

Final Prototype Presentation

Team Gold - Inclusive Classroom

DEC 8,2021 | CS 411W | Fall 2021

Team Members and Biographies



Randy Layne
Project Manager

Randy Layne is a linked Bachelor/Master Computer Science student at ODU and a full time Ruby on Rails developer and Snowflake SQL data engineer for Treehouse. Outside of studying and working he enjoys being a single dad of a wonderful 12 year old young lady.



Travis Bennett
Team Lead - Student App

Travis Bennett is a computer science senior at ODU. In his free time he enjoys watching sports, and playing games with family.



Grant Ralls
Team Lead - Teacher App

Grant Ralls is a Computer Science student at Old Dominion University and Software Engineer for Ferguson Enterprises. Outside of technology he enjoys reading and listening to music.

Team Members and Biographies



Colton Hurst

Team Lead - API/Database Architect

Colton Hurst is a senior at ODU, completing his Computer Science degree while working full time as a software engineer at PDI Software. In his scarce free time he enjoys Rust programming, working out, and cooking tasty food.



Dalton Hanbury

Webmaster

Dalton Hanbury is a Third year student at ODU studying for a Bachelor's in Computer Science. He's currently working part time for Nauticus in downtown Norfolk as a Museum Educator. When he's not doing classwork or working at Nauticus, he's usually playing airsoft with his team or building models.



Gregory Hubbard

Lead Researcher

Gregory Hubbard is a 4th year computer science student with a passion for learning. Currently, he works as an undergraduate research assistant in developing computer vision based behavioral imaging for clinical measures of autism spectrum disorder. His future goals include bridging the diverse applications of computer science to medicine.

Team Members and Biographies



Aubrie Davie
Front-End Developer

Aubrie Davie is a senior at Old Dominion University pursuing a Bachelor's in Computer Science with a minor in Energy Engineering. She currently leads efforts to achieve sustainability goals set forth by the Department of Energy at Jefferson Lab in Newport News, Virginia. She lives with her husband, daughter on the James River.



Sergiy Yermak
Front-End Developer

Sergiy Yermak is a senior at Old Dominion University and expected to graduate in December of 2021. He is working to attain a Bachelor of Science in Computer Science. Before attending college he served in United States Navy. He enjoys a variety of things from skateboarding, diving, hiking, playing video games, and reading books.

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Societal Problem

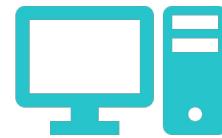
Young underprivileged students are adversely affected by having to learn online because of a lack of stable high-speed Internet (Anderson) and because they lack the knowledge and support at home needed to adapt when the Internet fails.

Problem Characteristics



Affects younger students most

They have not built-up study habits
Older students more familiar with apps



Lack of technical knowledge at home

Parents may not be tech savvy
Parents may be at work



Difficult to reach teachers

Limited forms of contact
IT is not their specialty



Simple UI

Icons for buttons
Limited options
Everything they need in one place



Native App

Works without Internet
Targets Chromebook
Written in Java



Highly Automated

Send/receive files
Zip/Unzip files
Weighted Priority Queue
Dropped Internet recovery
Downloads in sleep in Library



Video conferencing

Opt-In
Only on stable Internet
In App notifications

Solution Characteristics: Client App

User Roles

Student - User who needs access to their personal grades, download assignments, upload completed assignments, join live video sessions, and download recorded videos.

Teacher - Users who create assignments, grade assignments, create live sessions, control which content students can access and when, and perform simple reporting such as class grades.

School Administrator - Users who may need to do reporting on the information stored in the database such as grades, add and remove students from a class, but do not need the other teacher functions.

Student User Stories

As a student on a personal device, I should be able to log into Inclusive Classroom for the first time using a username/password combination.

As a student, I should be able to use a school-provided Chromebook to complete all tasks.

As a student, I should be able to use a device using Windows 10 to complete all tasks.

As a student, I should be able to use a device using MacOS to complete all tasks.

As a student, I should be able to use a personal device using iOS to complete all tasks.

As a student, I should be able to use a personal device using Android to complete all tasks.

As a student, I should be able to complete an assignment without using the Internet.

As a student, when I complete an assignment offline, the teacher should still know at what time and date I completed it.

As a student, I should be able to easily navigate between different classes.

Teacher User Stories

As a teacher, I should be able to log into Inclusive Classroom using a username/password combination.

As a teacher, I should be able to use a device using Windows 10 to complete all tasks.

As a teacher, I should be able to use a device using MacOS to complete all tasks.

As a teacher, I should be able to use a device using iOS to complete all tasks.

As a teacher, I should be able to use a device using Android to complete all tasks.

As a teacher, I should be able to create assignments.

As a teacher, I should be able to assign grades to completed assignments..

As a teacher, I should be able to create assignments with different styles of questions, such as multiple choice, fill in the blank, true/false, and short essay.

School Administration User Stories

As a school administrator, I should be able to log into Inclusive Classroom using a username/password combination.

As a school administrator, I should be able to use a device using Windows 10 to complete all tasks.

As a school administrator, I should be able to use a device using MacOS to complete all tasks.

As a school administrator, I should be able to use a device using iOS to complete all tasks.

As a school administrator, I should be able to use a device using Android to complete all tasks.

As a school administrator, I should be able to report on an individual student's grades.

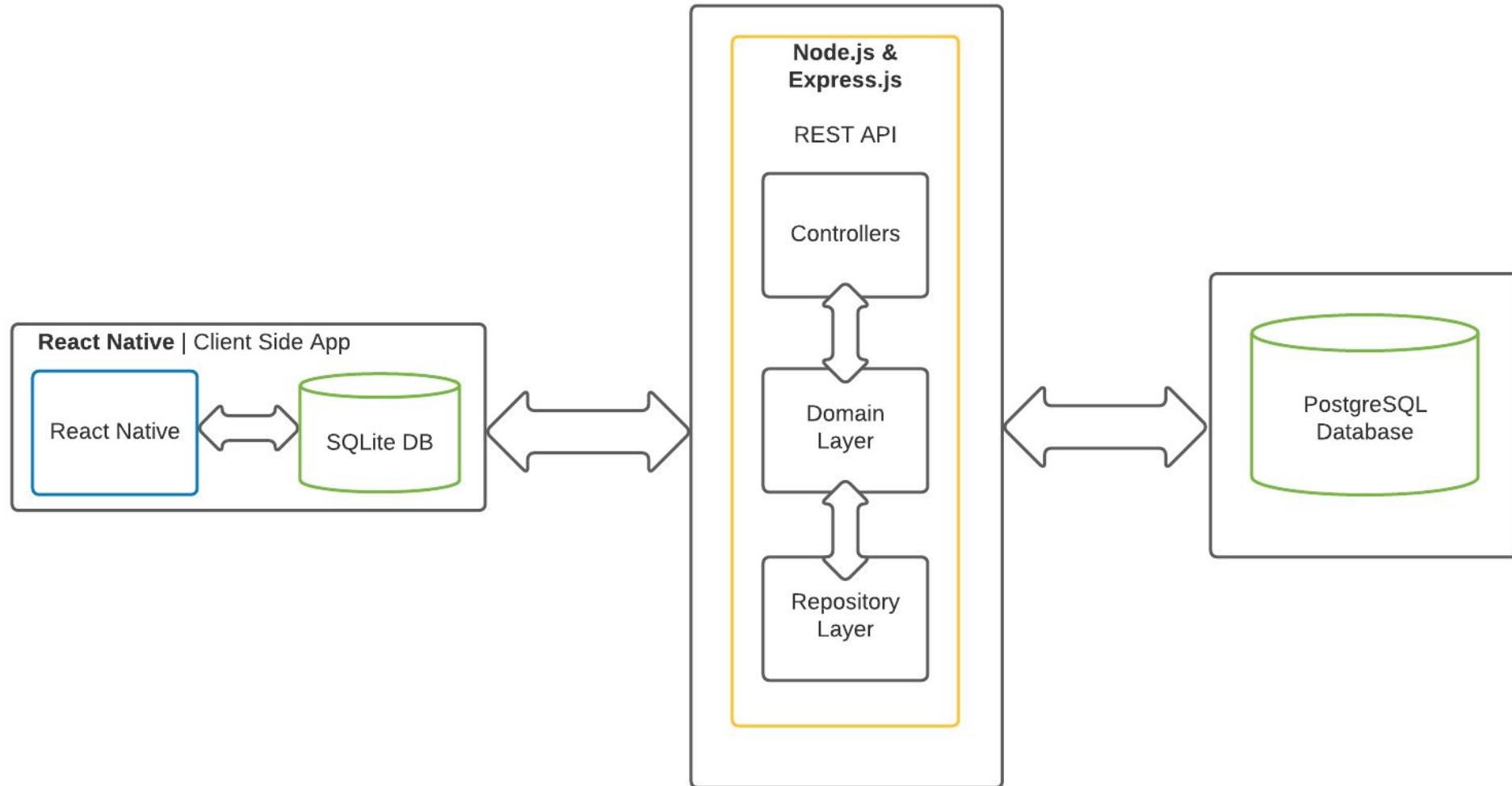
As a school administrator, I should be able to create classes to include assigning students and teachers to a class.

As a school administrator, I should be able to report on a class's grades.

As a school administrator, I should be able to evaluate a teacher's performance with their classes.

As a school administrator, I should be able to easily identify students who are struggling in multiple classes.

MFCD: Prototype



Prototype Feature Comparison

Feature	RWP	Prototype	Actual Prototype
Account Roles	Student, Parent, Teacher, Admin, IT	Student, Teacher, Administrator(limited) only	Student, Teacher, Administrator (limited) only
Automatic Internet Detection	Yes	Yes	Yes
Background Workers	Yes	Partial	Partial
Complete/Submit Assignments	Yes	Yes	Partial (works in api)
Create Assignments	Yes	Yes, limited in types	Yes
Grade Assignments	Yes	Yes	Yes
Postdate created content	Yes	No	Partial (works in api)
Recorded Videos	Yes	Yes, may not auto record	Partial (file upload works in api)
Reporting	Yes	No	No
Timestamp Completed Assignments	Yes	Yes	Partial (works in api)
Video Conferencing	Yes	No	No
Weighted Priority Queue	Yes	Yes	Partial

Development Tools

Software:

- Version Control: Git (git-community.cs.odu.edu)
- Other Repositories: GitHub
- IDE: VSCode
- Front end Framework: Expo/React Native
- Unit and Integration Testing on Client App:
Jest and react-testing-library
- API Request Tracking: Postman
- Issue Tracking: Jira
- Documentation: Markdown via GitHub
- Flowcharts: Lucid Chart

Hardware:

- Client App: Windows 10/Mac/Chromebook

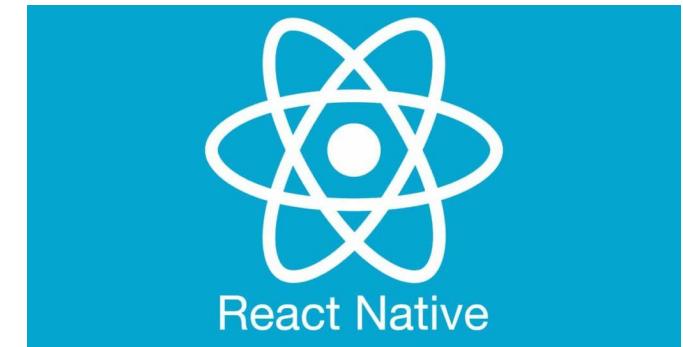
Application Technology : API

Language	JavaScript (Node.js)
Framework	Express.js
Database	PostgreSQL



Application Technology : Client Application

Language	TypeScript
Framework	React Native/Expo
Database	SQLite



Agile Sprints -Front End

Oct. 22, 2021 - Nov. 5, 2021



Oct. 7, 2021 - Oct. 21, 2021

Initial builds of client

Login roles defined; student should be able to log in via the client.

Details saved in DB via the API.

Dev tools should be configured and setup

Add authentication to the login roles. Teacher, student, and school administrator should be able to login, see their account page, and reset their password, change account details, etc.

Nov. 6, 2021 - Nov. 20, 2021
Teacher should be able to create classes and add students to the classes via the client.
Students should be able to see what classes they are in.
Administrators should be able to see a list of all teachers, create a class and assign teachers and students, and evaluate teacher performance.

Nov. 21, 2021 - Dec. 3, 2021
Teacher should be able to create assignments.

Students should be able to view assignments and submit to them before they are due (and not after).

Administrators should be able to view a list of students in a class and their overall grades and a student's list of classes and their overall grade in each class.

Dec. 4, 2021 - Dec. 8, 2021
Teacher should be able to Grade submissions. Students should be able to watch the recording.

Agile Sprints - Back End

Oct. 22, 2021 - Nov. 5, 2021

Add role based login and account creation. This allows an admin to create accounts, and all 3 roles to log in with Basic Auth. Create setup scripts for development.

Nov. 21, 2021 - Dec. 3, 2021

Add submission and list routes. Student should be able to view an assignment and create a submission. The list route will allow the app to access different lists of object based on views.



Oct. 7, 2021 - Oct. 21, 2021

Created the API Proposal v1. This defined functionality, contracts, and everything the client side should expect, as well as what routes they will be able to call. This allows for simultaneous development of both sides.

Nov. 6, 2021 - Nov. 20, 2021

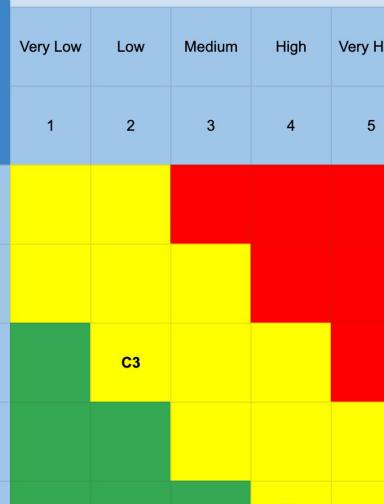
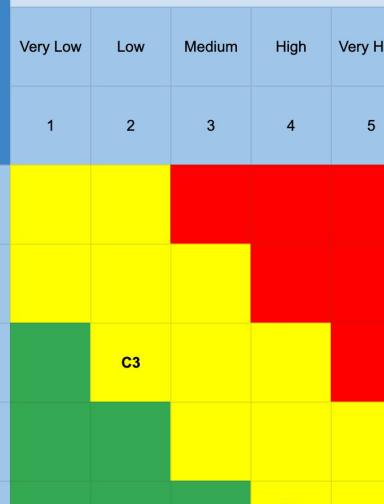
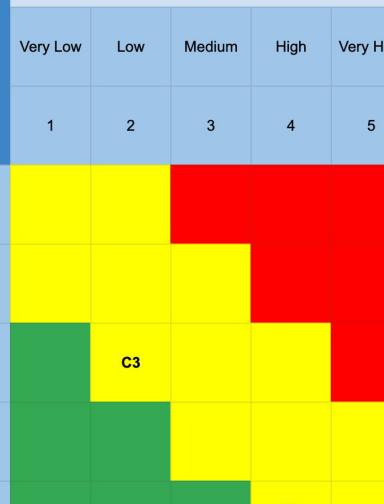
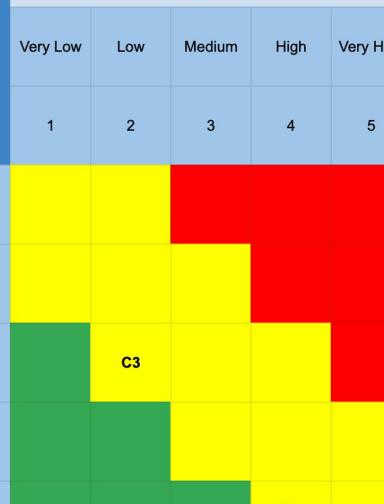
Add assignment and class routes. A teacher should be able to create an assignment, and a student should be able to view the assignment. An admin should be able to create and update classes.

Dec. 4, 2021 - Dec. 8, 2021

The teacher should be able to grade assignments. Additionally add other routes as needed, final testing and integration with the client side. Ensure setup script complete.

Risk Matrix: Customer & Legal

Key: implemented mitigations => 

Risk Matrix		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very High	5				
	High	4				
	Medium	3	 C3			
	Low	2				
	Very Low	1	 C1 C2 C4			
Risk Matrix		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very High	5				
	High	4				
	Medium	3	 L4 L1 L3 L2			
	Low	2				
	Very Low	1				

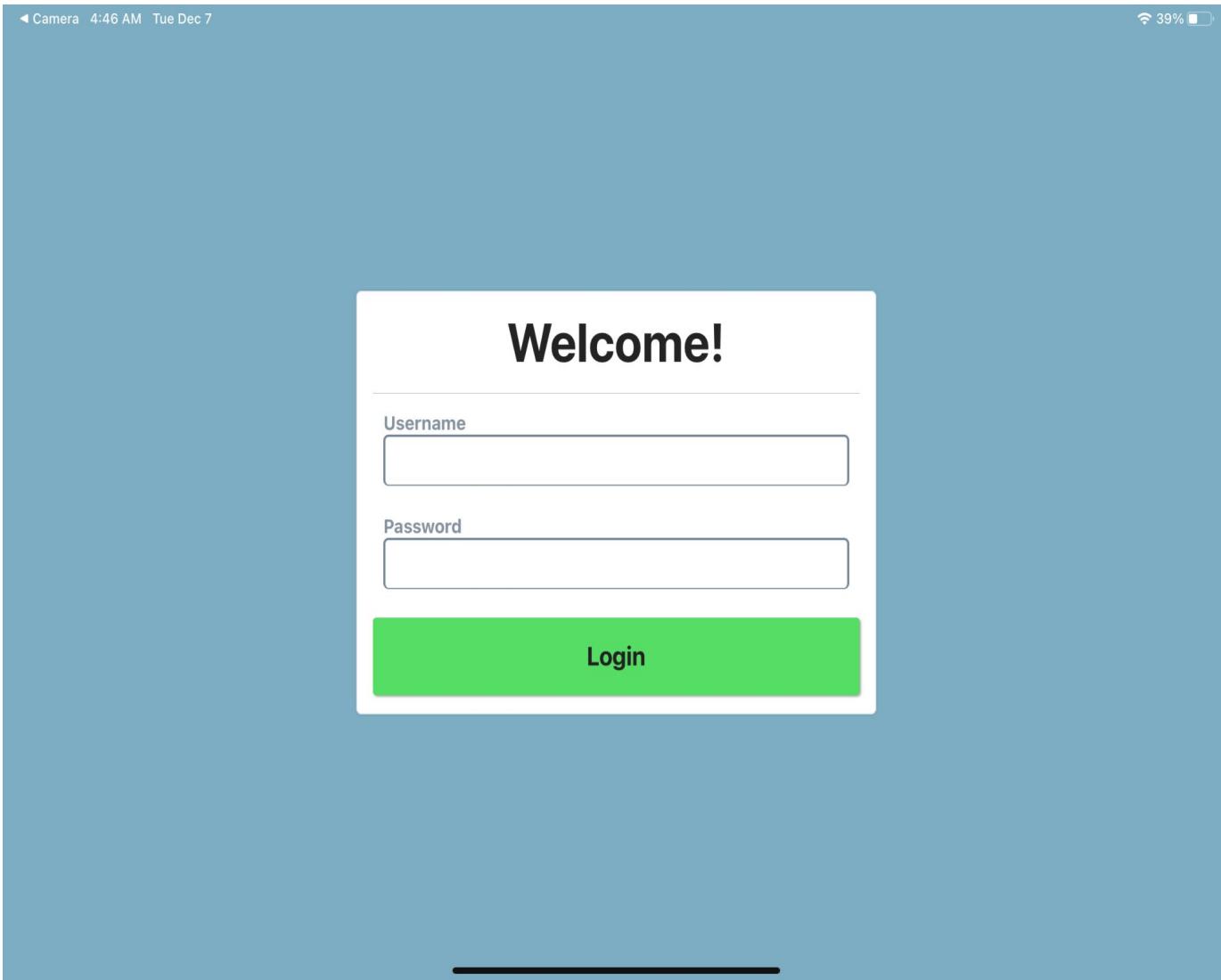
Risk ID	Title	Impact	Probability	Mitigation
C1	Student Privacy	High	Low	Student data will only be available to the administrators that absolutely need it, and teachers can request permission for student data if needed. Teachers and school administrators will need to go through privacy training to follow FERPA guidelines.
C2	Teacher Privacy	High	Low	Teacher data will only be available to the administrators that absolutely need it, and teachers can request permission for teacher data if needed. Teachers and school administrators will need to go through privacy training, and sign waivers to be recorded during lectures.
C3	Missed or Ignored Reminders and Due Dates	Low	Medium	The Inclusive Classroom software can include an 'acknowledge' button that proves a student and/or parent, via email or the UI, has seen an announcement, due date, or other important piece of information.
C4	Poor English	Very High	Very Low	Inclusive Classroom will be English only, but for students in ESL, a section of the UI can be translated to their selected language so that they can access ESL support through their language.
L1	Children's Online Privacy Protection Act	High	Low	Children's data will be heavily protected and encrypted. Anyone with access will have to go through privacy training and access will be by "need" only. Inclusive Classroom will adhere to COPPA laws, and will only gather the minimum amount of data needed to complete our mission.
L2	504 Plan - Children with Disabilities	Very High	Low	Each school should have a "504 team" that will support any children with disabilities. There will be a special area in the UI for any students with disabilities, so that they can receive immediate help from the support team.
L3	Litigation Risk	High	Low	Terms and conditions will be written up with legal support, and anyone using the software will have to agree to the terms. The goal will be for these to keep the company, the school system, and the students safe.
L4	Contract Risk	Medium	Low	Any contracts that are drawn up will be reviewed and checked by the Inclusive Classroom legal teams. They will need to be audited to ensure that Inclusive Classroom can honor them while still achieving its goal.

Risk Matrix: Technical & Security

Key: implemented mitigations => 

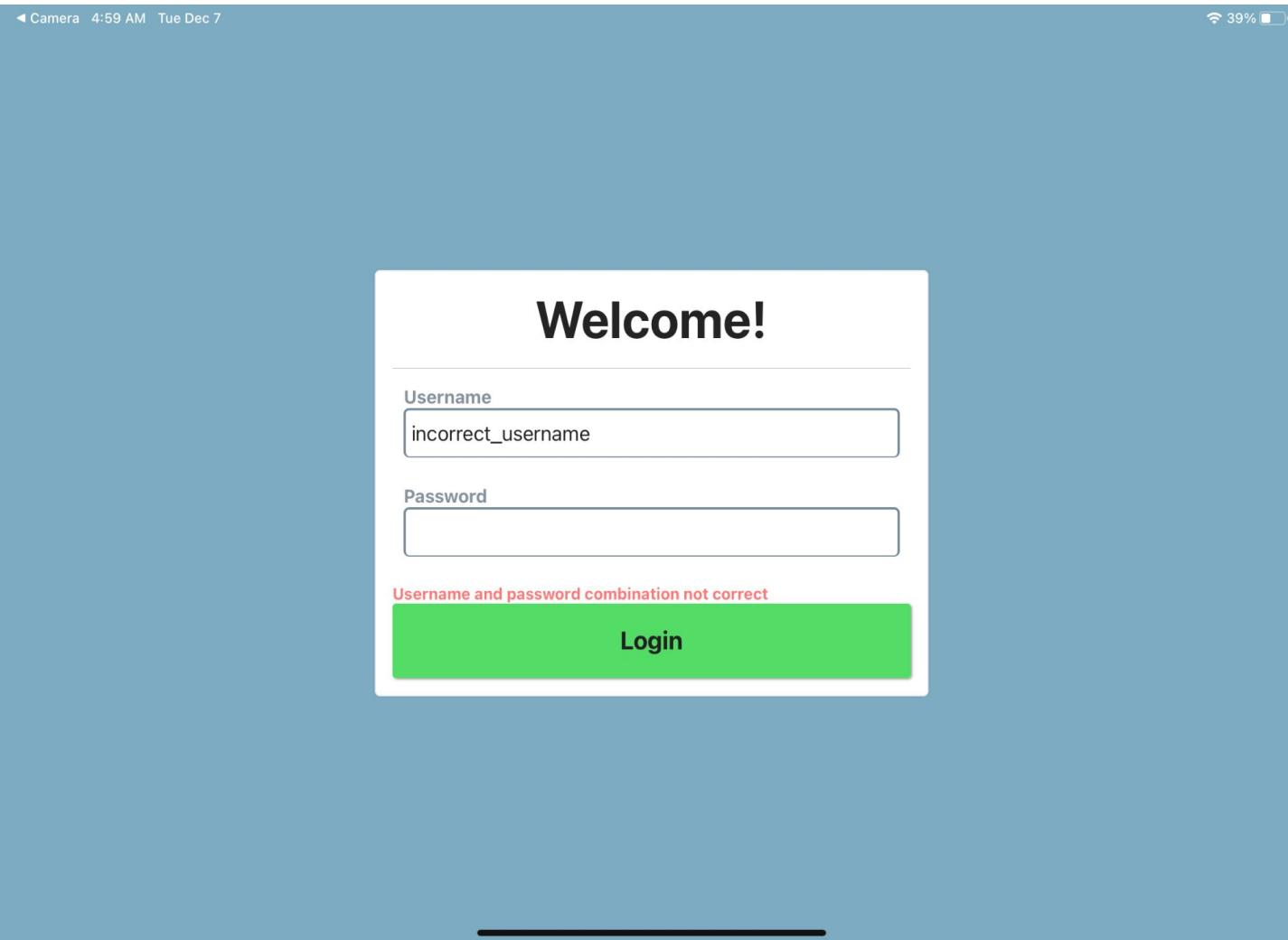
Risk Matrix		Impact										
		Very Low	Low	Medium	High	Very High	Risk ID	Title	Impact	Probability	Mitigation	
Probability	Very High	5				T1	Loss of internet during stream	Very High	Medium	Flag session as unseen and automatically download recorded version when internet is restored. Optionally, notify the teacher so they can follow up with the student for any extra help needed.		
	High	4				T2	Loss of internet in mid file transfer	High	Medium	Automatically detect dropped packages and resend when internet is restored. A date will be stored for all file transfer attempts.		
	Medium	3	T3		T2		Assignments can not be sent until after due dates	Low	Medium	A timestamp will be created when student completes an assignment, and this timestamp will be used when comparing the submission date to due date. This will help ensure that the student can reliably submit assignments on time without internet.		
	Low	2	T4					T4	Class updates not visible to students without internet	Medium	Low	Teachers will enter the syllabus into the system before the start of the year. All assignments and dates will be cached locally on the student side. Students can then receive updates throughout the semester without internet, and class updates will cache and change whenever connected if there are updates from the server.
	Very Low	1				S1	SQL Injection	Very High	Very Low	Databases will be parameterized through typed parameters and careful use of stored procedures. All web components (libraries, plug-ins, web server, database server software) will be kept up to date for security patches, and input will be sanitized.		
Probability	Very High	5				S2	Data Release	High	Very Low	Sensitive student/teacher data will be encrypted on the backend in accordance with privacy and FERPA laws. All transferred data will also be via HTTPS.		
	High	4				S3	Broken Access Control	High	Very Low	Enforcement on the server-side logins will prevent students from accessing teacher permissions. Additional tests will be made to ensure specific URLs will be "hidden" without proper authentication.		
	Medium	3	S4				S4	Broken Authentication	Medium	Low	Authentication will be primarily based on school provided tokenization of student logins. Student passwords will be properly formed in a secure manner. Periodic password updates will be required to ensure security.	
	Low	2				S2 S3 S1						
	Very Low	1										

Login Page



- Input for Username / Password
- Verified by Database
- Same view for all users (teacher / student / admin)
- Login directs to respective main menu OR warning

Login Page - Error



- Error for incorrect username/password
- Prevents user from proper login

Admin Dashboard

AdminDashboard

Admin Dashboard

Welcome Anthony

Class Creation View

Teacher Evaluation View

Teacher Index View

Student Index View

Logout

- Menu for Admin user
- First Admin screen
- Views available:
 - Class Creation View
 - Teacher Evaluation View
 - Teacher Index View
 - Student Index View
 - Logout

Class Creation View

← AdminClassCreation

Admin Class Creation Screen

The screenshot shows the "Admin Class Creation Screen". At the top, there is a header bar with the title "Admin Class Creation Screen". Below the header, there are several input fields and dropdown menus:

- A text input field containing "CS 411".
- A dropdown menu showing "Professional Workforce Development".
- A dropdown menu labeled "Pick a teacher:" containing "Thomas Kennedy".
- A section labeled "Pick students:" with three checkboxes:
 - Sara Student (checked)
 - Randy Layne (checked)
 - Aubrie Davie (checked)
- A date input field showing "2021-09-01".
- A date input field showing "2021-12-10".
- A dropdown menu labeled "Pick a date to meet:" containing "Mon_1600".
- A blue footer bar with a red circle highlighting the "Submit" button.
- At the bottom of the footer bar, there is a link "Return to Administrator Dashboard".

- class name and class description
- "Pick a teacher" dropdown
- "Pick students" selection
- start and end date input (yyyy-mm-dd)
- meeting time input (DayOfWeek_Time)
- Submit saves and confirms data
- Return to Administrator Dashboard

Teacher Evaluation

← AdminTeacherEvaluation

Admin Teacher Evaluation

Pick a teacher:

Terry Teacher

Teacher Review

Submit Evaluation

[Return to Administrator Dashboard](#)

- "Pick a teacher" dropdown
- Empty text box for evaluation
- Submit saves and confirms data
- Return to Administrator Dashboard

Teacher Index

← AdminTeacherIndex

Administrator Teacher Index

[Return to Administrator Dashboard](#)

Teacher Index

Janet Brunelle
Thomas Kennedy
Jay Morris
Terry Teacher
Steven Zeil



The screenshot shows a web-based application interface for managing teachers. At the top, there's a blue header bar with the title 'Administrator Teacher Index' and a link to 'Return to Administrator Dashboard'. Below the header is a light blue sidebar containing the heading 'Teacher Index'. The main content area is white and lists five teacher names: Janet Brunelle, Thomas Kennedy, Jay Morris, Terry Teacher, and Steven Zeil. The name 'Thomas Kennedy' is highlighted with a red oval, indicating it's the target for a click action.

- List of all teachers
- Click a teacher to expand information

Teacher Index - Example

← AdminTeacherIndex

Administrator Teacher Index

[Return to Administrator Dashboard](#)

Teacher Index

Janet Brunelle

Thomas Kennedy

Math 1

[Class Overview](#)

Science 1

[Class Overview](#)

Jay Morris

Terry Teacher

Steven Zeil

- Classes assigned to selected teacher shown
- Option to select “Class”:
 - class ID
 - class name
 - class description
 - class start and end dates
 - meeting times.
- Option to select “Class Overview”:
 - list of all students assigned to a selected class and their overall grade

Teacher Index - Example (class)

The screenshot shows the 'Administrator Teacher Index' page. At the top left is a back arrow and the text 'AdminTeacherIndex'. Below it is a blue header bar with the title 'Administrator Teacher Index' and a 'Return to Administrator Dashboard' link. The main content area is titled 'Teacher Index' and lists several teachers: Janet Brunelle, Thomas Kennedy, Math 1, Science 1, Jay Morris, Terry Teacher, and Steven Zeil. A modal window titled 'Alert' is displayed in the center, containing the following JSON data:

```
{"id": "0adbd2b1-24db-4e11-a5ab-77dd338a653d", "className": "Math", "classDescription": "Standard level Math for 6th grade students", "classStartDate": "2021-12-06T17:12:48.424Z", "classEndDate": "2021-12-06T17:12:48.424Z", "teacherId": "d2e2addf-b010-4d81-a7df-9332adc2a84b", "meetingTimes": "[\"T,R @ 9:00AM-10:30AM\"]", "statusId": "1", "studentList": [], "classSize": 1}
```

At the bottom right of the modal is an 'OK' button.

- Class details:
 - class ID
 - class name
 - class description
 - class start and end dates
 - meeting times.

Class Overview - Example

← AdminClassOverview

Admin Class Overview

Math

Student Name: Dalton Hanbury Overall Grade: A

- Class details:
list of all students assigned to a selected class and their overall grade

[Return to Administrator Dashboard](#)

Student Index

← AdminStudentIndex

Admin Student Index

[Return to Administrator Dashboard](#)

Sara

Randy

Aubrie

Dalton

Colton

Greg

Grant

...

- List of all students enrolled
- Clicking a student will reveal:
 - a. student's name
 - b. student ID
 - c. list of enrolled classes
 - d. overall grades.

Student Index - Example

← AdminStudentView

Admin Student View

Student Name: Sara Student

Student ID: cd174874-1dad-4cce-810d-a474e35bf028

Class Name: History Overall Grade: A

Class Name: Science Overall Grade: A

[Return to Administrator Dashboard](#)

- Example student selection
- Revealed:
 - a. student's name
 - b. student ID
 - c. list of enrolled classes
 - d. overall grades.
- Return to Administrator Dashboard

Teacher Dashboard

TeacherDashboard

Teacher Dashboard

Welcome Teacher

Class Overview

Create Recording

Create Assignment

Grade Assignment

Logout

- First Teacher View
- Display links to overviews
 - Class overview
 - Recording overview
 - Creating Assignment
 - Grading of assignments

Teacher Class Overview

← TeacherClassOverview

Teacher Class Overview

Assignment Index

Grade Assignment

Return to Teacher Dashboard

View Submissions

- Class overview gives access to:
 - Assignment Index
 - Submissions

Teacher Assignment Index

← TeacherAssignmentIndex

Assignment Index

[Return to Class Overview](#)

Assignment 1

Assignment 2

- List of assignments created by the teacher.

Teacher Recording Creation

← TeacherRecordingCreation

Teacher Recording Creation

[Return to Teacher Dashboard](#)

[Upload Recorded Video](#)

[Upload Live Video](#)

- Teacher can upload recorded videos for students to view.
 - Live is a link to zoom meeting
 - Recorded video would be a .mp4 or other file

Teacher Assignment Creation Dashboard

← TeacherAssignmentCreation

Teacher Assignment Creation

[Return to Teacher Dashboard](#)

- Clicking on box will take teacher to point where assignments can be created.

Teacher Assignment Creation

← TeacherNewAssignment

Teacher Assignment Creation for class

[Return to Teacher Dashboard](#)

Assignment Name

Assignment Description

New Question

Submit

- Template for creating assignments.
 - Can create as many questions as desired
 - 3 question types
 - Radio
 - Checkbox
 - Short-answer
- Submit assignments

Teacher Assignment Creation - Example

← TeacherNewAssignment

Teacher Assignment Creation for class

[Return to Teacher Dashboard](#)

First Assignment

This is your first demo assignment

New Question

radio

favorite color?

yellow, green, red, blue

blue

Delete

Submit

The screenshot shows a web-based application for teacher assignment creation. At the top, it says "Teacher Assignment Creation for class". Below that is a "New Question" button. A "radio" question is displayed with the prompt "favorite color?". The options listed are "yellow, green, red, blue" and "blue". At the bottom of the question card are "Delete" and "Submit" buttons.

- Allows naming of assignment and description
- Create new questions with different question types:
 - Radio
 - Short-answer
 - Checkbox
- Submit assignments

Teacher Grading Assignment

← TeacherSubmissionIndex

Take Assignment

- Will list an assignment that needs to be graded.
 - Clicking will bring teacher to view where assignment is graded.

Teacher Grading Submission

← TeacherGradeSubmission

Fake Assignment Grade

Short Answer Question Prompt

short-answer

ADD POINT

Prompt: Checkbox Question Prompt

Question Type: checkbox

Correct Answer: option2

Option Selected By Student, Not implemented

ADD POINT

SUBMIT

Points: 0/2

- Teacher can give points for assignments by a student.
 - Add points and submit
- Student answers visible

Student Classwork Dashboard

StudentDashboard

Welcome Sam

CLASSWORK MEETINGS

Incomplete

Quiz 3	Class: Math	Due: Today
Homework 4	Class: Science	Due: In 2 Days

Complete

Homework 3	Class: History	10/10
Quiz 2	Class: Math	5/10

Logout

- First Student View
- List of completed and incomplete assignments
 - Classes associated with assignments
 - Due dates in relative time.
- Completed assignments display the grade received if applicable.

Student Meeting Dashboard

StudentDashboard

Welcome Sam

CLASSWORK MEETINGS

Live

Class: History Time: 7:35 - 10:00AM [Join](#)

Upcoming

Class: Science Time: 12:35 - 3:00PM [Join](#)

Unwatched

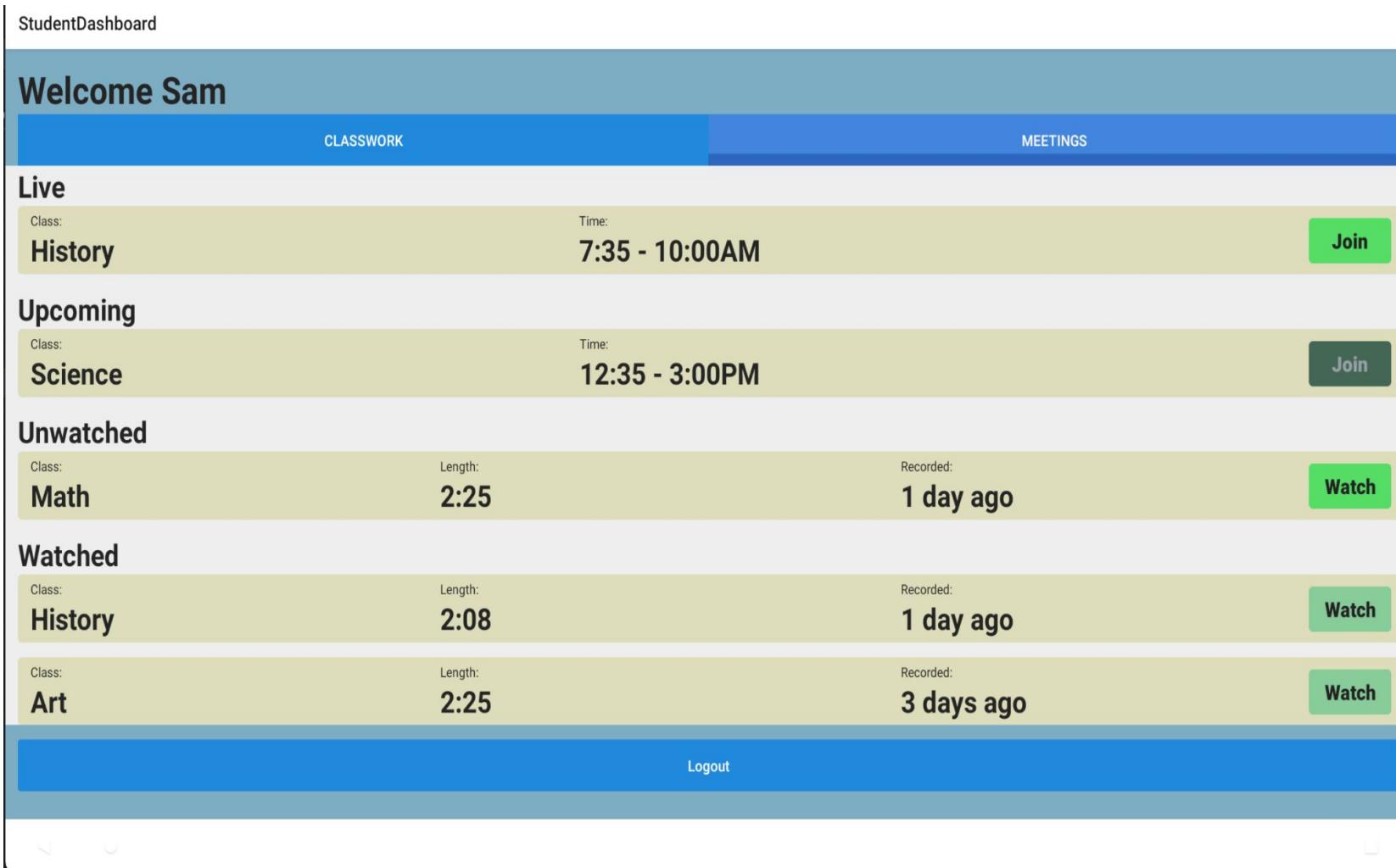
Class: Math Length: 2:25 Recorded: 1 day ago [Watch](#)

Watched

Class: History Length: 2:08 Recorded: 1 day ago [Watch](#)

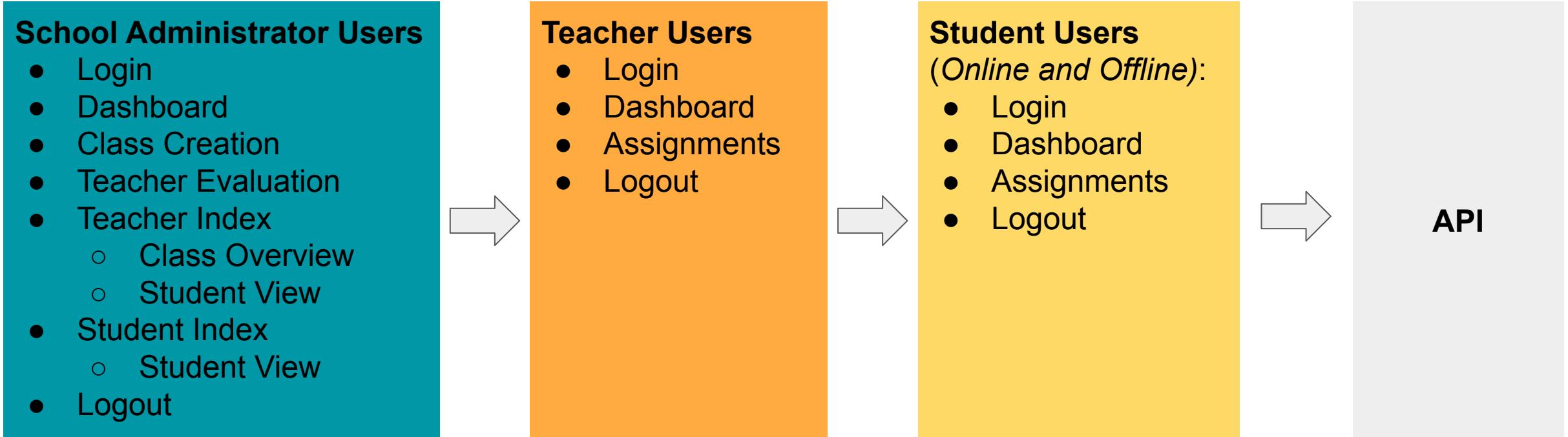
Class: Art Length: 2:25 Recorded: 3 days ago [Watch](#)

[Logout](#)



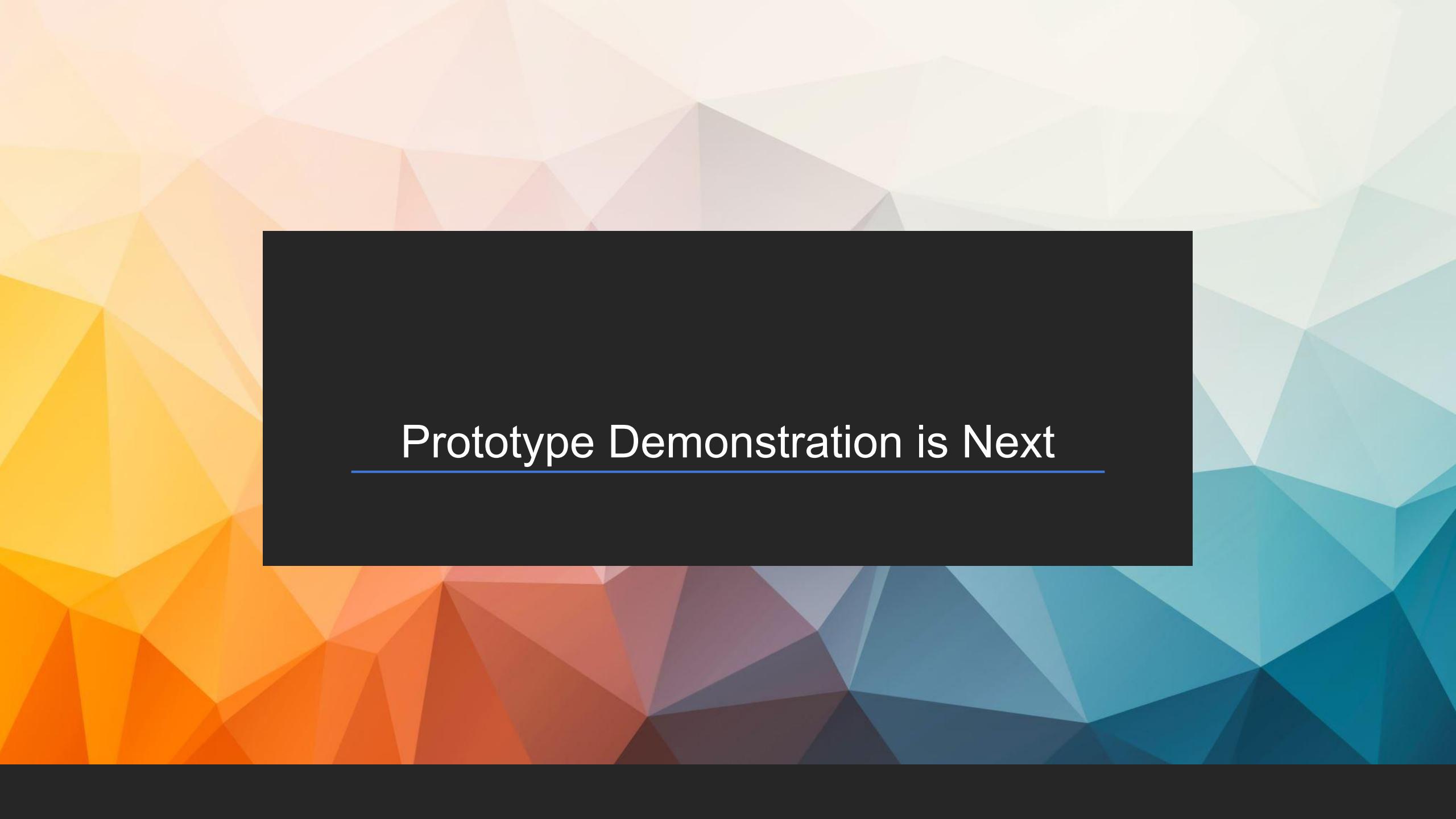
- Second tab for the classwork/dashboard
- List of ongoing and upcoming meetings
 - Time meetings occurred and ability to join in progress
- List of watched and unwatched meetings
 - Length of meeting and date recorded in relative time

Prototype Presentation Sequence





Questions?



Prototype Demonstration is Next

References

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Glossary

- **ESL** - English as a Second Language
- **Family Educational Rights and Privacy Act (FERPA)** - Federal law that protects the privacy of student education records
- **Google Classroom** - “Free web service developed by Google for schools that aims to simplify creating, distributing, and grading assignments” (Google)
- **High-speed Internet** - Internet with consistent download speeds of at least 3.8 Mbps (Zoom) HTTP – Hypertext Transfer Protocol
- **IC** - Inclusive Classroom
- **littleLearners** - Former CS 410 group solution that emphasizes simple UI for students in the K-5 age range (Del Razo)
- **ORM** – Object-relational mapping; programming technique for converting data between incompatible type systems
- **RFC** – Request for Comments; a formal document from the Internet Engineering Task Force
- **Stable Internet** - Internet with less than 1% dropped packets (ICTP)
- **UI** - User Interface