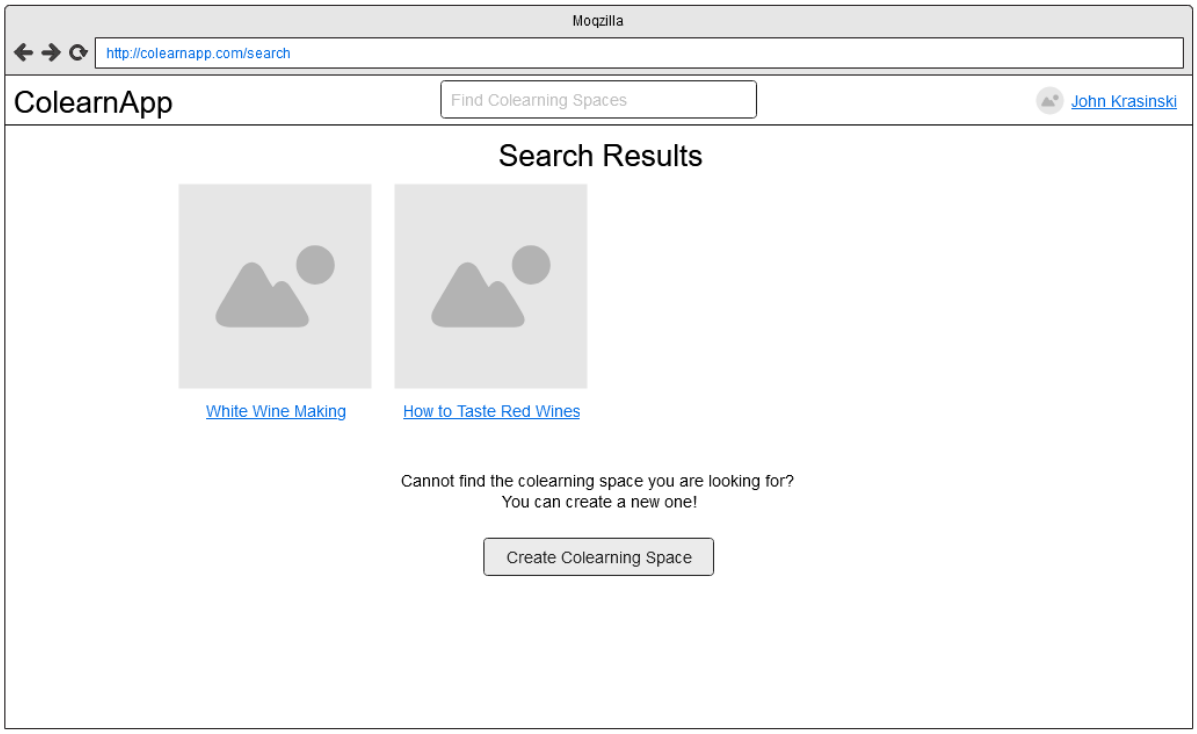
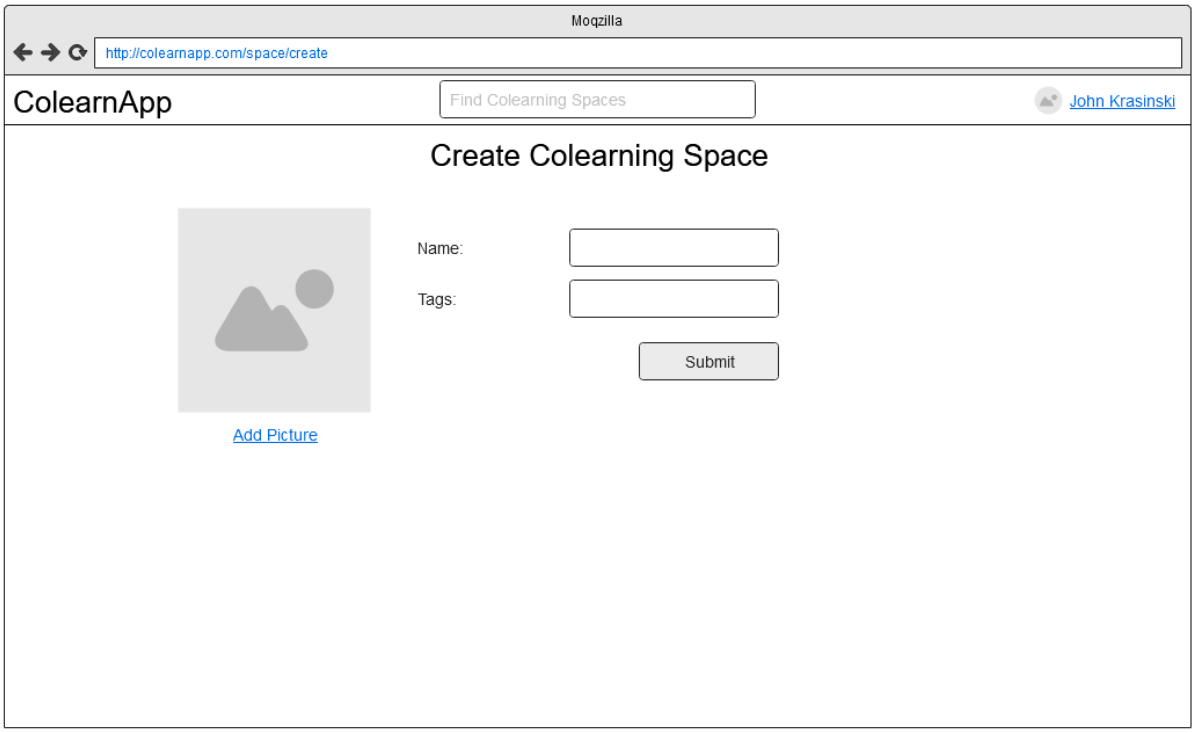
http://colearnapp.com/profile/CUEK4822
ColearnApp
Find Colearning Spaces
John Krasinski
Steve Carell
Bio
I am a curious person who likes to learn new things.
Interests
game development, wine, religion
Involved Colearning Spaces
Unity 3D
Wine Making in a Chateau
Badge
Badge
Add as Friend
Send Message
Report Bad Behavior
Ignore
Mute in Space


Moqzilla
http://colearnapp.com/search
ColearnApp
Find Colearning Spaces
John Krasinski
Search Results
White Wine Making
How to Taste Red Wines
Cannot find the colearning space you are looking for?
You can create a new one!
Create Colearning Space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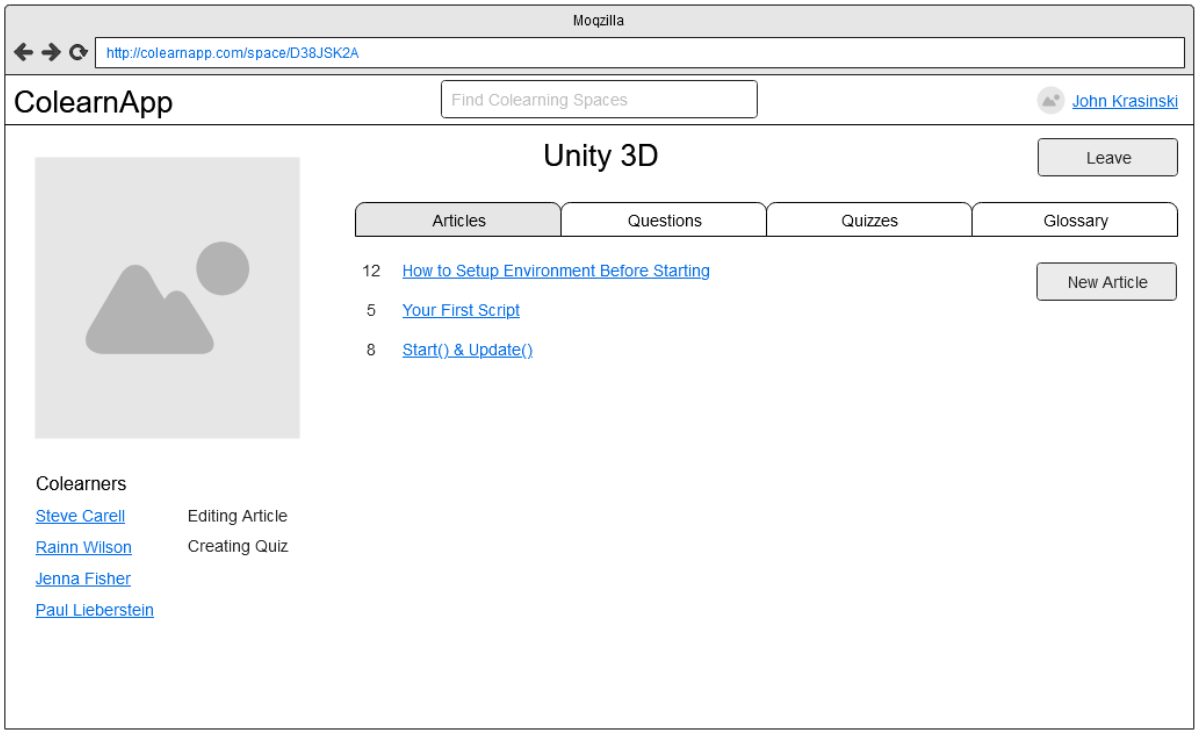
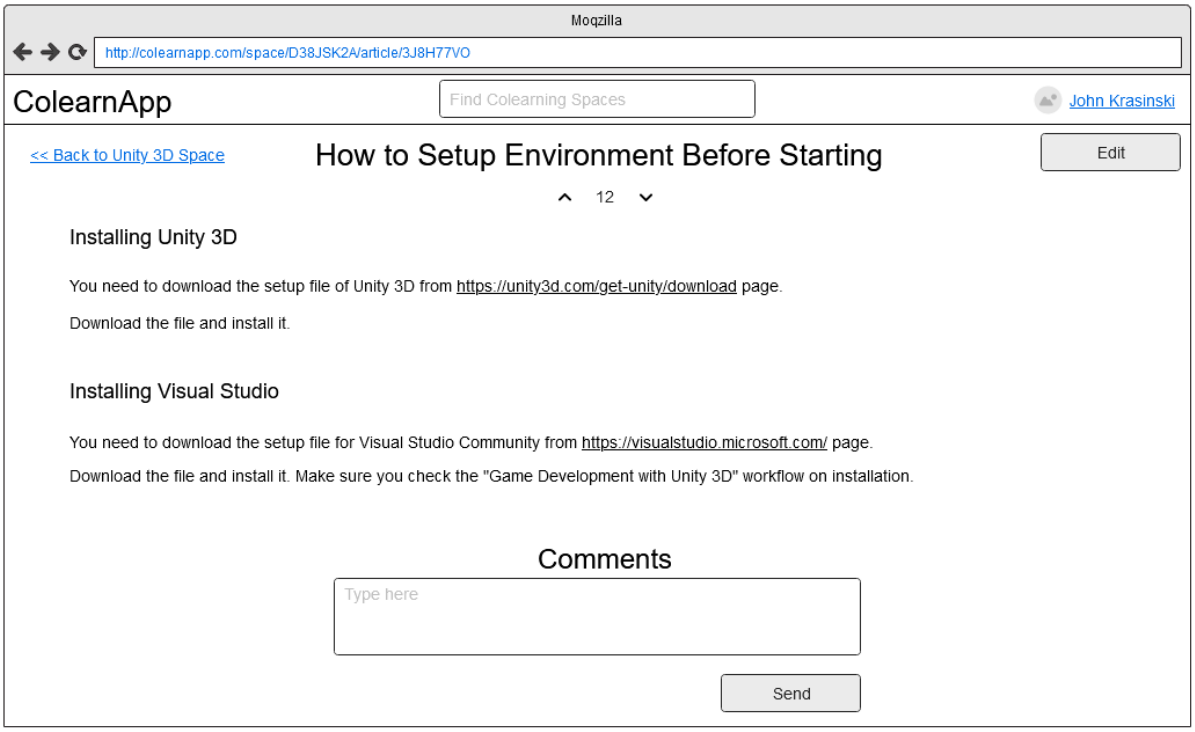
ColearnApp
Find Colearning Spaces
John Krasinski
Create Colearning Space
Name:
Tags:
Submit
Add Picture


Moqzilla
http://colearnapp.com/space/D38JSK2A
ColearnApp
Find Colearning Spaces
John Krasinski
Unity 3D
Leave
Articles
Questions
Quizzes
Glossary
12 How to Setup Environment Before Starting
5 Your First Script
8 Start() & Update()
New Article
Colearners
Steve Carell Editing Article
Rainn Wilson Creating Quiz
Jenna Fisher
Paul Lieberstein


Moqzilla
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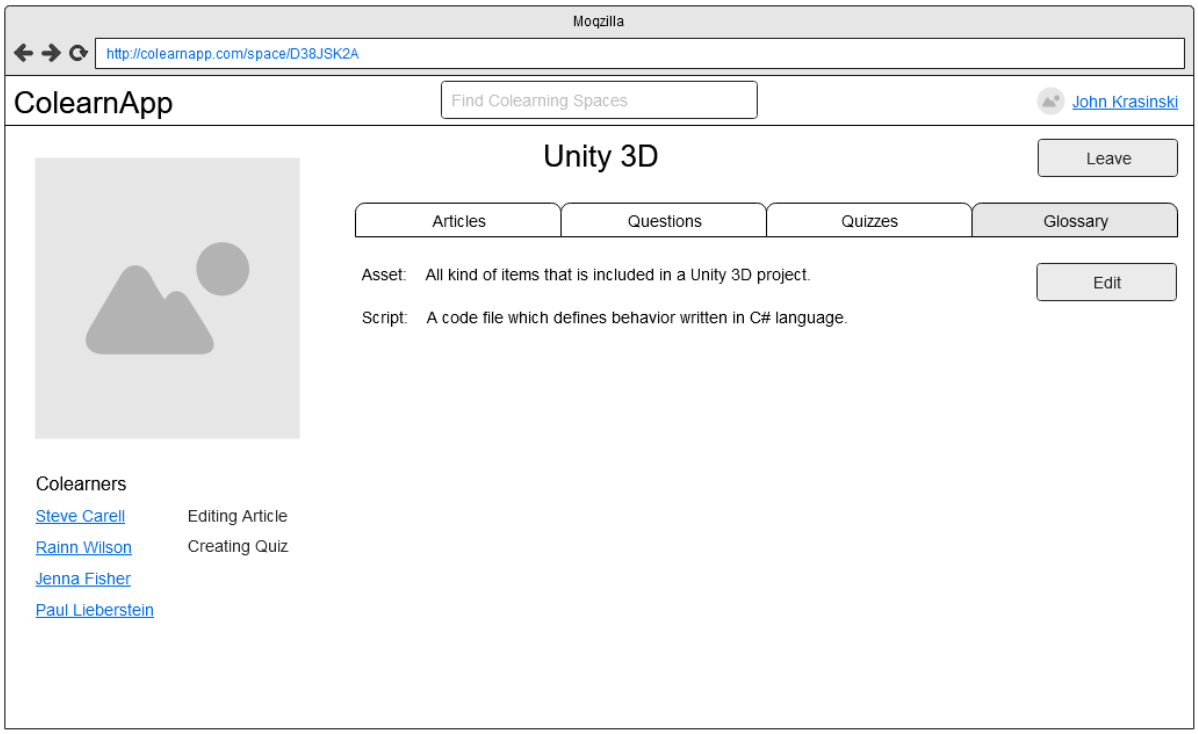
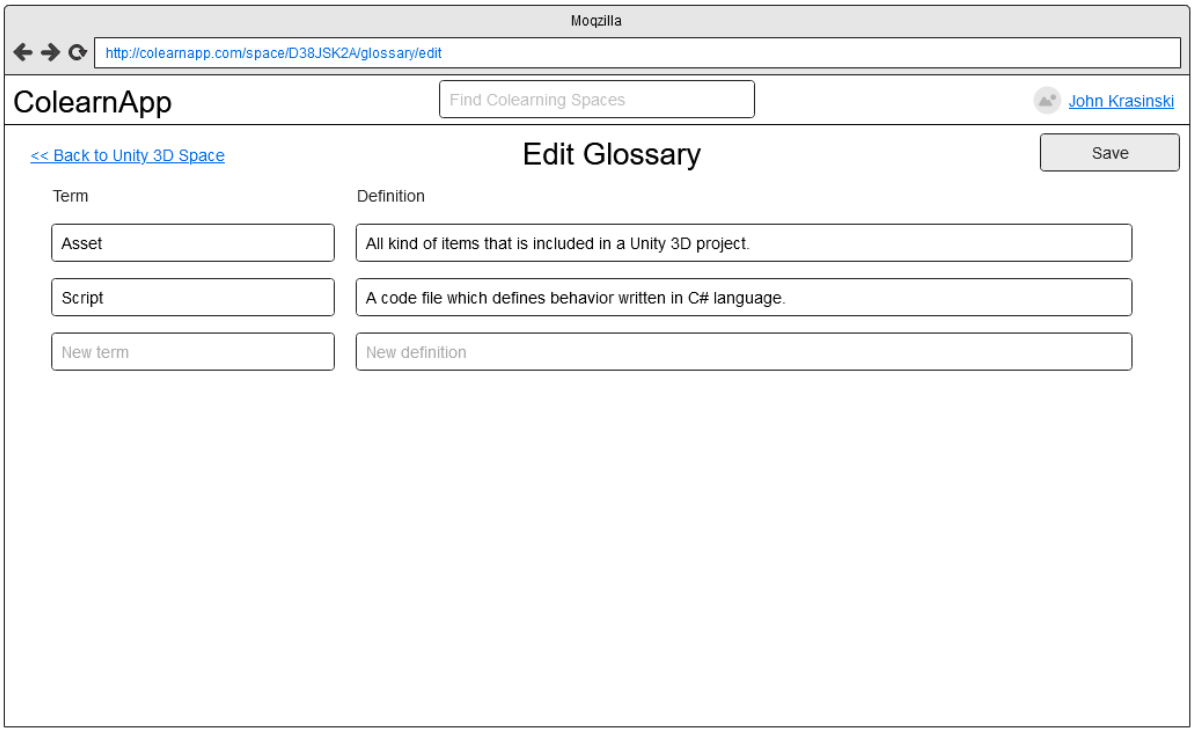
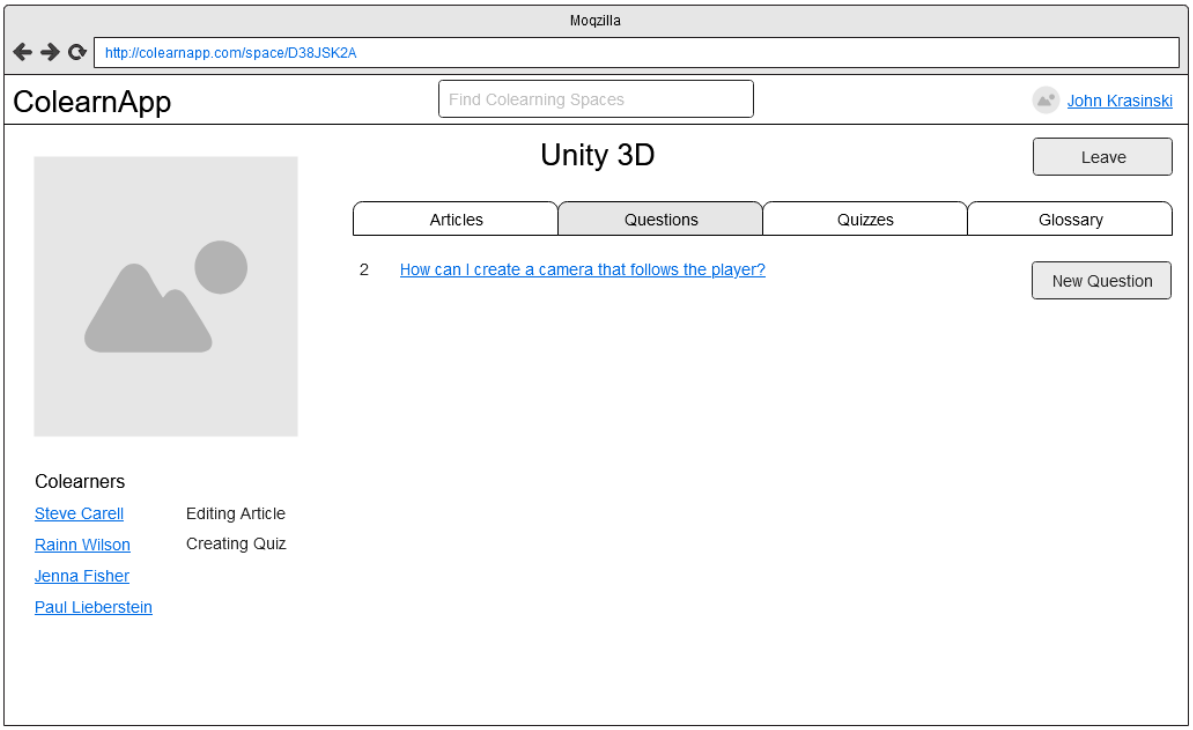
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Unity 3D Space
How to Setup Environment Before Starting
Edit
12
Installing Unity 3D
You need to download the setup file of Unity 3D from https://unity3d.com/get-unity/download page.
Download the file and install it.
Installing Visual Studio
You need to download the setup file for Visual Studio Community from https://visualstudio.microsoft.com/ page.
Download the file and install it. Make sure you check the "Game Development with Unity 3D" workflow on installation.
Comments
Type here
Send

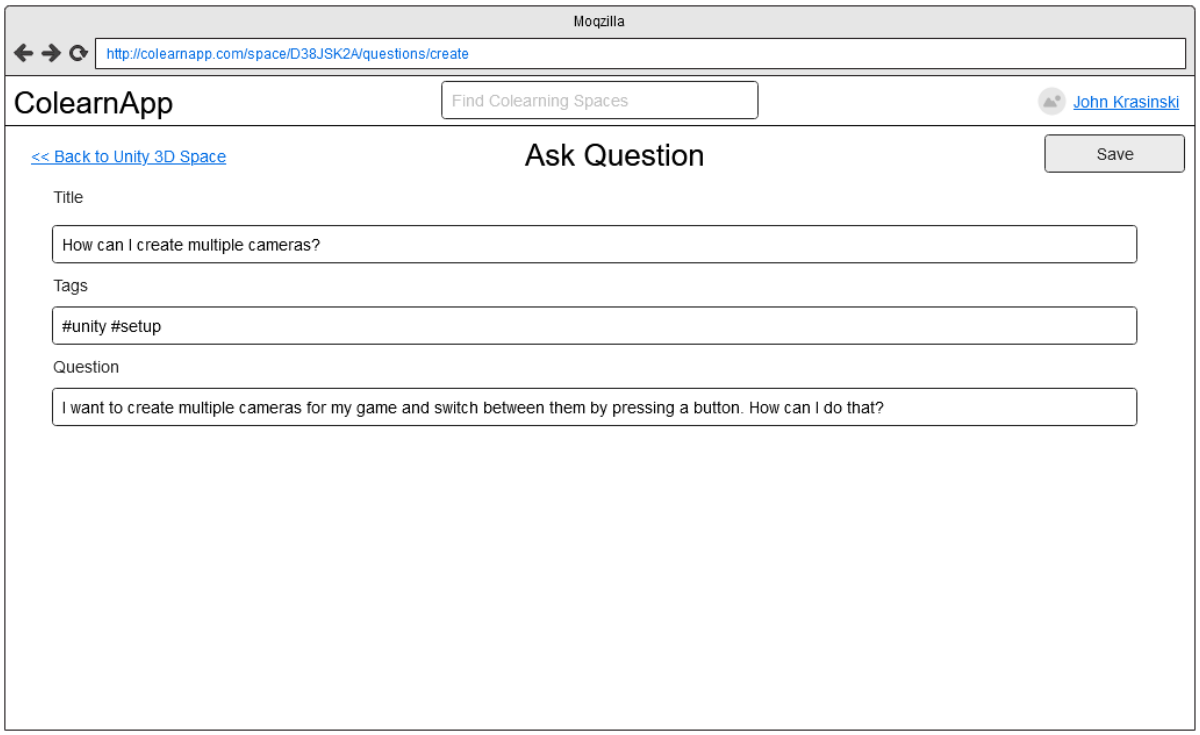

Moqzilla
http://colearnapp.com/space/D38JSK2A/article/3J8H77VO/edit
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Article
Edit Article
Save
Title
How to Setup Environment Before Starting
Tags
#unity #setup
Recommended Prerequisites
Content
Installing Unity 3D
You need to download the setup file of Unity 3D from https://unity3d.com/get-unity/download page.
Download the file and install it.
Installing Visual Studio
You need to download the setup file for Visual Studio Community from https://visualstudio.microsoft.com/ page.
Download the file and install it. Make sure you check the "Game Development with Unity 3D" workflow on installation.

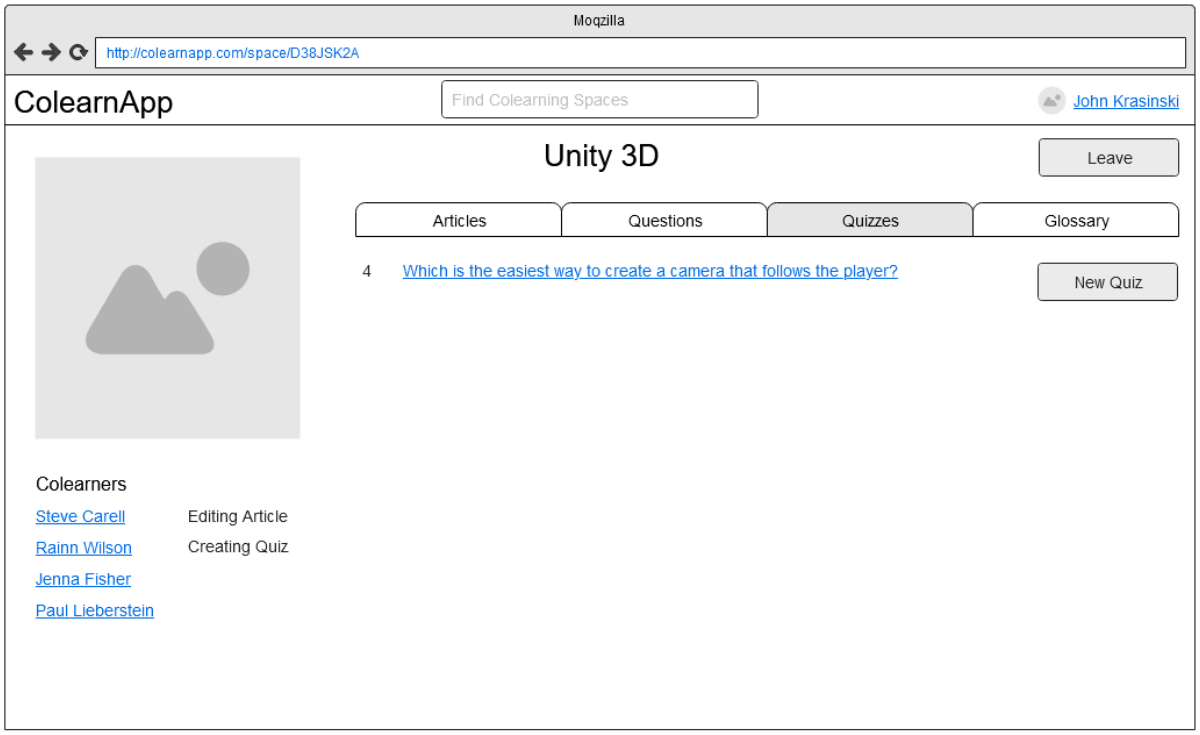

Moqzilla
http://colearnapp.com/space/D38JSK2A
ColearnApp
Find Colearning Spaces
John Krasinski
Unity 3D
Leave
Articles
Questions
Quizzes
Glossary
Asset: All kind of items that is included in a Unity 3D project.
Script: A code file which defines behavior written in C# language.
Edit
Colearners
Steve Carell Editing Article
Rainn Wilson Creating Quiz
Jenna Fisher
Paul Lieberstein

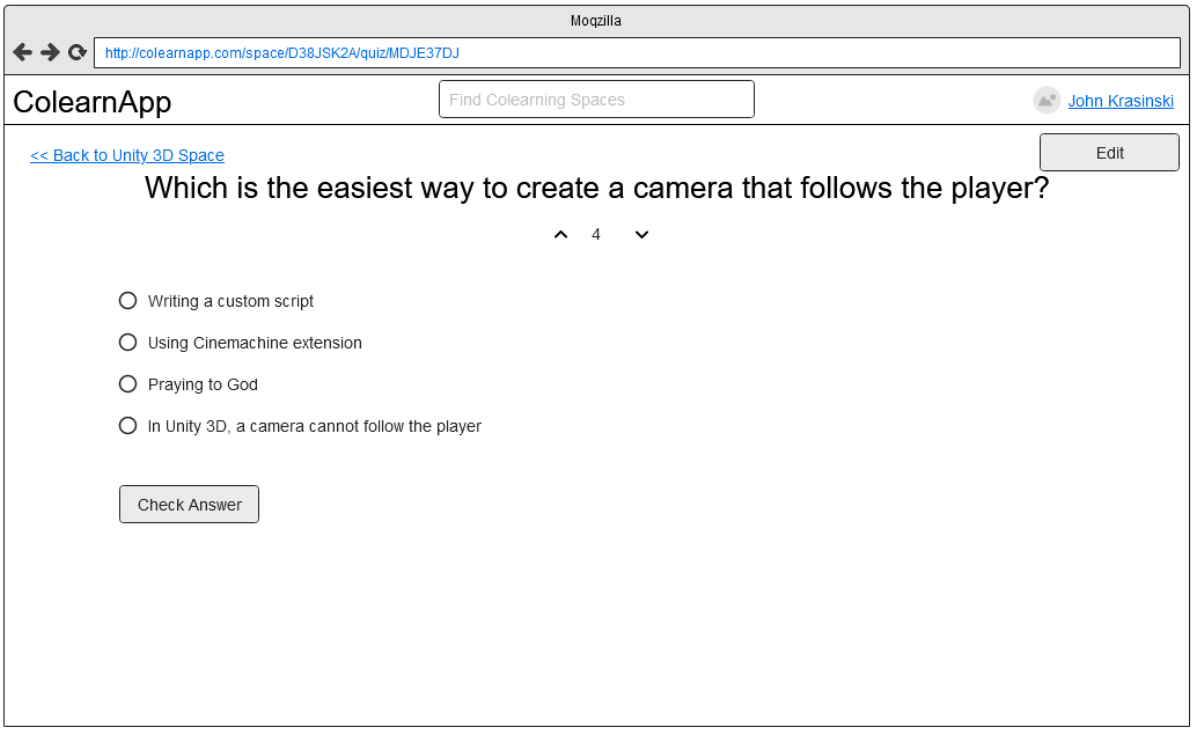

Moqzilla
http://colearnapp.com/space/D38JSK2A/glossary/edit
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Unity 3D Space
Edit Glossary
Save
Term
Definition
Asset
All kind of items that is included in a Unity 3D project.
Script
A code file which defines behavior written in C# language.
New term
New definition

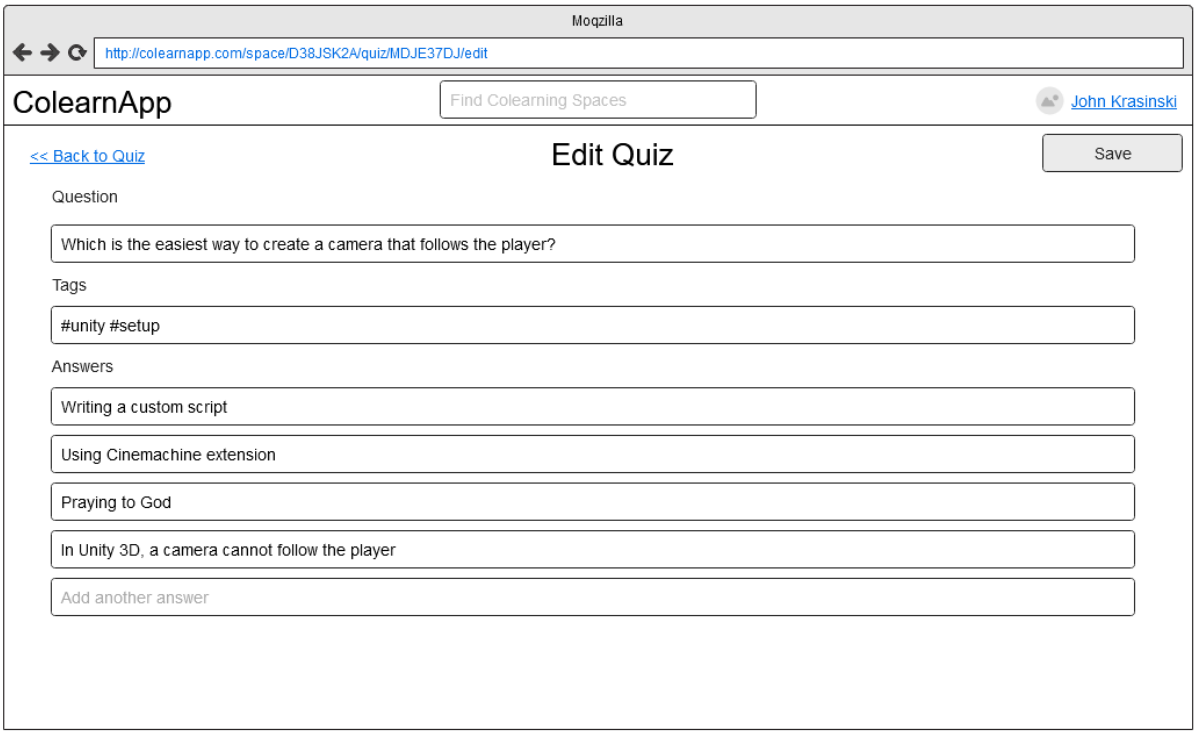

Moqzilla
http://colearnapp.com/space/D38JSK2A
ColearnApp
Find Colearning Spaces
John Krasinski
Unity 3D
Leave
Articles
Questions
Quizzes
Glossary
2
How can I create a camera that follows the player?
New Question
Colearners
Steve Carell
Editing Article
Rainn Wilson
Creating Quiz
Jenna Fisher
Paul Lieberstein


Moqzilla
http://colearnapp.com/space/D38JSK2A/question/5J8DUEVO
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Unity 3D Space
How can I create a camera that follows the player?
2
I want a camera in my scene which follows the player I control. How can I do that?
Answers
You can easily use Cinemachine extension for that.
Steve Carell - 01.04.2022
New Answer
Type here
Send


Moqzilla
http://colearnapp.com/space/D38JSK2A/questions/create
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Unity 3D Space
Ask Question
Save
Title
How can I create multiple cameras?
Tags
#unity #setup
Question
I want to create multiple cameras for my game and switch between them by pressing a button. How can I do that?


Moqzilla
http://colearnapp.com/space/D38JSK2A
ColearnApp
Find Colearning Spaces
John Krasinski
Unity 3D
Leave
Articles
Questions
Quizzes
Glossary
4
Which is the easiest way to create a camera that follows the player?
New Quiz
Colearners
Steve Carell
Editing Article
Rainn Wilson
Creating Quiz
Jenna Fisher
Paul Lieberstein


Moqzilla
http://colearnapp.com/space/D38JSK2A/quiz/MDJE37DJ
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Unity 3D Space
Edit
Which is the easiest way to create a camera that follows the player?
4
Writing a custom script
Using Cinemachine extension
Praying to God
In Unity 3D, a camera cannot follow the player
Check Answer


Moqzilla
http://colearnapp.com/space/D38JSK2A/quiz/MDJE37DJ/edit
ColearnApp
Find Colearning Spaces
John Krasinski
<< Back to Quiz
Edit Quiz
Save
Question
Which is the easiest way to create a camera that follows the player?
Tags
#unity #setup
Answers
Writing a custom script
Using Cinemachine extension
Praying to God
In Unity 3D, a camera cannot follow the player
Add another answer

Status

The majority of the requirements for the application has been implemented. The application is deployed in a live environment. There are no known bugs, and it is ready to use with implemented functionality.

However, some of the requirements cannot be implemented due to development time constraints. Below is the missing functionality which would be implemented with a wider project time frame.

- The interests that users can specify through their profile does not produce colearning space recommendations to users, because the recommended spaces module is not implemented.
- Related to the requirements above, the user cannot directly specify their interests after the registration as per the requirements. They need to go to their profile page.
- The system does not have badges.
- Reporting other users for bad behavior is not implemented.
- Ignoring other users is not implemented.
- Muting other users for bad behavior by colearning space owners or moderators is not implemented.
- Adding other users as friends is not implemented.
- Sending direct message to other users is not implemented.
- Though users can see names and profiles of other users who joined a colearning space, they cannot see what they are doing right now.

Status of Deployment

The application is deployed in live environment and can be accessed through https://colearnapp.mustafatulun.com URL.

The application is containerized with Docker and is run on Google Cloud Run service. This service is a serverless managed service, so that developers does not need to provision some old fashion VMs and manage the operating system and installations on the VM. In addition, it supports “scale-to-zero” feature which means if the application is not accessed by anybody within a configurable time window (defaults to 10 minutes), the application is stopped completely, consuming no CPU and RAM, and when anyone tries to access to the application through the URL, it quickly starts the application and start to serve users again. This feature lowers the costs to run application if it is not uses 24/7. It also supports automatic horizontal scaling to handle lots of concurrent users. Last but not least, this service supports usage of custom domains. This is why the URL of the application does not contain any sign of Google.

The application uses PostgreSQL as the database. It is hosted in AWS RDS with the 12-month free-tier.

The application has support for users to upload their own profile pictures or colearning space cover images. These static images are saved on AWS S3 service upon the submission of corresponding forms by users and served directly from AWS S3 when users use the application. In addition, the static files collected with the “collectstatic” command of Django are also saved to AWS S3 and served from there.

Forgot Password feature in the application requires an SMTP to send emails to users. GMail's SMTP servers are used for this purpose. However, it would be better to use other cloud service such as AWS SES, Sendgrid or PostmarkApp. Using on-prem email servers for this purpose is also an option, which is used by all banks in Turkey due to the regulatory constraints.

Deployment is automatic and is triggered by a CI/CD pipeline implemented with CircleCI. The status of the pipeline can be seen here:
https://app.circleci.com/pipelines/github/mustafacagataytulun/bounswe573-2022

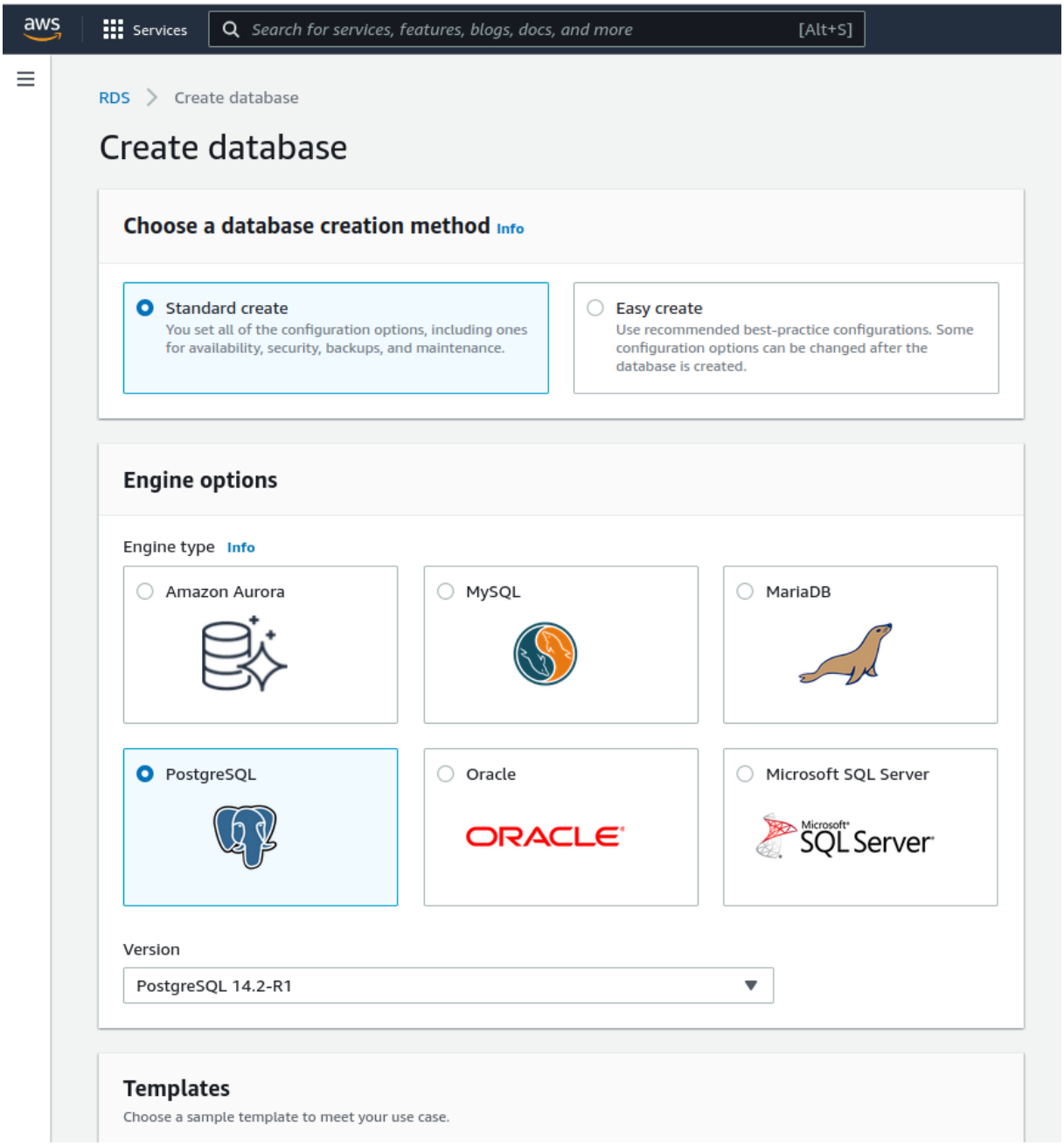
System Manual

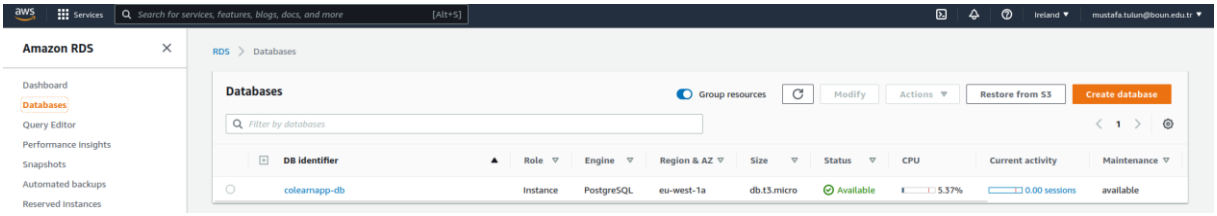
The system can be operated on any platform which can run Docker containers. All in all, below are the requirements for the operation of the application.

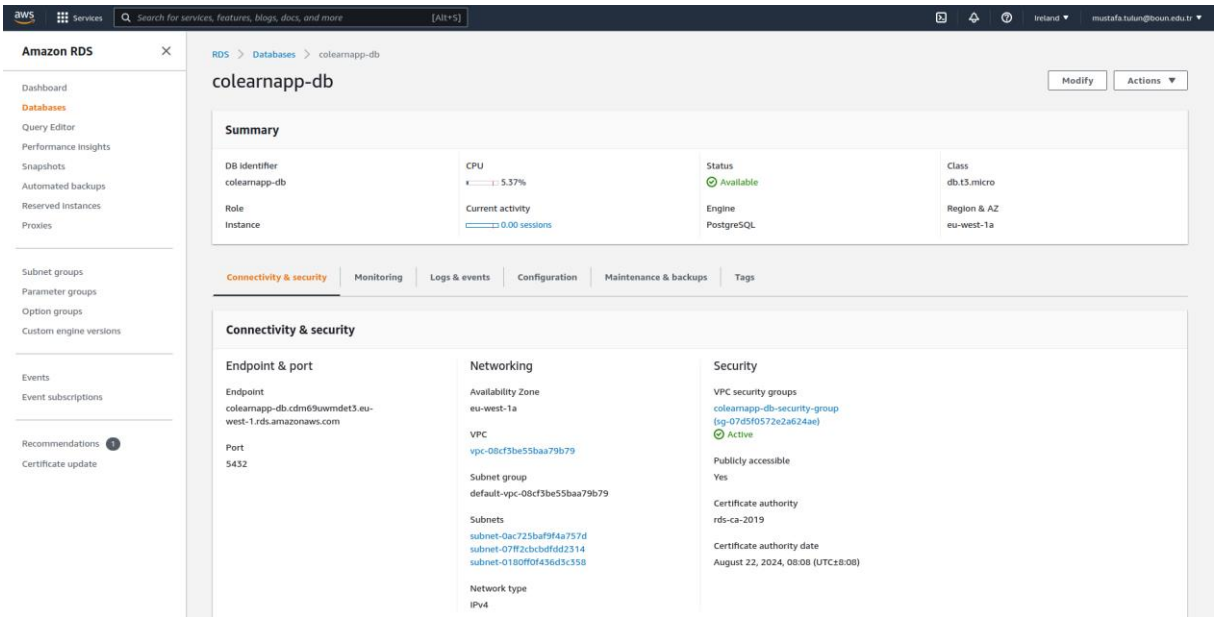
- A container platform (managed service, or a VM on which Docker is installed)
- A PostgreSQL database (managed service, or installed on a VM)
- AWS S3
- An SMTP server (managed service, or an email server installed on a VM)

PostgreSQL Database

For the live deployment of this project, AWS RDS is used. A PostgreSQL database instance can easily be created through the AWS Management Console.



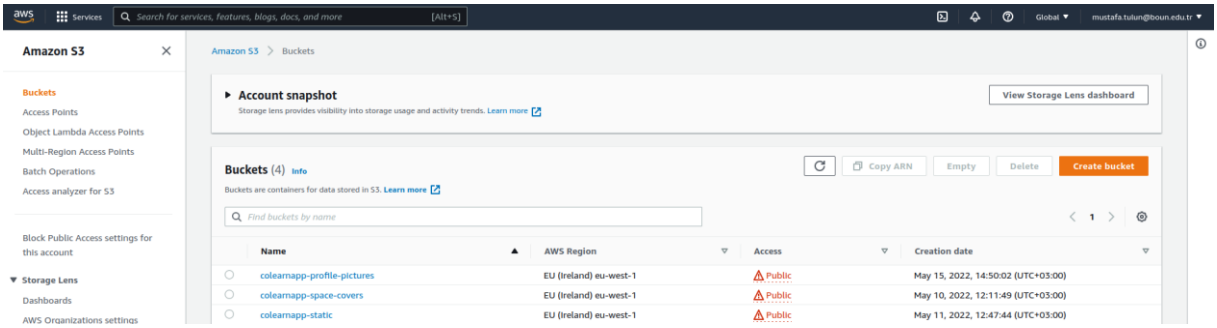




AWS S3

3 buckets must be created for application to work. They can be created through the AWS Management Console.

- colearnapp-profile-pictures
- colearnapp-space-covers
- colearnapp-static



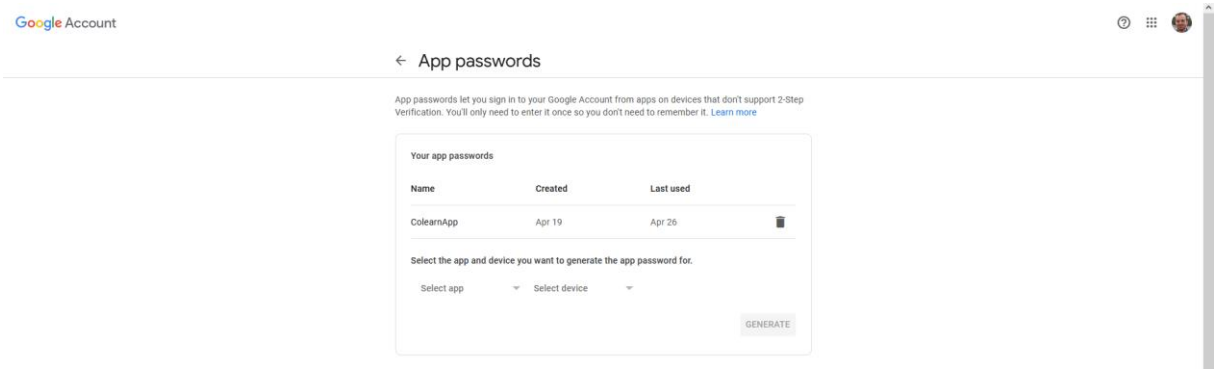
They all should have public-read permission, so this policy should be applied to all of them:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "PublicRead",
      "Effect": "Allow",
      "Principal": "*",
      "Action": [
        "s3:GetObject",
        "s3:GetObjectVersion"
      ],
      "Resource": "arn:aws:s3:::colearnapp-profile-pictures/*"
    }
  ]
}
```

The highlighted part should be changed with the bucket name.

SMTP Server

For the live deployment, GMail SMTP server is used. It requires authentication. Therefore, an app password must be generated through Google Accounts Security page.



Application

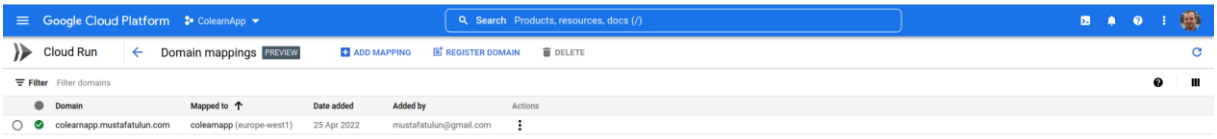
For the live deployment, the application is put on Google Cloud Run service. After making the initial installation and configuration of gcloud CLI, the application can be made up and running by using this command:

```
gcloud run deploy colearnapp --image gcr.io/colearnapp/colearnapp:latest --min-
instances=0 --max-instances=4 --allow-unauthenticated --region=europe-west1 --
cpu=1 --memory=128Mi --port 8000 --timeout=15 --update-env-vars
SECRET_KEY=${SECRET_KEY},DB_HOST=${DB_HOST},DB_PASSWORD=${DB_PASSWORD},EMAIL_HOST=
```

```
${EMAIL_HOST},EMAIL_HOST_USER=${EMAIL_HOST_USER},EMAIL_HOST_PASSWORD=${EMAIL_HOST_
PASSWORD},IS_HTTPS_ENABLED=True,SECURE_HSTS_SECONDS=31536000,AWS_ACCESS_KEY_ID=${A
WS_ACCESS_KEY_ID},AWS_SECRET_ACCESS_KEY=${AWS_SECRET_ACCESS_KEY}
```

The deployment may take up to 2 minutes.

If a custom domain name is desired, it can be easily configured through the Google Cloud Platform Console.



User Manual

The application can be used by first accessing it through the https://colearnapp.mustafatulun.com URL.

As a first-time comer, the user can browse available colearning spaces and search among them.

The user can view inside colearning spaces by clicking their name or cover images from the home page.

In a colearning space, the user can see who are joined to that colearning space on the left. On the right is the content of the colearning space. The user can see the welcoming page of the colearning space on the right as default. The user can access articles, questions, quizzes, and the glossary of the colearning space by using the tabs on the right. The user can view details of the content by clicking them on the list.

To edit content and join the collaborative learning effort, the user must be a registered user. He/she can register through the link on the home page, filling the registration form and clicking Register button. The user is automatically logged in to the system after initial registration.

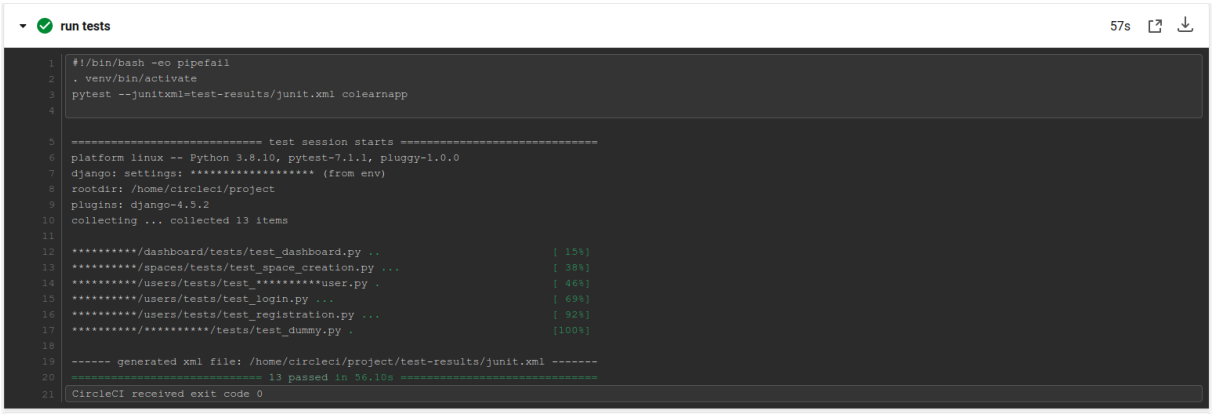
Revisiting users can login through the login link on the home page or on the right side of the top navigation bar. Users can create new password in case of a forgotten password by following the instructions on Forgot Password link on login page.

Logged in users can join to colearning spaces by clicking the Join button on the top right of the space. By joining, users can create new content, edit existing content, upvote or downvote content, write comments to articles and write answers to questions. A user who joined to a colearning space can leave the colearning space by clicking the Leave button on top right of the space.

Test Results

All the functionality implemented has been manually tested on the live deployment. There are no known bugs.

Moreover, there are some automated tests for some of the functionality. These tests are run on each build by the CI/CD pipeline. If any error occurs, the pipeline does not continue further. In other words, a container is not created, and the application is not deployed in case of even a single failing test. Below is the last result of automated tests while writing this report.



Manual testing can be done with users below.

Email: josephmckinney@example.com
Password: Qwerty!123456

Email: elizabethbrooks@example.com
Password: Qwerty!123456

Assets

Below design assets are used for the development of this application.

- Bootstrap Starter Template (https://startbootstrap.com/template/bare), MIT License.
- Profile avatar placeholder large (https://commons.wikimedia.org/wiki/File:Profile_avatar_placeholder_large.png), BSD License.

Following libraries are used for the development of this application.

- django-bootstrap5 (https://github.com/zostera/django-bootstrap5), BSD 3-Clause License.
- Django Markdownify (https://github.com/erwinmatijsen/django-markdownify), MIT License.
- django storages (https://github.com/jschneier/django-storages), BSD 3-Clause License.
- Psycopg (https://www.psycopg.org/), GNU Lesser General Public License.

References

While development and deployment of this application, I benefitted from resources below.

- Offical Django documentation
  https://docs.djangoproject.com/en/4.0/
- Get Started With Django Part 2: Django User Management
  https://realpython.com/django-user-management/
- Coverage.py documentation
  https://coverage.readthedocs.io/en/6.3.2/
- Django-storages documentation
  https://django-storages.readthedocs.io/en/latest/index.html
- Django-bootstrap5 documentation
  https://django-bootstrap5.readthedocs.io/en/latest/index.html
- Bootstrap v5.0 documentation
  https://getbootstrap.com/docs/5.0/
- Google Cloud Run documentation
  https://cloud.google.com/build/docs/deploying-builds/deploy-cloud-run
- Bucket Policy Examples for AWS S3
  https://docs.aws.amazon.com/AmazonS3/latest/userguide/example-bucket-policies.html
- Docker documentation
  https://docs.docker.com/samples/django/
- CircleCI documentation
  https://circleci.com/docs/