Lab 1 – ReasonED.io Product Description

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1. **Introduction**

In a day and age where social media has grown to new levels, and people are interacting with each other more over the internet, people need to learn and reinforce their critical thinking skills to avoid misinformation. With logical fallacies sneaking their ways into online discussion, one will need to be able to discern the truth from lies.

For example, the figure below shows a social media post, detailing this person's experience at an American Airlines airport. They claim that the rudeness of the flight attendants at American Airlines is the reason for their bankruptcy. Without doing the proper research however, it would be impossible to know the true reason behind any financial struggles that American Airlines might be facing. Posts like these that misinform people could cause irreparable harm to brands or ideas, as people may not do anymore research and follow this unfounded claim.

Figure 1: Causation Fallacy

In a study performed by Bouygues, titled "Teaching Critical Thinking in K-12", it was found that 86% of the 4th-grade teachers placed an emphasis on deductive reasoning in their courses. However, as you reach the 8th-grade level, the number was found to significantly drop to around 39%. In a study conducted by the Cambridge University in 2019, they state that half of the teachers in the study expressed concerns about the time they had to teach proper critical thinking skills. This study also stated that only 21% of teachers agreed with the statement that they had the proper resources to teach these skills. As teachers struggle to teach deductive reasoning skills, high school graduates are left unequipped to handle logical fallacies in an increasingly online world.

Educators looking to include deductive reasoning skills in their curriculums will have to create or find other online resources to use, as many curriculums do not adequately cover these topics. A solution that uses these resources could potentially come with issues however, as

students need to reference this material throughout the year. If students are only taught these skills once in a school year, they may not be able to properly utilize these skills when exposed to logical fallacies. A proper solution would have to include a proper schedule, along with the adequate resources to teach these skills.

The ideal solution would have to include a way for teachers to teach these critical skills, a way to easily reuse materials, and be able to span these resources through multiple grade levels. With teachers already struggling for time, this solution needs to be easy to set up by educators, and easily usable by the students. ReasonED.io is a software solution created by Team Crystal to tackle these issues.

2. Product Description

ReasonED.io will be a game-based educational website that aims to improve the users' ability to identify logical fallacies in age-appropriate video games. The ReasonED website will host a series of games for all educational levels, from elementary all the way through high school and post-graduation. These games share the same goal of creating and improving critical thinking skills, as well as logical fallacy identification skills. The difficulty of these games will vary, with the difficulty scaling to the selected age level.

A series of games planned for ReasonED includes one where each game involves a logical fallacy personified as a character with quirks relating to the fallacy they represent. The character will encounter different scenarios relating to the fallacy, and the player must choose the correct responses to progress each game. Each game in this series will correspond to an age level, with games having increasingly complex scenarios as the age level increases. A few games planned for this series are listed below:

- **Straw Manny:** Straw Manny is a hopeful knight who needs better training. He only practices combat on fake straw men because they're easier to hit. As a result, he isn't a very skilled fighter. 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.
- **Hasty Harry:** Harry is always in a rush to make decisions. Players must help him collect all the puzzle pieces before he rushes to complete the puzzle, teaching the "hasty generalization" fallacy.
- **Slippery Slope Sadie:** Sally often jumps to extreme conclusions. Players need to guide her safely down a winding path without letting her slip into a pitfall, introducing the "slippery slope" fallacy.

Some of these game concepts are targeted towards a younger audience, with the idea that personifying the fallacies will help individuals to remember the experiences they had with them. This will help users use their skills to identify fallacies, as their experience with these characters are likely to be more memorable than regular curriculums.

2.1. Key Product Features and Capabilities

ReasonED will host games to be playable directly on a website, which allows users to play without requiring any downloads or logins. However, users are welcome to register for a free account which can save any accessibility options or keep track of progress throughout the games. The games found on ReasonED are curated to grade levels including elementary, middle school, high school, and beyond. These games are intended to support students throughout the school year at all grade levels. These games will include optional in-game tutorials, along with accessibility options such as text-to-speech. Readings will also be provided to introduce the concept of logical fallacies at each grade level, this will help users who may not have accessed the site through a school system. ReasonED is designed to be easily accessible in school networks, so that students can use the website during their free time. This web-based approach makes ReasonED easier to use in classes as schools push to incorporate newer technologies.

2.2. **Major Components (Hardware/Software)**

ReasonED.io will be accessed through both desktop and tablet web browsers. ReasonED will require the necessary components such as the website interface, the collection of games, and access to other uploaded resources. You can find a list of the selected development tools in the sections below.

2.2.1. Back-End:

ReasonED will utilize a Node.js web server, since it is known for its scalability and flexibility. The Godot game engine, which allows for two-dimensional games to be hosted and playable from within an internet browser. The Godot game engine supports both C# and its own proprietary scripting language GDScript. A PostgreSQL database will be utilized for storing user data. The final host has yet to be finalized, but the two selections are HostGator, or 000webhost.

2.2.2. Front-End:

React, HTML, and CSS will be utilized to develop a responsive and unintrusive user interface. The PostgreSQL database mentioned previously was selected for its reliability and performance, which helps make the interface and service feel more responsive.

2.2.3. Development Tools:

ReasonED will be developed through Visual Studio Code IDE since it allows for an efficient programming workflow. Github (and other local versions of Git) was selected for version control, which helps maintain the codebase as the service is developed. Other tools like Mocha and Chai will be utilized to help the testing processes throughout development. Discord and Zoom services will function as communication tools for the developers, which allows for quick communication and coordination across the team.

3. **Identification of Case Study**

ReasonED is a scalable educational platform intended to be used and accessible to a diverse userbase. The use of lightweight tools and game engine allows ReasonED to be utilized despite traditional educational boundaries. ReasonED benefits two groups, categorized as **Customers** and **End Users**.

3.1. **Intended Users**

Customers:

1. **K-12 Schools**: ReasonED contains games and activities designed to support education through the K-12 learning levels. ReasonED is designed to support critical thinking skills in students.
2. **College and Universities**: ReasonED is intended to serve as a supplement to other course material. ReasonED utilizes educational games to improve logical fallacy education.
3. **Educational Publishers**: ReasonED can provide resources to educational publishers looking to enhance their critical thinking education services.

End Users:

1. **K-12 Students**: ReasonED enhances logical fallacy education at all levels for K-12 students. ReasonED is intended to be used by both public and private schools alike, including accessibility to homeschoolers.
2. **College Students**: College students can use ReasonED to improve their critical thinking skills, and it can be used as an entertaining respite from the usual coursework.
3. **Educators**: ReasonED supports educators at all levels, providing a useful and engaging way to reinforce critical thinking skills in students.
4. **General Public**: ReasonED's accessibility encourages the public to learn or improve their critical thinking and logical fallacy identification skills.

3.2. **Intended Use**

ReasonED intends to provide useful and engaging logical fallacy education services to educational stakeholders looking to expand their resources. ReasonED serves to supplement critical thinking resources in more traditional curriculums, providing an entertaining and informative way to enhance this skillset.

3.3. **Case Study Group**

ReasonED's goal of education and accessibility will be supported by collaborating with local school systems to gain platform approval in educational environments. Collaboration with school officials allows ReasonED to develop and integrate into school systems as a valuable logical fallacy educational tool.

3.4. **Future Use**

ReasonED's designed accessibility allows the user base to expand beyond traditional education systems. ReasonED welcomes everyone to further their critical thinking skills, from the average person to enthusiasts of logic. ReasonED's goal: to create an easily accessible and adaptable educational tool focused on logical fallacies and critical thinking. ReasonED will help foster and support critical thinking skills across diverse user-profiles, and to help support the current education systems.

4. **Product Prototype Description**

The prototype is designed to be an immersive demonstration of the envisioned ReasonED platform, showcasing the experience and features to stakeholders. This prototype operates within a simulated environment, which showcases planned functionalities, menu interactions, and playable prototype educational games. The breakdown for the prototype is listed below in Table 1.

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+	✓	1 Game Elementary, 1 Middle, 1 High School	

Table 1: Real World Product vs. Demo Prototype

4.1. **Prototype Architecture (Hardware/Software)**

For the front-end, React will be used as the framework for responsive and interactive user interfaces. JavaScript, HTML5, and CSS will be used for the front-end as well. For the back-end, a Node.js web server will be used. The educational games will be built on the Godot engine, which uses C# and JavaScript as its programming languages. Godot also utilizes its own proprietary scripting language, GDScript. HostGator will be used for hosting the servers, and a PostgreSQL database will be used for its performance and reliability.

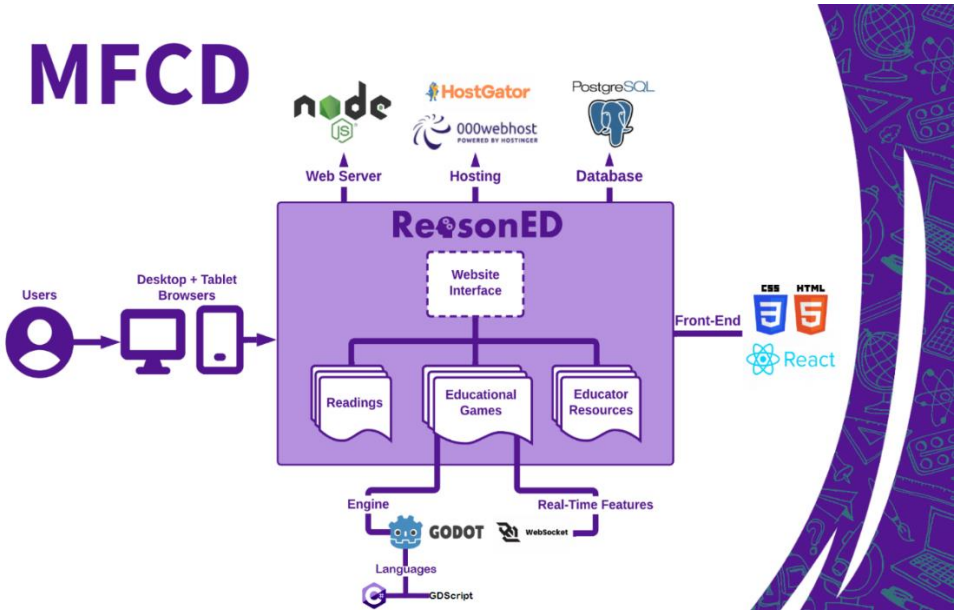

Figure 2: Multi-Functional Component Diagram

4.2. **Prototype Features and Capabilities**

A functional game prototype will be developed for the three K-12 levels: Elementary, Middle School, and High School. These games will showcase multiple two-dimensional characters and functioning animations for both the characters and interface. Each game will offer tutorials and accessibility options, with each game being designed for both desktops and tablets. Printable graphics and progress tracking will also be showcased in the prototype.

4.3. **Prototype Development Challenges**

As this prototype was designed, there were a few expected challenges to overcome as ReasonED reaches some of its goals.

1. **Technical Compatibility:** Providing support for many platforms requires extensive testing to ensure a stable and optimized experience across devices.
2. **Characters and Animations:** Complex animations are a design problem that needs to be accounted for in order to provide a smooth and engaging experience across platforms. Characters and interface elements need to be designed with this constraint in mind to provide an optimized experience.
3. **Accessibility Integration:** Customizable Text-to-Speech creates an interesting design and development challenge. These settings need to be easily accessible, but not hinder the otherwise seamless user experience.
4. **Educator Tools and Progress Tracking:** Progress tracking is important to keep students on track. These tools need to be comprehensive in features but also easy to access and understand.
5. **Diversified Educational Games:** Games need to feature diverse experiences tailored to the educational level. Each game faces unique design problems, as they need to be both challenging and entertaining at each level.

These challenges will require steady collaboration between developers, educators, designers, and the user base. User feedback loops and continuous testing is vital to reaching the standards set by ReasonED, and an iterative developmental approach will be needed to create the best educational experience.

5. **Glossary**

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).

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.).

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