



ReasonED.io: Design

Team Crystal

Emily Louk
Alysha Morgan
Areeb Nabi
June Troyer
Dakota Dawe
Nolan Marchione
Devan Hill

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Vision



- **Cultivate Logical Fallacy Skills Throughout K-12 and Adulthood**
- **Game-Based Learning Website**
- **Engaging Games For Every Age**
- **Make Critical Reasoning Education Fun & Accessible**



Biographies



Emily Louk



Emily is a senior undergraduate at ODU. She has an Associate degree in Information Systems and will pursue software engineering after earning her B.S.C.S.. At ODU, she has interned with the Game Studies program as a programmer and participated in a research project. She is interested in developing educational tools, video games, and mobile apps.

Dakota Dawe



Dakota is still finishing his Associates degree at LFCC while working through the remaining courses at ODU for his Bachelors. Dakota is currently working as a games programmer selling plugins on the Unreal Engine marketplace as well as a contract programmer for Small Indie Company developing their upcoming title “We The People”.

Areeb Nabi



Areeb is a senior at Old Dominion University pursuing his undergraduate degree in Computer Science. He recently completed a 10-week summer internship with Automatic Data Processing (ADP), honing his skills as a Full-Stack Developer. Areeb specifically enjoys front-end development, and working with JavaScript libraries such as React, Express, and Node.js.

June Troyer



June is a senior Computer Science undergraduate at ODU in the linked Master's program. She has an associate degree in Science from Piedmont Virginia Community College. She enjoys helping others explore new topics and improve their skills and reasoning.

Biographies cont.



Alysha Morgan



Alysha is a undergraduate Senior at Old Dominion University, currently working towards her Bachelor's degree in Computer Science with a minor in Cybersecurity. With a deep passion for technology, she is actively honing her skills to become a software engineer.

Nolan Marchione



Nolan is an undergraduate senior at Old Dominion University, aiming for a Bachelor's degree in Computer Science. He enjoys listening to music, and is interested in using his skills to develop video games and open-source software tools.

Devan Hill



Devan is an undergraduate senior at Old Dominion University for a Bachelor's degree in Computer Science. He enjoys learning different kinds of technology. He wants to write programs and develop video games.

Terms



- **Confirmation Bias** - A cognitive bias that involves seeking, interpreting, and remembering information that confirms one's preconceptions (American Psychological Association n.d.).
- **Critical Thinking** - The ability to think clearly and rationally, understanding the logical connection between ideas and the ability to make reasoned judgements (American Psychological Association n.d.).
- **Fact-Checking** - The process of verifying the accuracy of claims made in public discourse and journalism (Cambridge English Dictionary n.d.).
- **False Dilemma** - A fallacy that presents a limited set of options as the only possible choices when there may be other alternatives (Excelsior OWL n.d.).
- **Logical Fallacy** - An error in reasoning or a flawed argument that can make an argument appear valid when it is not (Nikolopoulou, 2023).

Terms cont.



- **Misinformation** - False or inaccurate information shared, often unintentionally, without the intent to deceive (Dictionary.com n.d.).
- **Disinformation** - False information deliberately spread to deceive or mislead others (Dictionary.com n.d.).
- **Slippery Slope** - A fallacy that suggests one small step will inevitably lead to a chain of related events, often with exaggerated consequences (Excelsior OWL n.d.).
- **Straw Man Argument** - A fallacy that involves misrepresenting an opponent's argument to make it easier to attack and refute (Excelsior OWL n.d.).

Background

In the digital age, the ubiquity of the Internet has transformed the way we access, consume, and interact with information.

The online world serves as an expansive repository of knowledge, but it is not immune to **misinformation** and flawed reasoning (Wardle and Derakhshan, 2017).

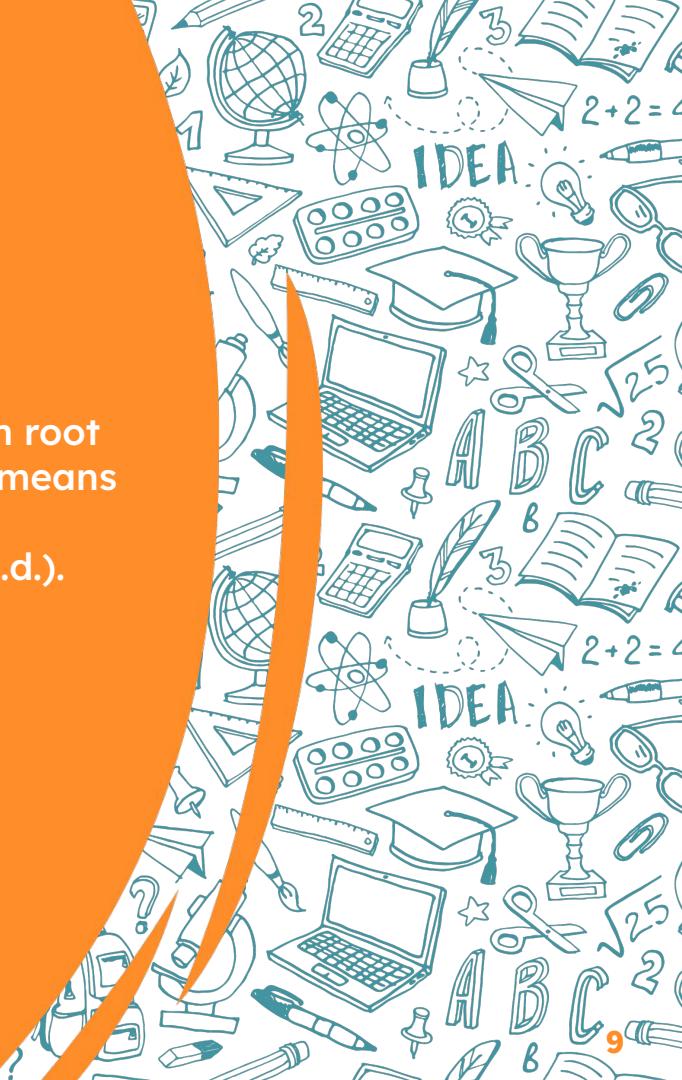


Background cont.

Logical fallacies, such as straw man arguments, false dilemmas, slippery slopes, and others, persist in online content, undermining the quality of discussions and the credibility of information distribution.

Fallacy

From the latin root *fallac*, which means **to deceive** (Etymology n.d.).



Background - Examples

Flight attendant on American reamed me out 4 playing WORDS W FRIENDS while we sat at the gate, not moving.
#nowonderamericaairisbankrupt

1:01 PM - 6 Dec 2011

2,198 Retweets 288 Likes

904 2.2K 288

1

Seton Hall Sports Poll: 74% of the general population asked said they weren't buying NFL gear this holiday season.

27% said it was because of the player protests during the National Anthem.

9:25 AM - 30 Nov 2017

43 Retweets 131 Likes

34 43 131

2

The cities in the background are approx. 16miles apart... where is the curve ? please explain this



3:05 PM - 24 Jan 2016

3,904 Retweets 3,885 Likes

1.3K 3.9K 3.9K

3

In a blog post by M. Hope Echales (2017), the author discusses various Twitter posts related to LSAT preparation. @ABFalecbaldwin, @darrenrovell, and @bobatl, were all topics of the discussion.

Statistics

86% of 4th-grade teachers expressed a substantial emphasis on deductive reasoning (Bouygues, 2022).

The above figure dwindled to a mere **39% among 8th-grade teachers** when expressing the same sentiment (Bouygues, 2022).

50% of teachers indicated that they face challenges in allocating time to teach critical thinking skills effectively (Critical Thinking Teacher Survey 2019).

Just 21% of teachers agreed that they possess all the necessary resources to cultivate these skills (Critical Thinking Teacher Survey 2019).



Statistics cont.

| Type of measurement (Pre-test) | Study Groups | Number of subjects 20 | | Duration of treatment | Type of measurement (post-test) | Feedback questionnaire Structured interview |
|-------------------------------------|---------------|-----------------------|--------|--|-------------------------------------|---|
| | | Male | female | | | |
| Receptive tasks Productive tasks | Experimental | 10 | 10 | 4 weeks training related to 15 fallacies under study | Receptive tasks Productive tasks | Feedback questionnaire Structured interview |
| | Control group | 10 | 10 | no prior treatment or training | | |
| | | | | | | |

(Khartite & Hellalet, 2021, p. 227)

| Group | N | Mean | SD | Std Error. Mean | P-value |
|-----------|----|-------|------|-----------------|---------|
| Treatment | 20 | 19.35 | 2.04 | 0.27 | 0.062 |
| Control | 20 | 14.20 | 1.80 | 0.57 | |

(Khartite & Hellalet, 2021, p. 228)

Problem Statement

**High school graduates
are not prepared with
the skills necessary to
identify logical fallacies
in an increasingly online
world.**

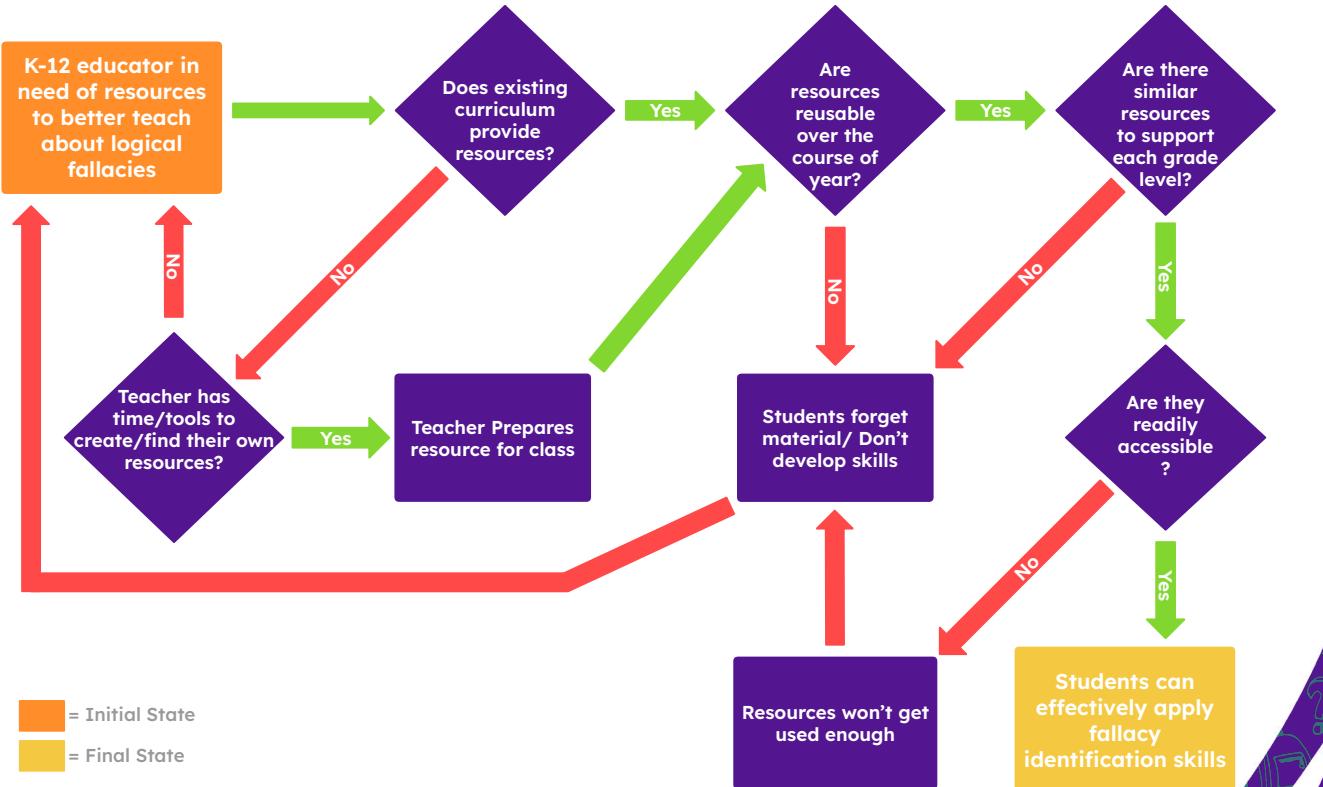


Problem Characteristics



- **Prevalence of Logical Fallacies**
- **Limited Critical Thinking Skills**
- **Misinformation Vulnerabilities**
- **Neglecting Contextual Research**

Current Process Flow





ReasonED is a game-based learning website that improves the ability of users to identify logical fallacies through simple, age-appropriate games. This website will provide educators with a tool to cultivate their student's critical reasoning skills over the long-term and beyond the scope of a single subject.

Prototype Overview

- **3 Games Available on Website:**
 - Hasty Harry
 - Straw Manny
 - Slope Sadie
- **Scaled Difficulty:**
 - Elementary (Grades 2-3)
 - Middle School (All)
 - High School (All)
- **Key Game Features:**
 - Age-Appropriate explanation of fallacy
 - Educational Feedback

Hasty Harry

Harry is an astronaut who makes flawed generalizations about the new creatures and plants he discovers. Players will collect enough information about each planet and help Harry avoid making generalizations in his planet report, teaching the "hasty generalization" fallacy.

Concept Art/Inspiration:



Straw Manny

Straw Manny is a hopeful knight who needs better training. He only practices combat on fake straw men because they're easy to hit. Players need to help Manny build his combat skills by attacking real opponents rather than fake ones, teaching the concept of the "straw man" fallacy.

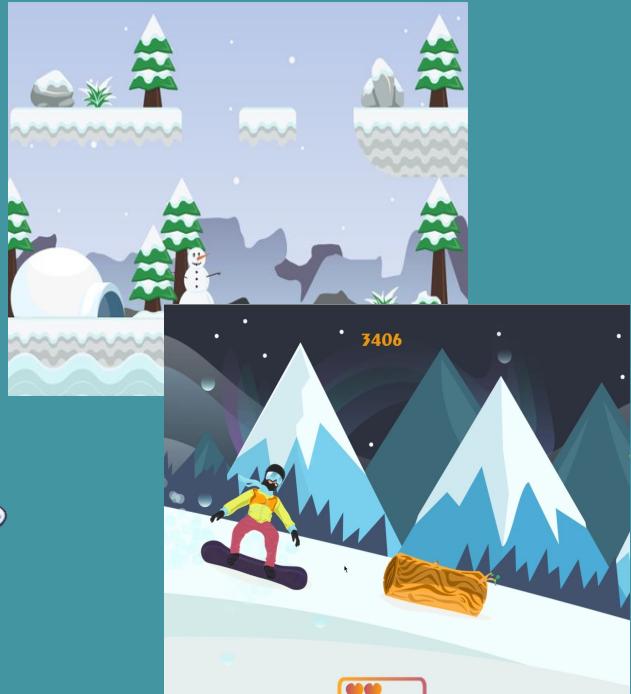
Concept Art/Inspiration:



Slope Sadie

Sadie often jumps to extreme conclusions. Players need to guide Sally safely down a winding snowy path without letting her slip into a pitfall, introducing the "slippery slope" fallacy.

Concept Art/Inspiration:



Features

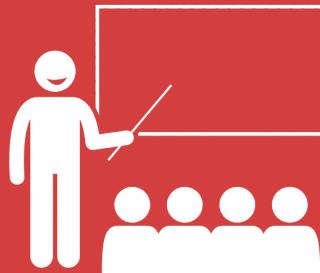
ReasonED WILL contain:

- **Simple, school-friendly 2D games to be played directly on the site**
- **Wide range of game difficulties**
- **Instructions for each game**
- **Introductory readings for each age group**

ReasonED will NOT contain:

- **RAM and CPU-intensive elements**
- **Lesson plans (unless provided by educators)**
- **In-game references to specific people or political events**

Customers & End Users



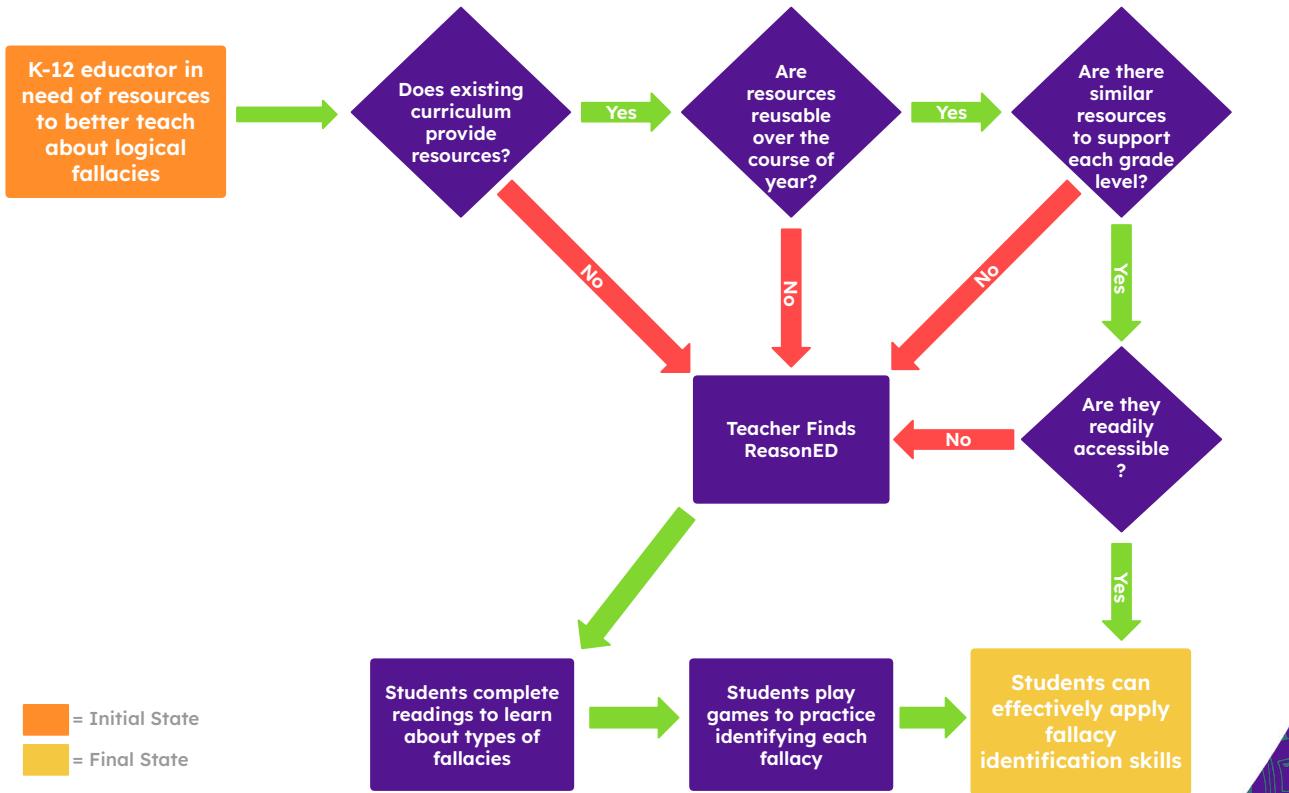
Customers:

- K-12 schools
- Colleges
- Universities
- Educational publishers

End Users:

- K-12 Students (including homeschoolers)
- College Students
- Educators
- General Public

Solution Process Flow



Competition Matrix

Direct Competitors

| | ReasonED.io | ABCya! | Funbrain | Arcademics | BrainPOP |
|------------------------------------|------------------|--------------|-----------|--------------|----------|
| Primary Audience | K-12 and College | Pre-K - 6 | Pre-K - 8 | K-8 | K-8 |
| Game-Based Learning | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logical Fallacy Focus | ✓ | | | | |
| Device Compatibility | PC | PC | PC | PC | PC |
| Characters and Animation for Kids | ✓ | ✓ | ✓ | | ✓ |
| Accessibility Features | ✓ | | | | |
| Educator Tools | ✓ | Premium Only | | Premium Only | ✓ |
| Easily Playable outside of School? | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cost | Freemium | Freemium | | Freemium | |

Competition Matrix

Indirect Competitors

| | ReasonED.io | Kahoot! | Quizlet Live | Socrative | Gimkit |
|------------------------------------|------------------|------------------|------------------|-----------|-----------------|
| Primary Audience | K-12 and College | K-12 and College | K-12 and College | K-12 | K-12 |
| Game-Based Learning | ✓ | ✓ | ✓ | | ✓ |
| Logical Fallacy Focus | ✓ | | | | |
| Device Compatibility | PC | PC, Phone | PC, Phone | PC, Phone | PC, Phone |
| Characters and Animation for Kids | ✓ | Depends on Game | | | Depends on Game |
| Accessibility Features | ✓ | ✓ | ✓ | ✓ | ✓ |
| Educator Tools | ✓ | ✓ | ✓ | ✓ | ✓ |
| Easily Playable outside of School? | ✓ | | | | |
| Cost | Freemium | Freemium | Freemium | Freemium | Subscription |

Technical Risks

| Likelihood | Impact | | | | | |
|------------|-----------|-----|--------|------|-----------|--|
| | Very Low | Low | Medium | High | Very High | |
| | Very High | | | | | |
| | High | | | | | |
| | Medium | | T1 | M3 | T3 | |
| | Low | M1 | M2 | T2 | | |
| | Very Low | | | | | |

T1: Version Compatibility

- **Risk:** Compatibility issues with varying browsers.
- **M1:** Keep up with browser updates, maintain backward compatibility.

T2: Third-Party Integrations

- **Risk:** Problems with integrating external services or APIs.
- **M2:** Careful selection and testing of third-party tools or APIs.

T3: Data Backup and Recovery

- **Risk:** Risks of data loss or system failure.
- **M3:** Implement regular data backup and recovery procedures.

Customer Risks

| | | Impact | | | | |
|------------|-----------|----------|-----|--------|------|-----------|
| | | Very Low | Low | Medium | High | Very High |
| Likelihood | Very High | | | | | |
| | High | | | | C2 | |
| | Medium | | | | C1 | |
| | Low | | | C3 | M2 | |
| | Very Low | | | M3 | M1 | |

C1: User Proficiency

- **Risk:** Users may not have the prerequisite knowledge or skills to benefit from the application.
- **M1:** Tutorials and introductory lessons help lower the bar for new users.

C2: User Engagement

- **Risk:** Customers may not feel the need to stay engaged with the games.
- **M2:** Progress tracking and regular content updates help to maintain user interest.

C3: User Feedback

- **Risk:** If a game is too difficult or is not explained well, then users might stop using the application.
- **M3:** Provide feedback mechanisms to iterate on the game.

Security Risks

| | | Impact | | | | |
|------------|-----------|----------|--------|--------|--------|-----------|
| | | Very Low | Low | Medium | High | Very High |
| Likelihood | Very High | Yellow | Yellow | Red | Red | Red |
| | High | Green | Yellow | Yellow | S2 | Red |
| | Medium | Green | Yellow | S1 | Red | S3 |
| | Low | Green | Green | Yellow | Yellow | Red |
| | Very Low | Green | M1 | M2 | M3 | Yellow |

S1: Data Security

- **Risk:** Users may be concerned about what data is collected on them.
- **M1:** Communicate what data is gathered, and comply with data protection regulations to keep collected data safe.

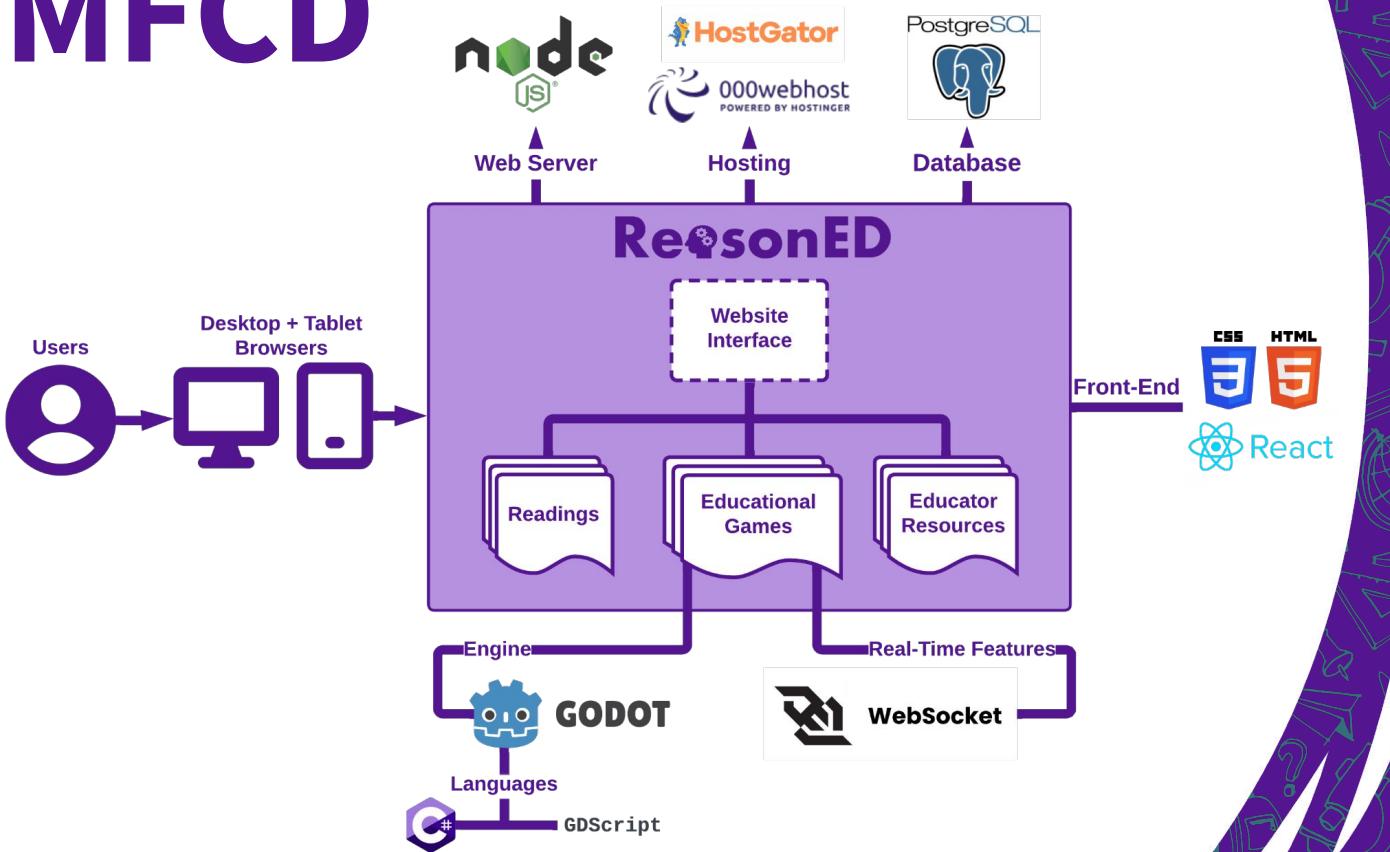
S2: Account Security

- **Risk:** Unauthorized access to a user account.
- **M2:** Strong password policies and two-factor authorization for account login.

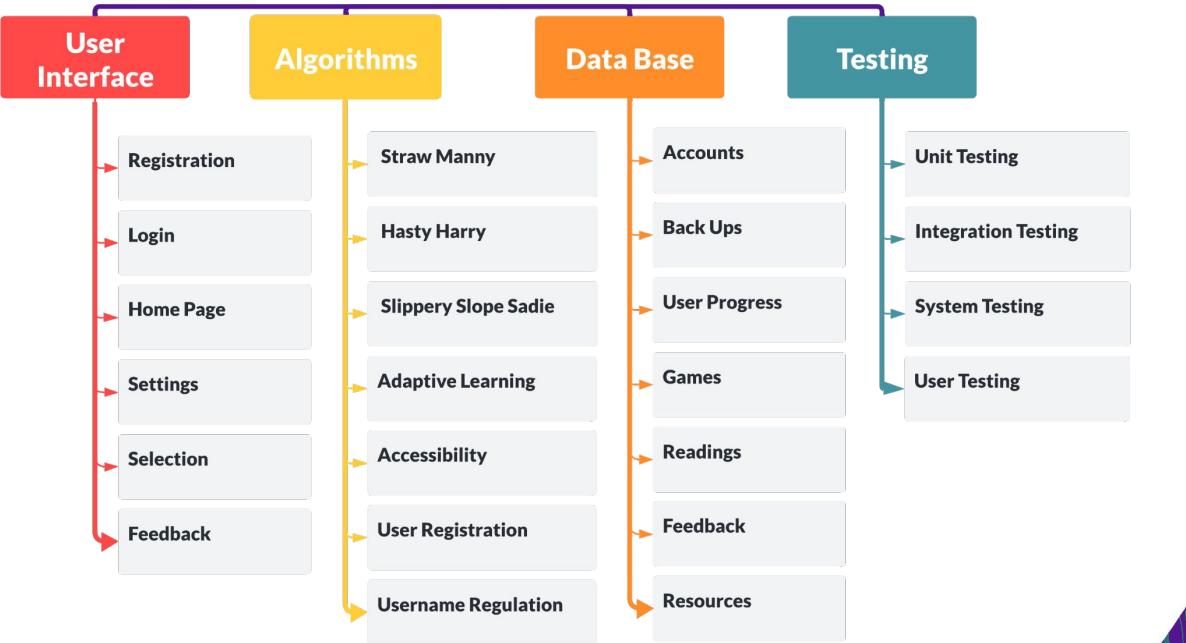
S3: Security Updates

- **Risk:** New exploits are discovered which jeopardize our systems.
- **M3:** A regular schedule for checking for exploits and implementing security patches.

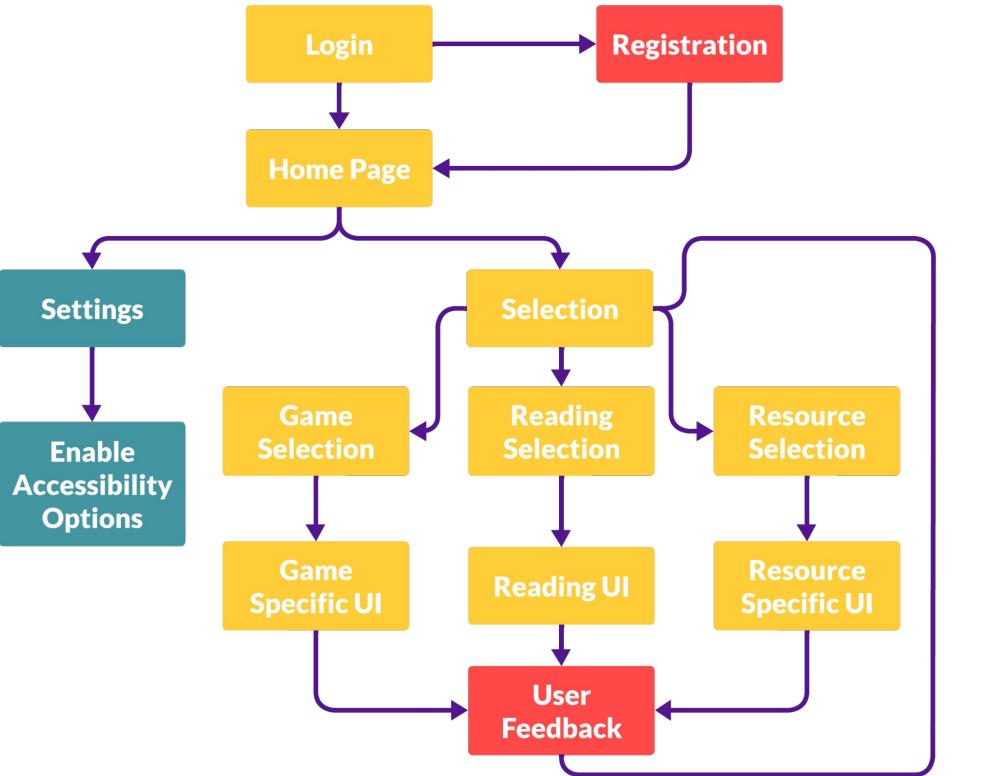
MFCD



Work Breakdown Structure



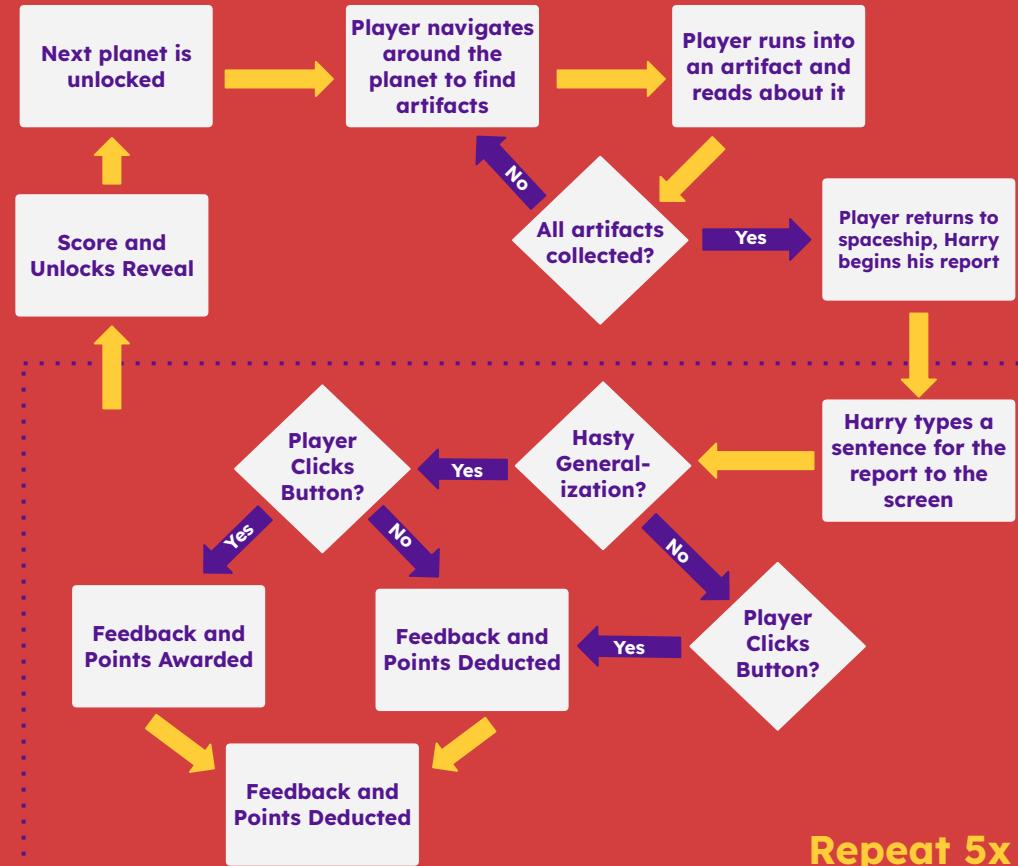
Work Breakdown - UI



Algorithms

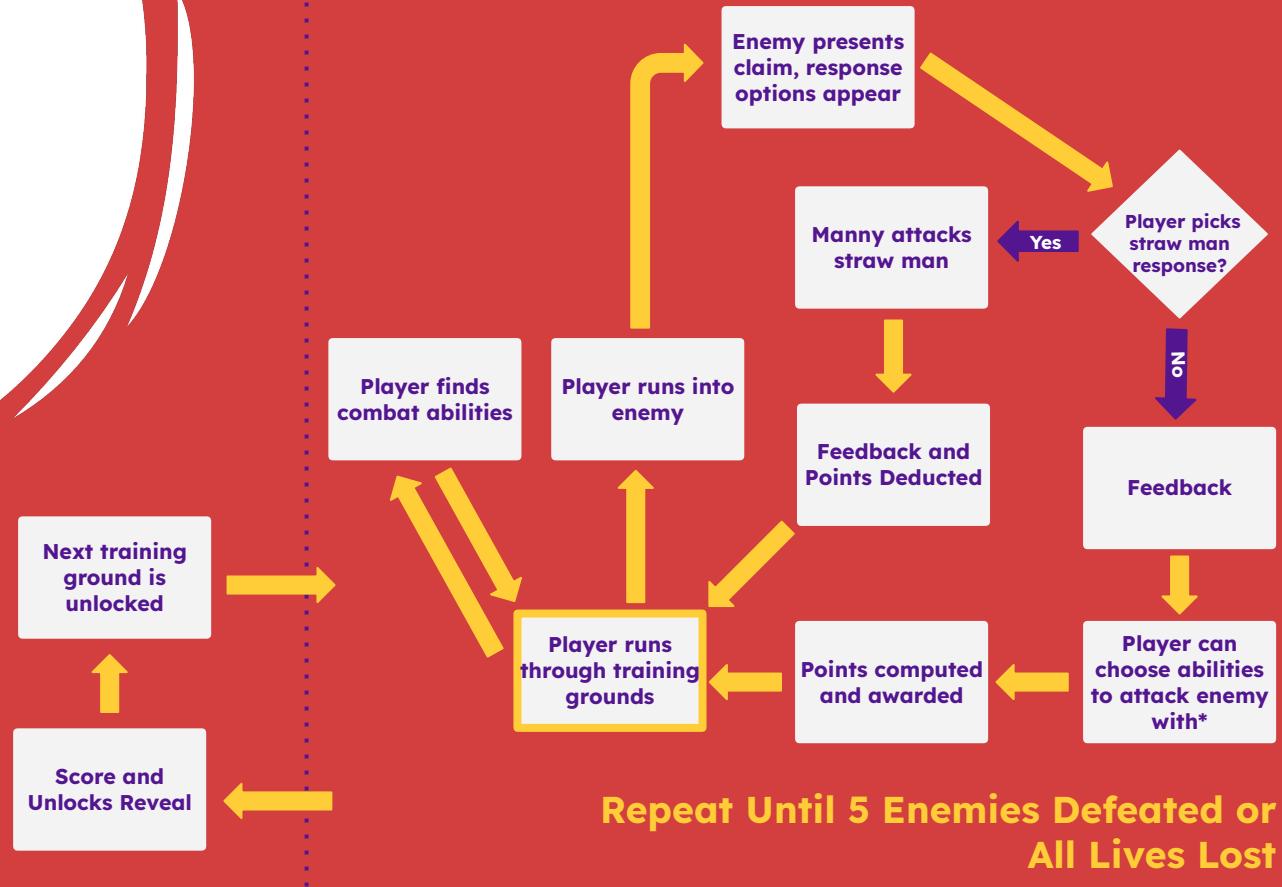
- **Games**
 - Character Customization
 - Feedback & Event systems
 - Item Unlocks/Certificates
- **Adaptive Learning**
- **User Registration and Authentication**
- **Username Regulation**

Hasty Harry



Repeat 5x

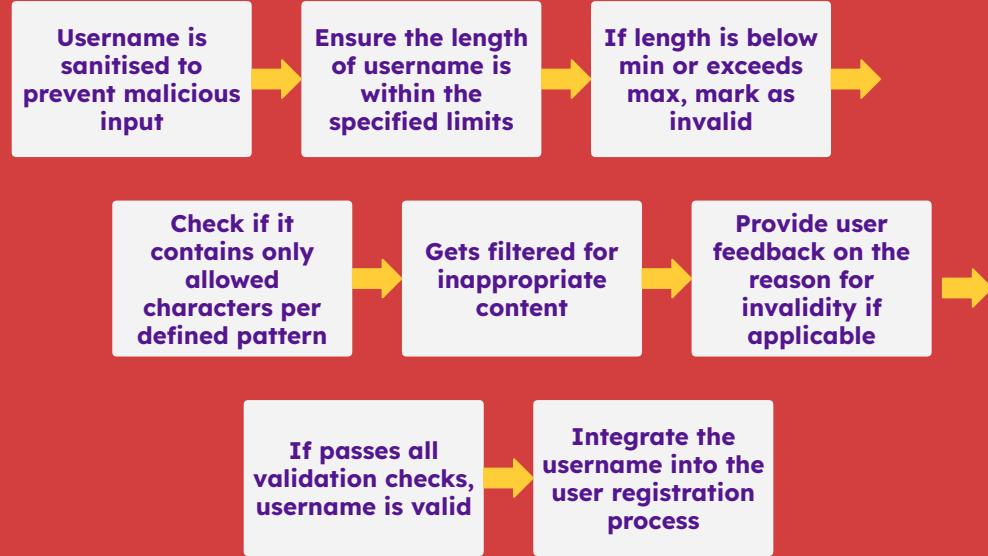
Straw Manny



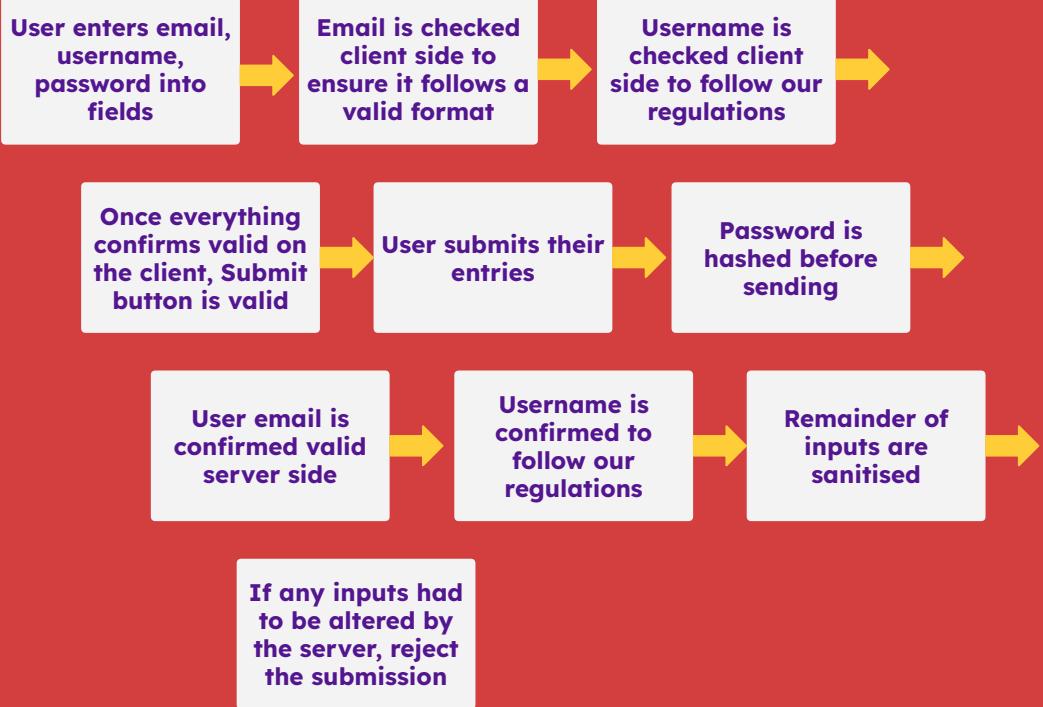
Slope Sadie

Adaptive Learning

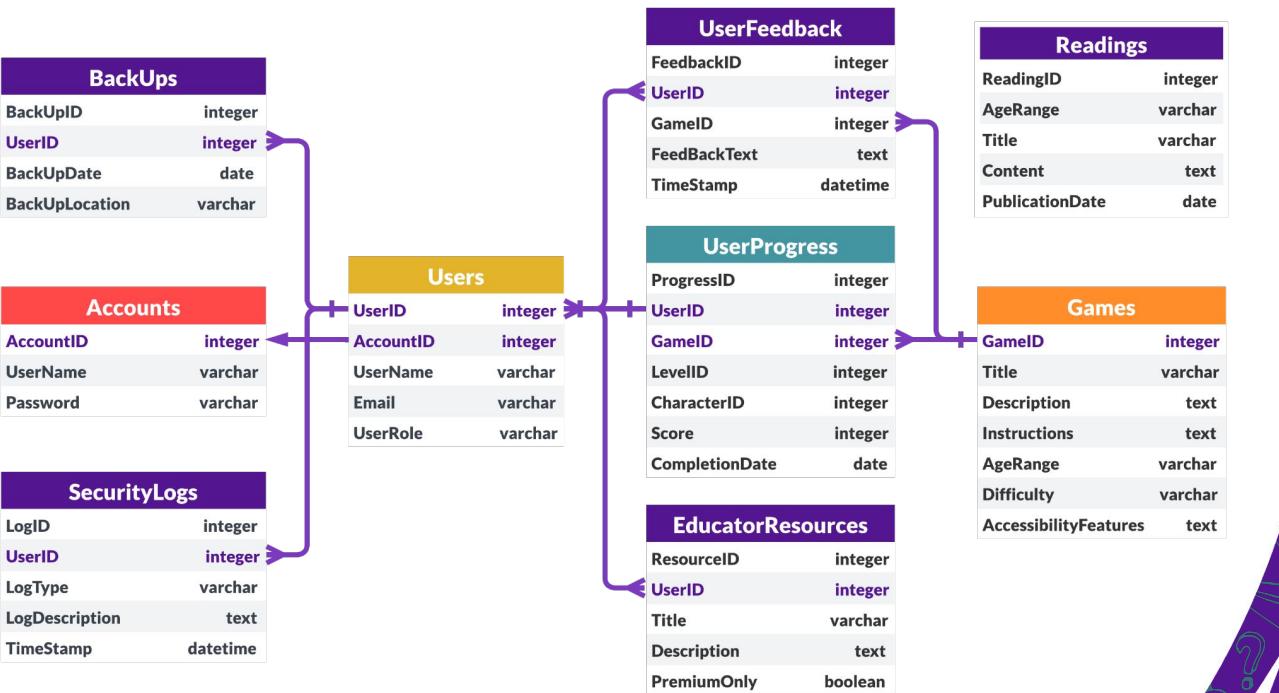
Username Regulation



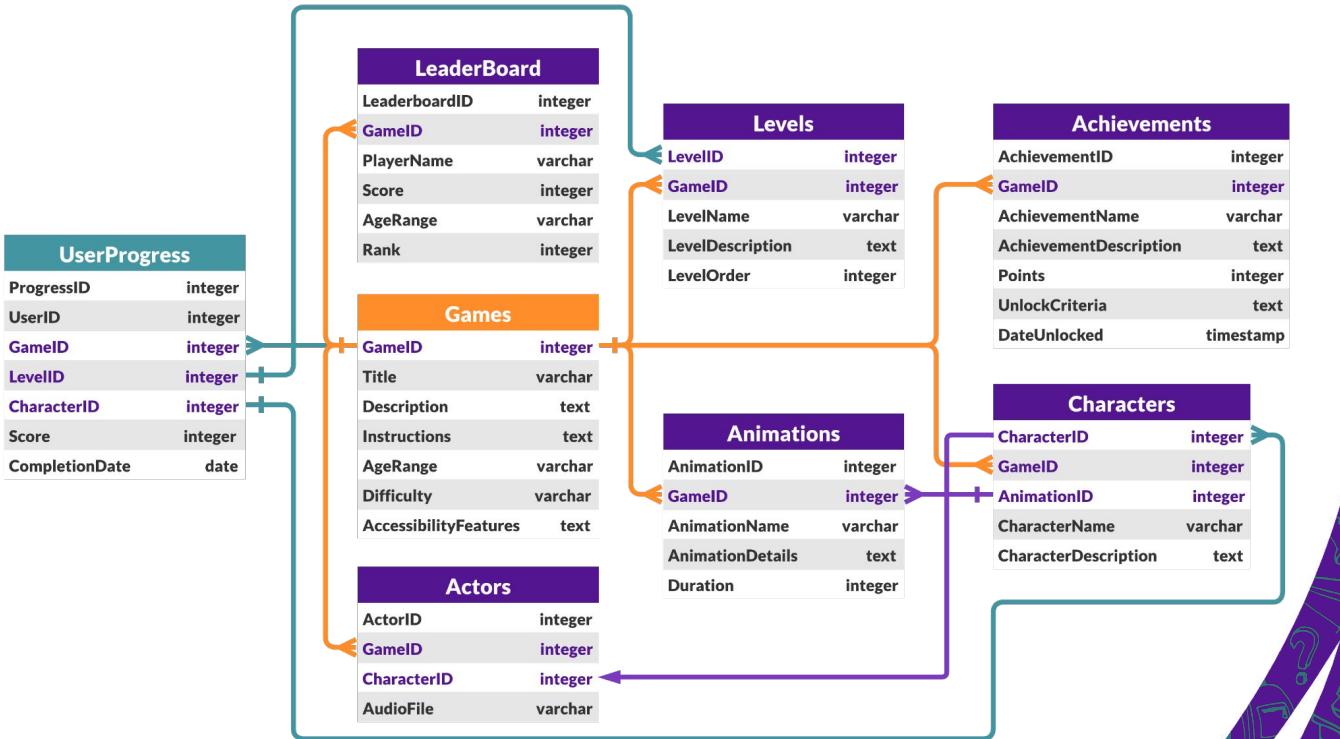
User Registration



Database Schema



Database Schema



RWP vs. Prototype

| Features & Functionality | RWP Features | Planned Prototype | Actual Prototype |
|---------------------------|--------------|--|------------------|
| PC & Tablet compatibility | ✓ | ✓ | |
| Characters+ Animations | ✓ | ✓ | |
| Accessibility Features | ✓ | Text-to-Speech | |
| Educator Tools | ✓ | Printable Graphics, Progress Tracking | |
| Paid Features | ✓ | | |
| Games for k-12+ | ✓ | 3 games, scaled for 3 general age groups | |

Software/Hardware Tools

Development Tools

Version Control: Git/GitHub

Issue Tracking: Trello

Unit Testing: JavaScript
(Mocha, Chai)

IDE: Visual Studio Code

Collaboration Tools

- Discord
- Zoom

3rd Party Software

- TBD

Back-End

Web Server: Node.js

Languages:

- JavaScript
- C#
- GDScript

Engine: GODOT

Database: PostgreSQL

Hosting: HostGator

Front-End

Framework: React

Languages:

- JavaScript
- HTML5
- CSS



Conclusion



- **Nationwide lack of logical fallacy identification skills**
- **Our games and resources will strengthen those skills**
- **Prioritize critical reasoning in U.S. schools at all grade levels**

Questions?
Comments?

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