

IINSPIRE STEM Program Survey Visualization Tool

Client: University of Iowa/Dr. Rover
Advisor: Dr. Rover

Our Team: Front-End



Jimmy Driskell
Major: Software Engineering



Nathan Frank
Major: Software Engineering



Kaitlin Hansen
Major: Software Engineering

Our Team: Back-End



Lydia McCleary
Major: Software Engineering

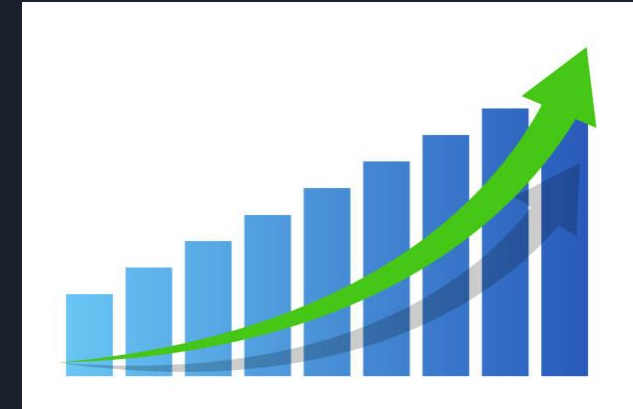
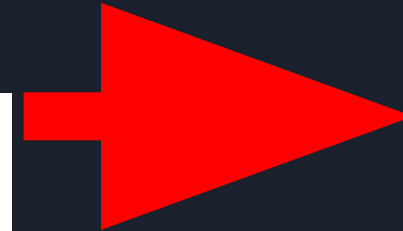
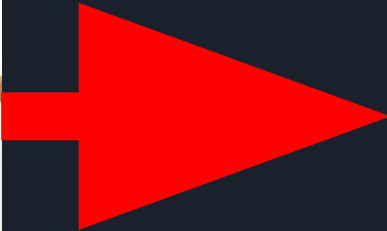


Thomas Nunez
Major: Cybersecurity Engineering

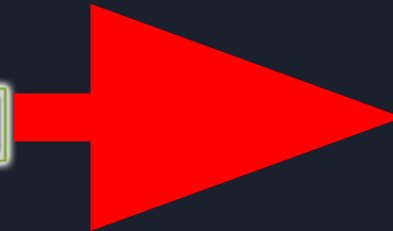
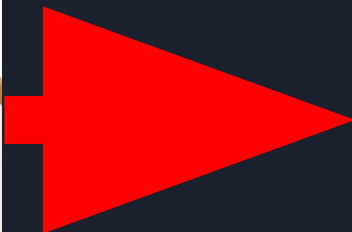


Abe Scheideman
Major: Software Engineering

Before



After



Project Vision

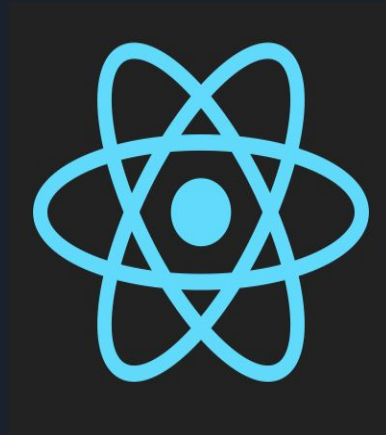
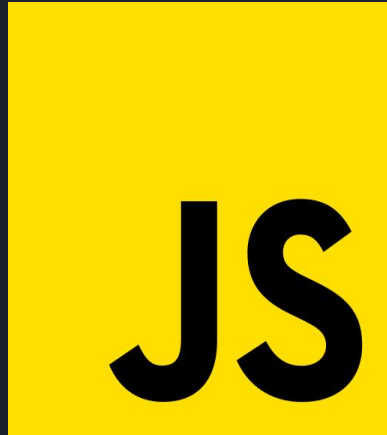
To build a web application where users can take surveys and see their results visualized in a graphical manner.

Use Case:

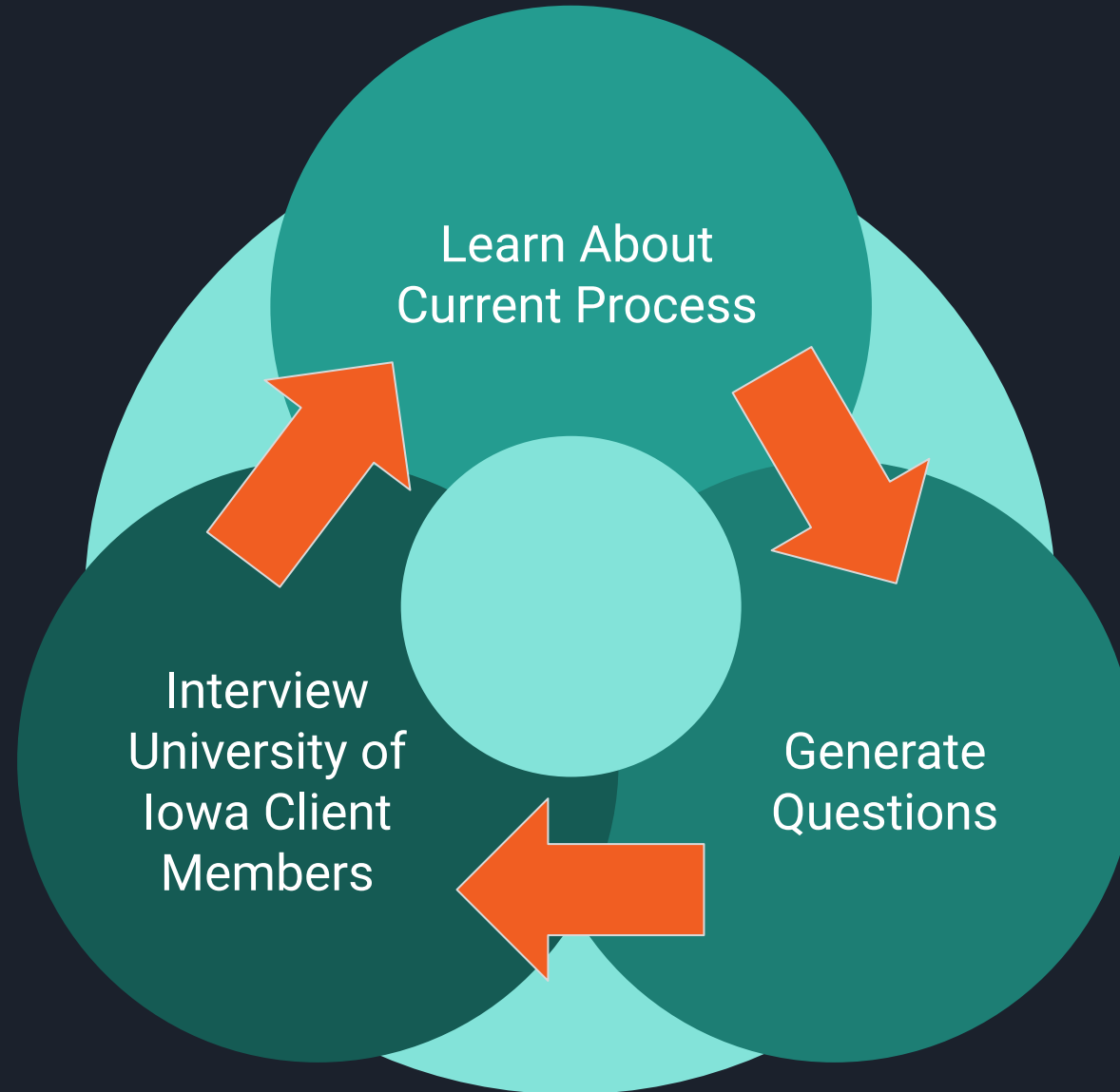
- Students in the IINSPIRE STEM program take a survey
- Results are collected by mentors
- Graphs are manually created to facilitate discussion
- Currently using Qualtrics and Excel



General Approach

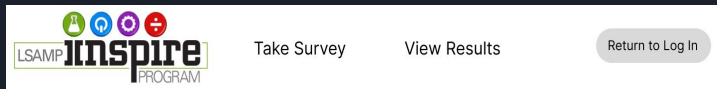


Requirements Gathering Process



Functional Requirements

Survey

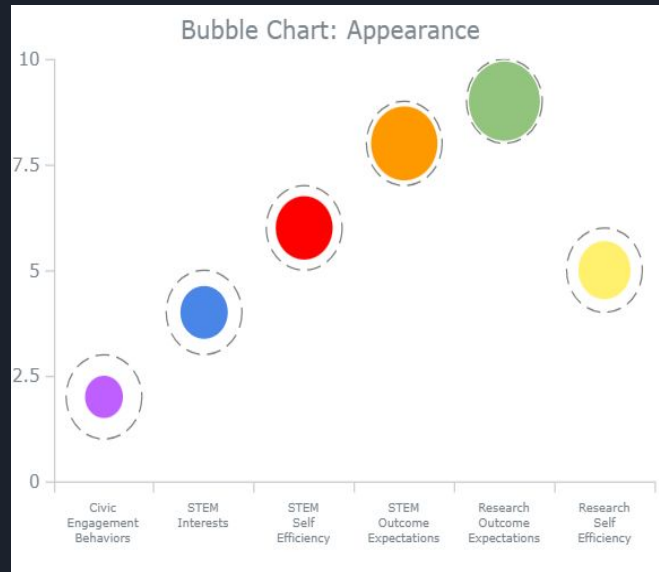


1 2 3 4 5

	Strongly Disagree	Disagree	Mixed/ Unsure	Agree	Strongly Agree
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Previous Next

Results



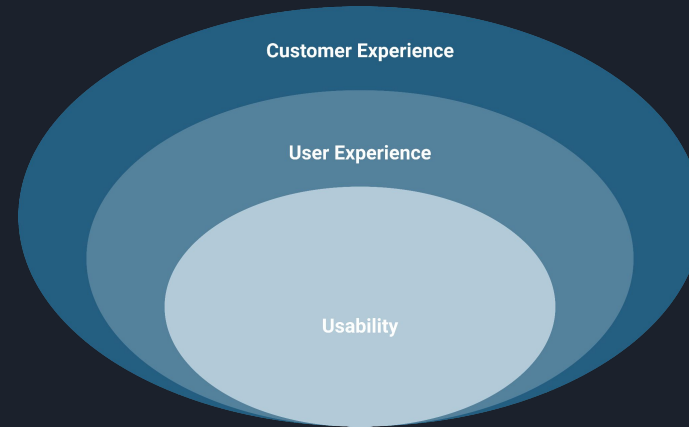
User



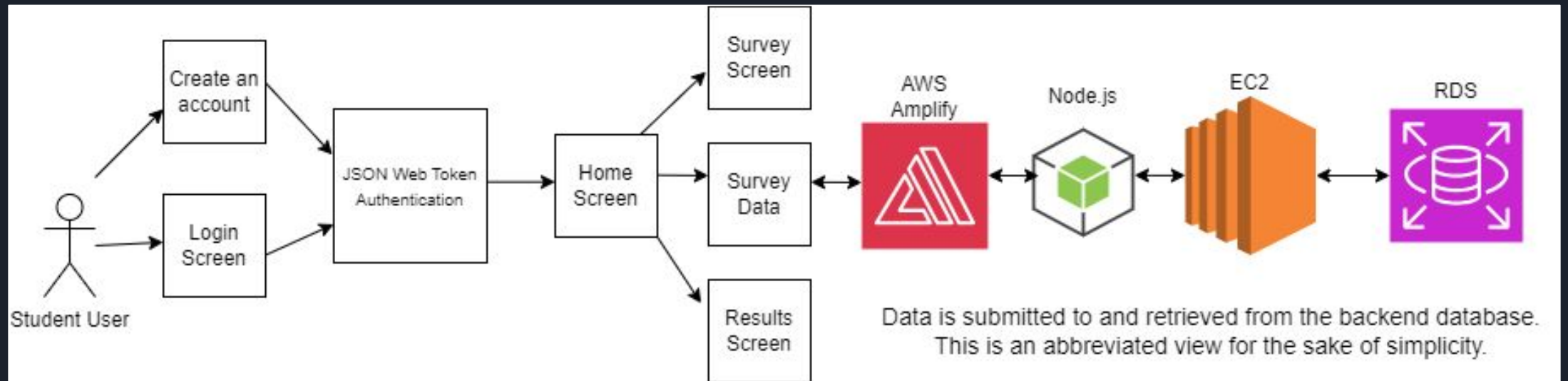
General



Nonfunctional Requirements



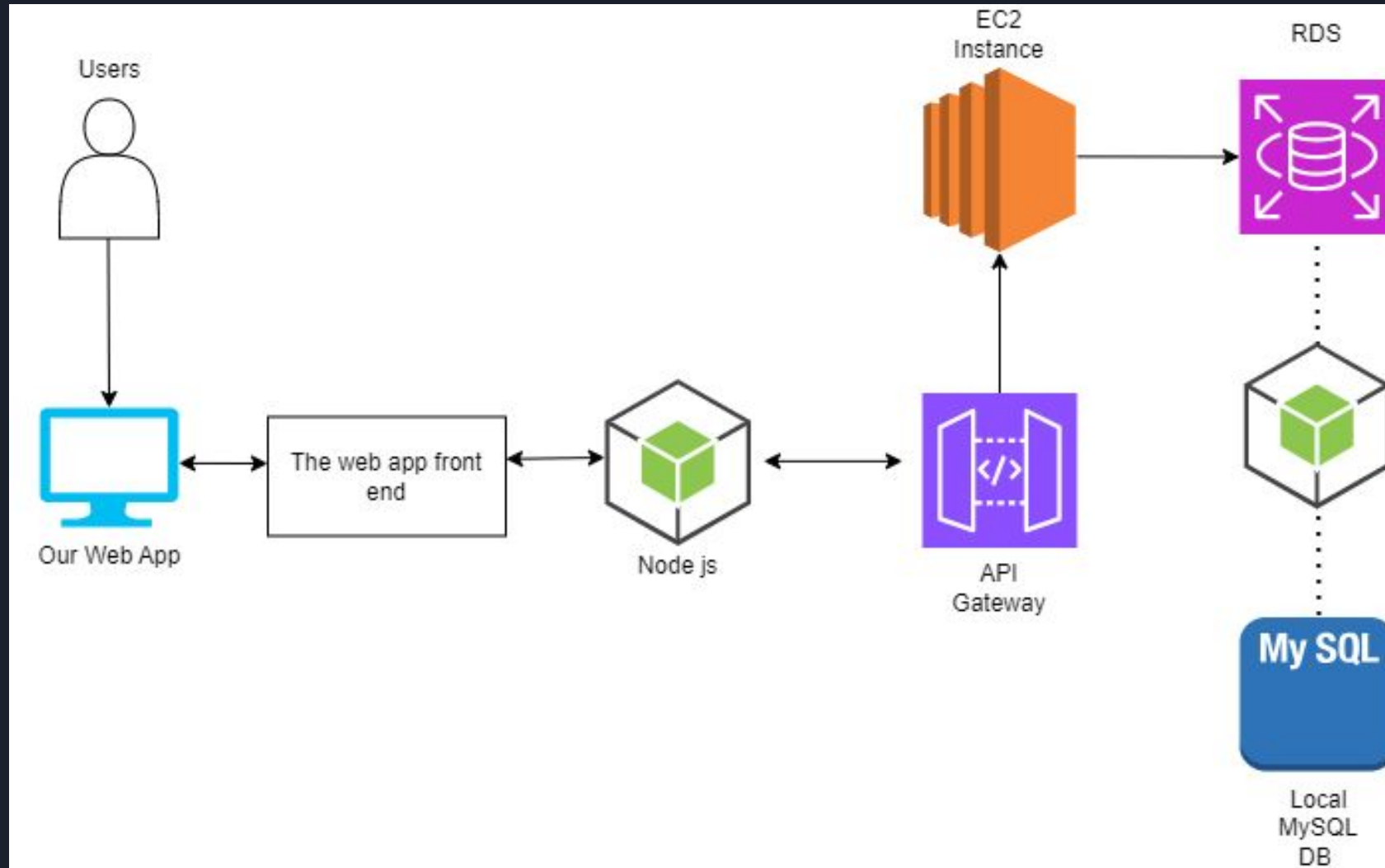
Design Diagram - High Level



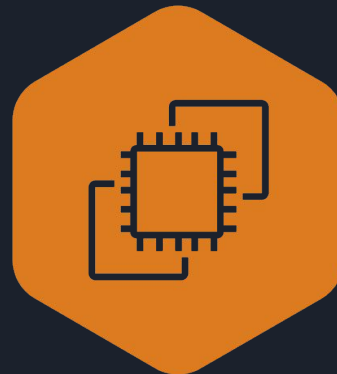
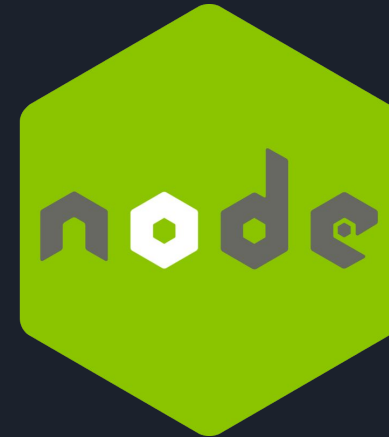
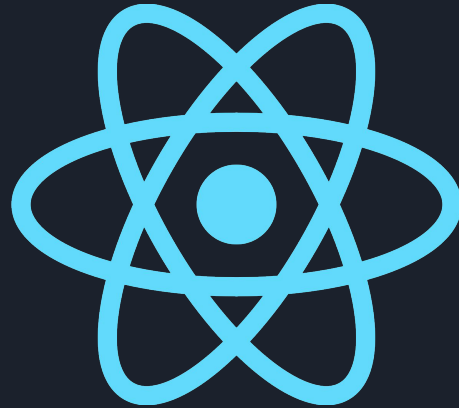
Front-end

Back-end

Design Diagram - Back-End



Software Frameworks & Technologies



Component Breakdown - DB Tables

The screenshot shows a database management interface. On the left, the 'Navigator' pane displays a tree view of 'SCHEMAS' with a search box 'Filter objects'. Under the 'db' schema, the 'Tables' folder is expanded, showing 'surveyquestions', 'surveyresponses', and 'users_table'. The 'surveyquestions' table is selected. The main window shows a query editor with the following SQL statement:

```
1 • SELECT * FROM db.surveyquestions;
```

Below the query editor is a 'Result Grid' showing the data returned by the query. The grid has two columns: 'Question_ID' and 'Question_Text'. The data is as follows:

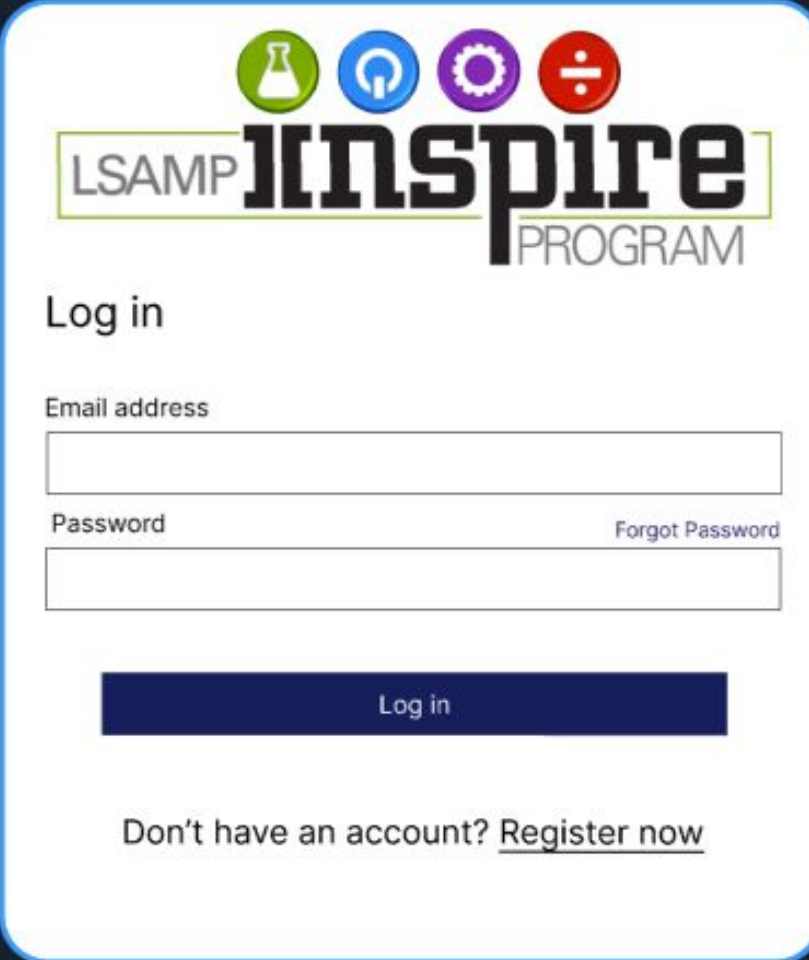
Question_ID	Question_Text
1	I feel responsible for my community.
2	I believe I should make a difference in my comm...
3	I am committed to serve in my community.
NULL	NULL

Component Breakdown - DB Tables

The screenshot displays a database management interface. On the left, a 'Navigator' pane shows a tree view of 'SCHEMAS'. Under the 'db' schema, the 'Tables' folder is expanded, listing 'surveyquestions', 'surveyresponses', and 'users_table'. The 'surveyresponses' table is selected. The main window shows a query editor with the SQL statement: `SELECT * FROM db.surveyresponses;`. Below the query editor, a 'Result Grid' displays the data returned by the query. The grid has four columns: 'ResponseID', 'UserID', 'QuestionID', and 'Response'. The data rows are as follows:

	ResponseID	UserID	QuestionID	Response
▶	1	1	1	0
	2	1	2	0
	3	2	1	1
	4	2	2	5
	5	3	1	4
	6	3	2	3
•	NULL	NULL	NULL	NULL

Component Breakdown - Front-End



The image shows a login form for the LSAMP Inspire Program. At the top, there are four circular icons: a green flask, a blue lightbulb, a purple gear, and a red division sign. Below these icons is the logo for LSAMP Inspire PROGRAM, with 'LSAMP' in a box and 'Inspire PROGRAM' in a stylized font. The form includes a 'Log in' heading, an 'Email address' input field, a 'Password' input field, and a 'Forgot Password' link. A dark blue 'Log in' button is positioned below the password field. At the bottom, there is a link for users who do not have an account: 'Don't have an account? [Register now](#)'.

LSAMP **Inspire** PROGRAM

Log in

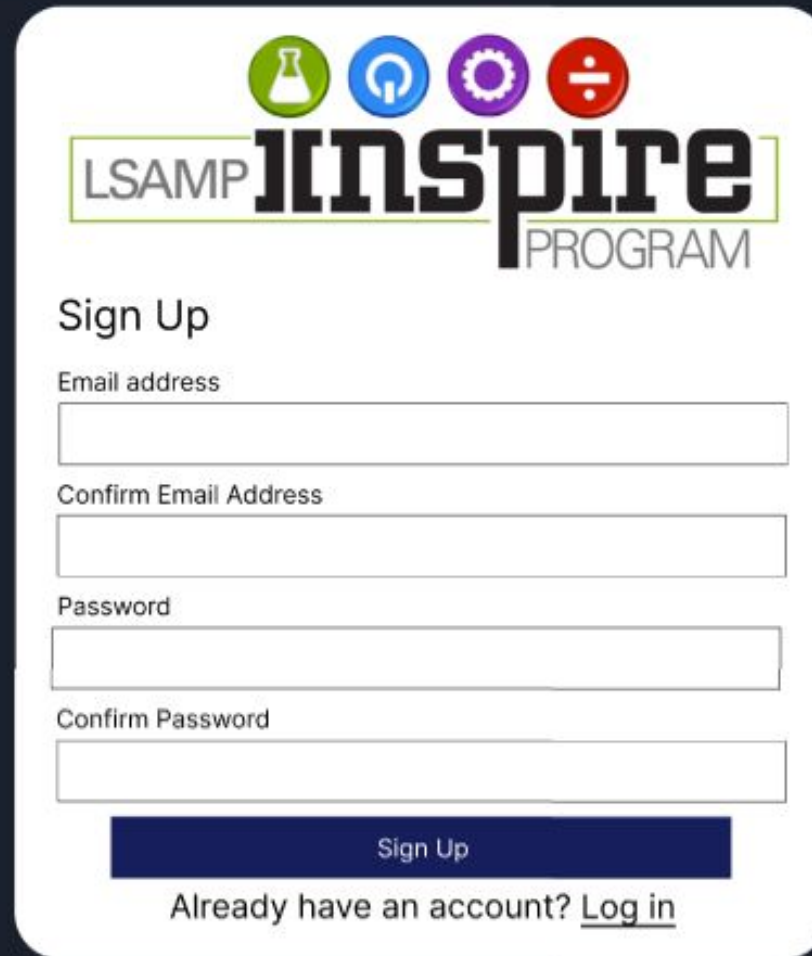
Email address

Password [Forgot Password](#)

Log in

Don't have an account? [Register now](#)

Component Breakdown - Front-End



The image shows a sign-up form for the LSAMP Inspire Program. At the top, there are four circular icons: a green flask, a blue plug, a purple gear, and a red division sign. Below these icons is the logo for LSAMP Inspire PROGRAM, with 'LSAMP' in a box and 'Inspire PROGRAM' in a larger font. The form is titled 'Sign Up' and contains four input fields: 'Email address', 'Confirm Email Address', 'Password', and 'Confirm Password'. A blue button labeled 'Sign Up' is positioned below the fields. At the bottom, there is a link that says 'Already have an account? [Log in](#)'.

LSAMP **Inspire** PROGRAM

Sign Up

Email address

Confirm Email Address

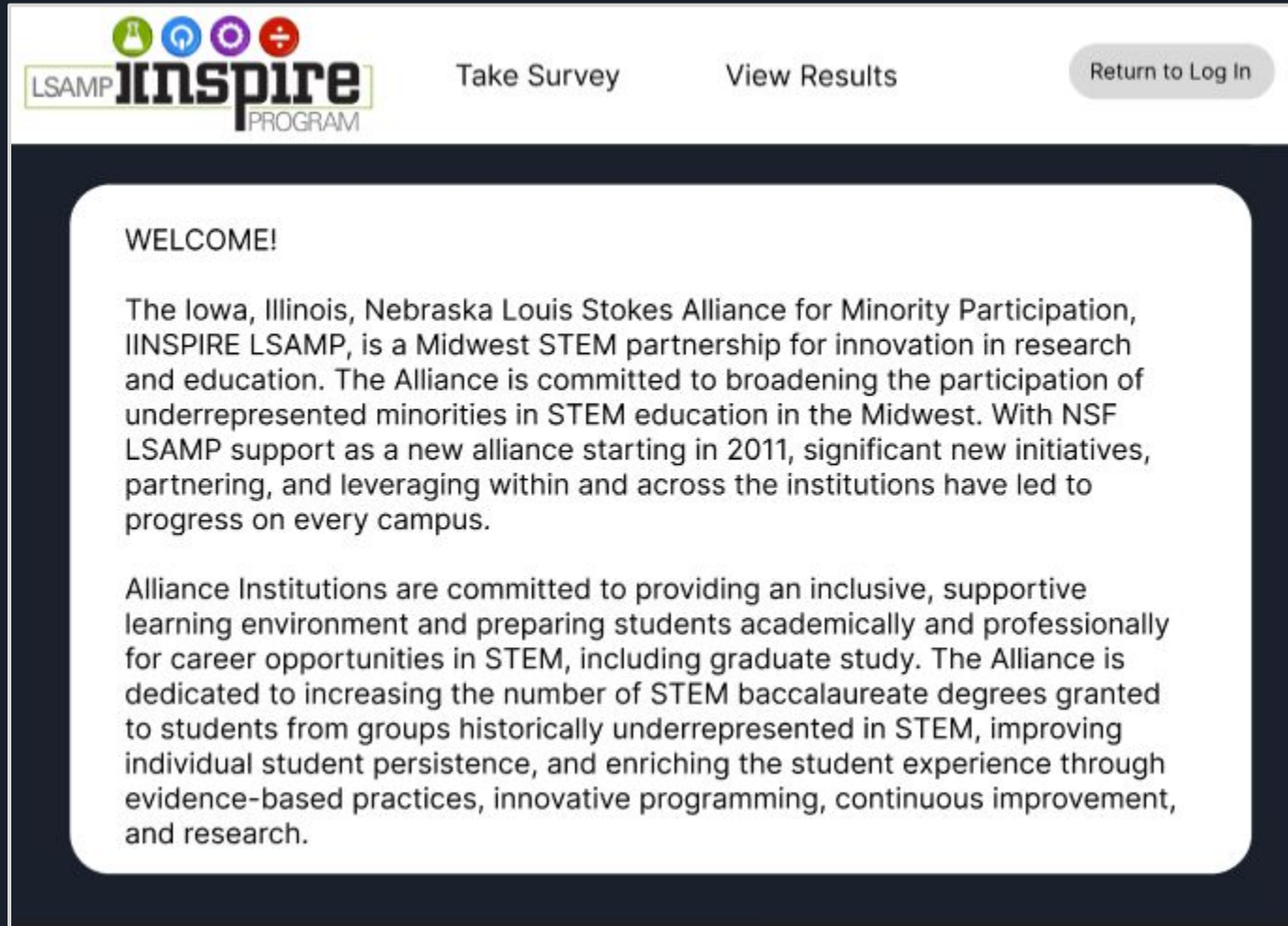

Password

Confirm Password

[Sign Up](#)

Already have an account? [Log in](#)

Component Breakdown - Front-End



The screenshot shows the front-end of the IINSPIRE LSAMP PROGRAM website. At the top left is the logo, which includes four colored icons (a flask, a lightbulb, a gear, and a plus sign) above the text "LSAMP IINSPIRE PROGRAM". To the right of the logo are two links: "Take Survey" and "View Results". Further right is a button labeled "Return to Log In". The main content area is a white rounded rectangle on a dark background, containing a "WELCOME!" heading and two paragraphs of text.

WELCOME!

The Iowa, Illinois, Nebraska Louis Stokes Alliance for Minority Participation, IINSPIRE LSAMP, is a Midwest STEM partnership for innovation in research and education. The Alliance is committed to broadening the participation of underrepresented minorities in STEM education in the Midwest. With NSF LSAMP support as a new alliance starting in 2011, significant new initiatives, partnering, and leveraging within and across the institutions have led to progress on every campus.

Alliance Institutions are committed to providing an inclusive, supportive learning environment and preparing students academically and professionally for career opportunities in STEM, including graduate study. The Alliance is dedicated to increasing the number of STEM baccalaureate degrees granted to students from groups historically underrepresented in STEM, improving individual student persistence, and enriching the student experience through evidence-based practices, innovative programming, continuous improvement, and research.

Component Breakdown - Front-End

The screenshot displays the front-end of the LSAMP Inspire Program survey. At the top left is the logo for the LSAMP Inspire Program, featuring four icons (flask, gear, target, and plus) above the text "LSAMP inspire PROGRAM". To the right of the logo are two links: "Take Survey" and "View Results". Further right is a button labeled "Return to Log In".

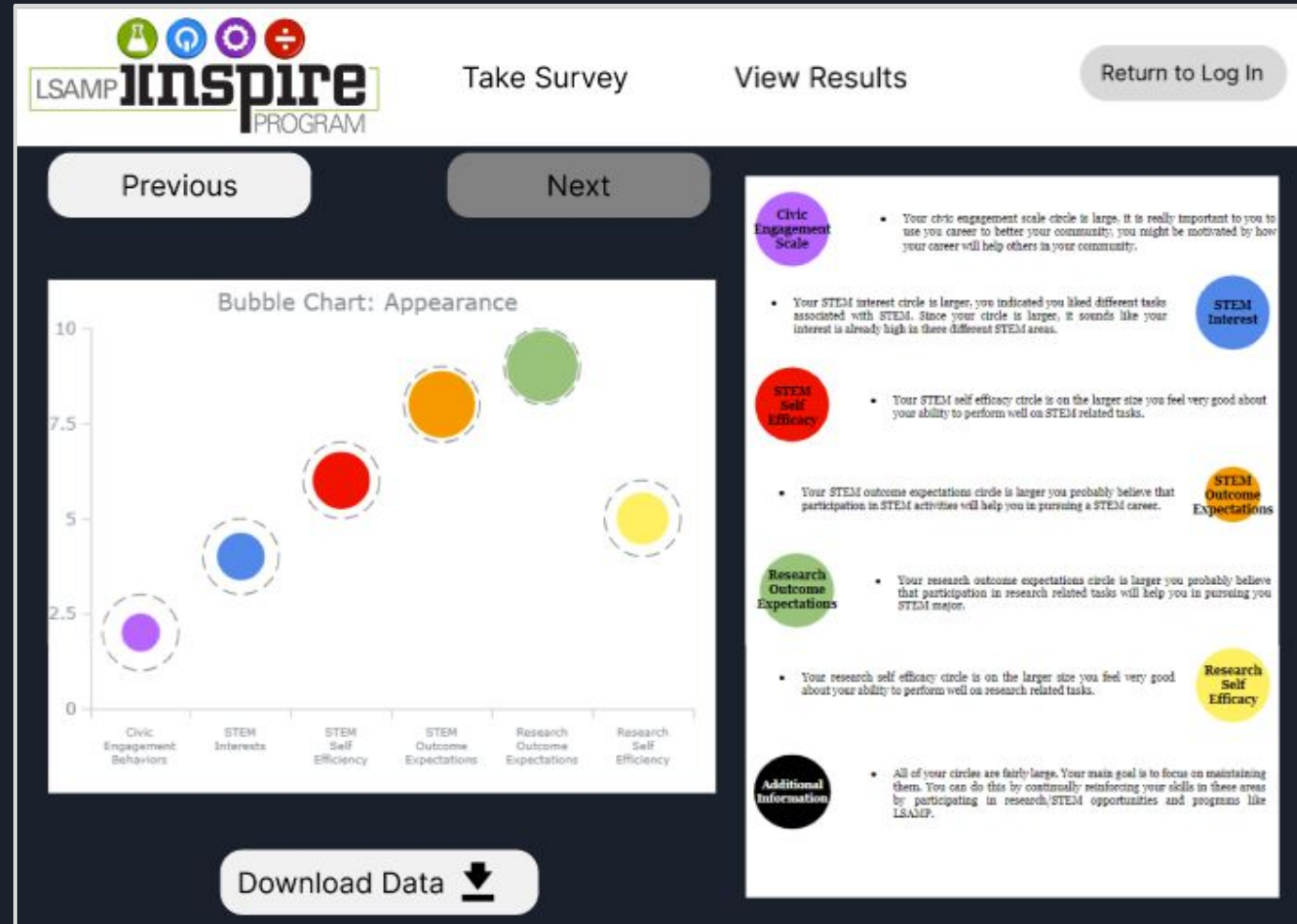
Below the header is a progress bar with five numbered steps. Steps 1 and 2 are highlighted in green, indicating they are completed. Step 3 is the current step, shown in grey. Steps 4 and 5 are also shown in grey, indicating they are yet to be completed.

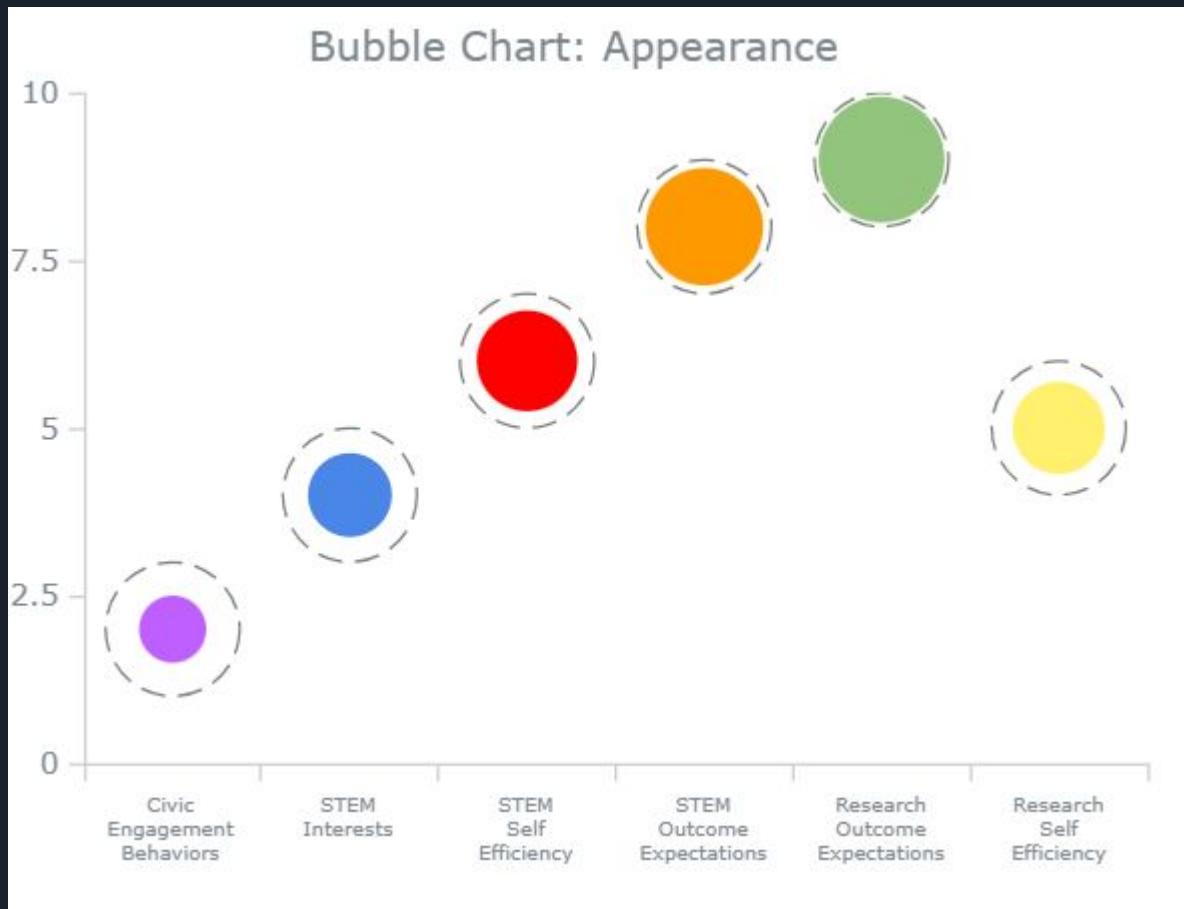
Underneath the progress bar is a Likert scale table. The table has five columns representing response options: "Strongly Disagree", "Disagree", "Mixed/Unsure", "Agree", and "Strongly Agree". There are four rows, each starting with a "Prompt..." label. Each cell in the table contains a grey circle representing a radio button for selection.

At the bottom left of the survey area is a dark blue button labeled "Previous". At the bottom right is a dark blue button labeled "Next".

	Strongly Disagree	Disagree	Mixed/Unsure	Agree	Strongly Agree
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prompt...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Component Breakdown - Front-End





```
// create data
var data1 = [
  {x:"Civic\nEngagement\nBehaviors", y:2, size:10},
  {x:"STEM\nInterests", y:4, size:10},
  {x:"STEM\nSelf\nEfficiency", y:6, size:10},
  {x:"STEM\nOutcome\nExpectations", y:8, size:10},
  {x:"Research\nOutcome\nExpectations", y:9, size:10},
  {x:"Research\nSelf\nEfficiency", y:5, size:10}
];

var data2 = [
  {x:"Civic\nEngagement\nBehaviors", y:2, size:2, color: "#bf5fffff"},
  {x:"STEM\nInterests", y:4, size:4, color: "#4a86e8ff"},
  {x:"STEM\nSelf\nEfficiency", y:6, size:6, color: "#ff0000ff"},
  {x:"STEM\nOutcome\nExpectations", y:8, size:8, color: "#ff9900ff"},
  {x:"Research\nOutcome\nExpectations", y:9, size:9, color: "#93c47dff"},
  {x:"Research\nSelf\nEfficiency", y:5, size:5, color: "#fff16eff"}
];

// create a chart
var chart = anychart.cartesian();

chart.maxBubbleSize("10%");

// set the interactivity mode
chart.interactivity().hoverMode("by-x");
```

Component Breakdown - Front-End

The screenshot displays the front-end of the LSAMP Inspire Program interface. At the top left is the logo for LSAMP Inspire PROGRAM, featuring four colored icons (flask, lightbulb, gear, and plus) above the text. To the right of the logo are two buttons: "Take Survey" and "View Results". Further right is a "Return to Log In" button. Below the navigation bar is a dark header bar. The main content area shows "Section 1" with a plus icon in a circle to its right. Below this, there is a list of ten questions, each represented by a dotted line followed by the text "Question goes here.....". To the right of each question are two icons: a trash can icon and a hamburger menu icon (three horizontal lines).

Design Complexity

Complexity

- There are several different possible graphics to use when visualizing data
- It should function without any installations needed
- Each team member will have to learn how to use different engineering tools

Second Iteration

- Added to the back-end
 - Back-end resources for AWS were established (MySQL, Node.js, etc.)
- Our design expanded beyond student users
 - Researchers
 - Program mentors

Project Plan - Task-Decomposition

Front-end

- Set up user access screens
 - Login Screen
 - Registering
 - Home Screen
 - Survey Page
 - Results Page
 - Admin Page

Back-end

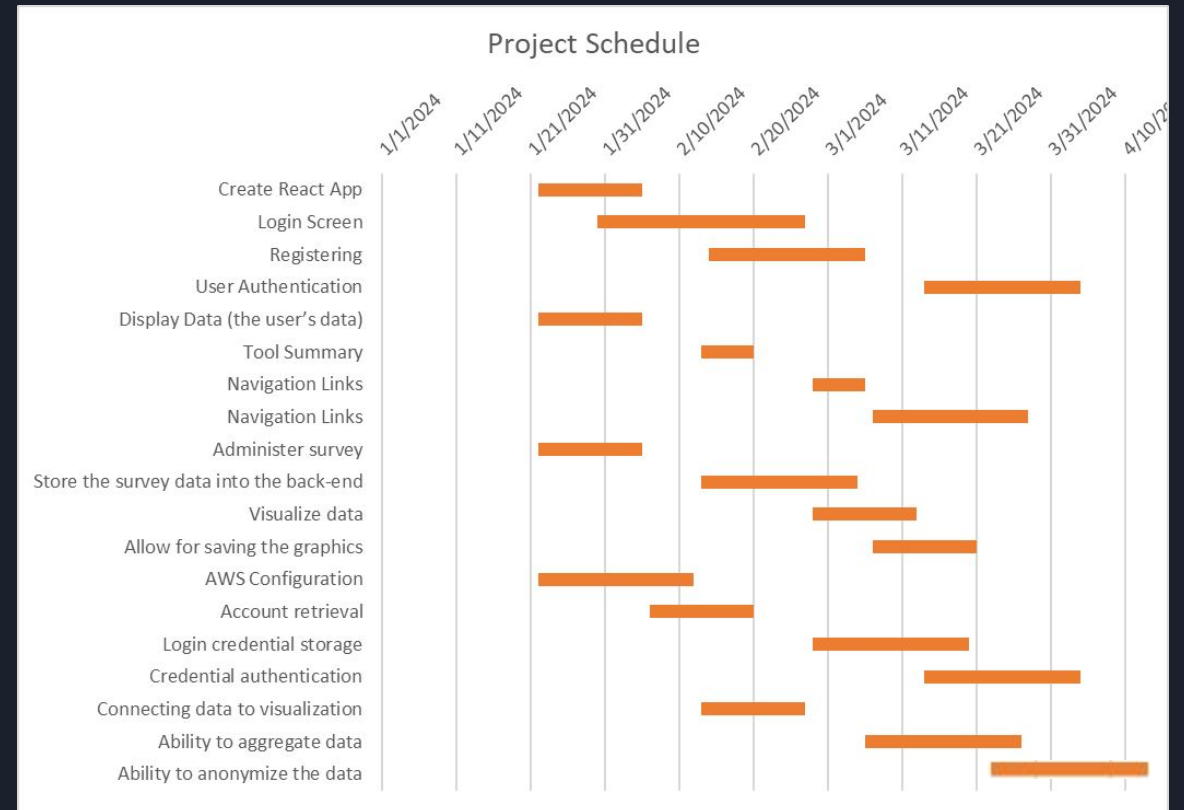
- Create an AWS account
 - Configure the AWS Amplify instance
 - Configure EC2 instance
 - Configure RDS (Relational Database Service) for hosting
 - Implement limitations on resource usage to avoid unnecessary or excessive costs
- User information storage
 - Able to send email for account retrieval
 - Login credential storage
 - Credential authentication
- Survey data storage
 - Connecting data to visualization so it's visible to the user
 - Ability to anonymize the data

Project Plan - Risks and Mitigation

Risk	Mitigation	Risk Probability
User data is insecure and gets leaked	Implement code with security in mind and encrypt the database.	10%
Data gathered from the survey is not able to be visualized.	Offer multiple ways to download and generate the visualizations. Cover all possible scenarios in regard to data visualization.	5%
The clients hate our user interface and don't find it easily navigable.	Research how other surveys (ex: Google Forms, Qualtrics) set up their UI.	15%
The user finds the survey too long or irrelevant and spams through it.	Create a pre-survey presentation showing off previous results and how if done correctly can help the user.	30%
Server downtime or technical issues may disrupt the survey delivery.	Host the site on a reliable and scalable infrastructure. Implement redundancy, monitoring and disaster recovery plans to minimize downtime.	33%
Violation of laws or regulations related to data collection and privacy.	Stay informed about relevant laws and regulations, and obtain any necessary approvals or permissions.	5%

Project Plan – Schedule/Milestones

- The back-end can send aggregated survey data to the front end
- The back-end can process and store user data dynamically
- Document SQL schema table mappings
- Log In/User Milestones
- Home Screen Milestones
- Results page
- Survey page



Testing

- Unit
 - Jest
 - Docker
- Interface
- Integration
- System
- Acceptance

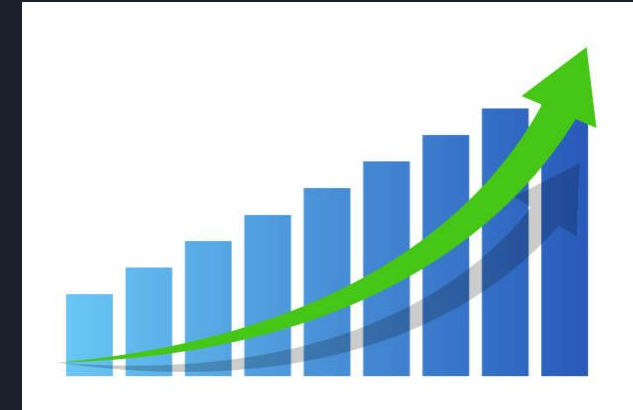
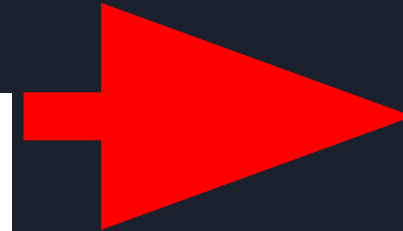
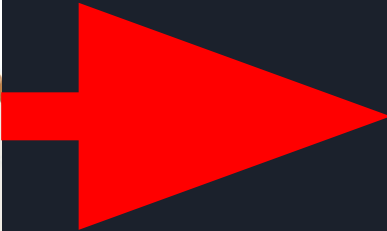




Conclusions

- Contributions:
 - Back-End Development: Lydia McCleary, Thomas Nunez, Abe Scheideman
 - Front-End Development: Jimmy Driskell, Nathan Frank, Kaitlin Hansen
 - Advisor/Client Communication Lead: Jimmy Driskell
 - Grad Student Communication Lead: Kaitlin Hansen
 - University of Iowa Students Communication: Jimmy Driskell
 - Webmaster: Lydia McCleary

Before



After

