Lab 1 – ReasonED.io Product Description

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Collaborative Outline Version 1

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1. Introduction

In this digital era, where the internet serves as a vast source of information, the need for sound critical thinking skills is more significant than ever. However, with the abundance of online content, we face a pressing societal challenge: the prevalence of logical fallacies, misinformation, and a lack of emphasis on critical reasoning skills.

Figure 1 shows the causation fallacy in a social media post about the quality of work by an American Airlines employee. The causation fallacy, also known as "post hoc, ergo propter hoc", translates to "after this, therefore because of this." The creator of this comment suggests that the reason the airline company is failing is due to the rude employees they experienced at American Airlines. However, without the proper research, there is no way to confirm that the cause of the American Airlines bankruptcy was due to rude employees. A claim such as the one shown above can cause major harm to someone or something's reputation, as someone without the proper critical thinking skills may spread this misinformed idea without doing their own research. This is one example of a fallacy, and the figure shows just how far these fallacies can spread with this post being shared more than 2,100 times.

Figure 1: Causation Fallacy

A report titled "Teaching Critical Thinking in K-12" noted that among 4th-grade teachers, 86% emphasized teaching deductive reasoning, but this figure sharply declines to a mere 39% among 8th-grade teachers when expressing the same sentiment. Moreover, in a 2019 global survey conducted by Cambridge, 50% of teachers indicated they do not have enough time to effectively teach these skills, and only 21% of teachers agreed that they possess all the necessary resources to cultivate these skills. Educators often find themselves unable to effectively teach deductive reasoning among students, and as a result, high school graduates are not prepared with the skills necessary to identify logical fallacies in an increasingly online world.

Many existing curriculums do not include adequate resources for teaching logical fallacies. If educators wish to emphasize these concepts, they must spend time either creating their own materials or searching through the internet to find potential tools. Then arises another challenge: if the resources are not reusable over the course of the year, students will not develop adequate skills, and if there are not similar resources across grade levels, students will forget the

material and fail to build on the skills they have acquired. Only if all of these elements come together will students be fully supported to build their skills in logical fallacy detection.

An optimal solution should account for these common pitfalls by having resources that are both reusable in a way that still builds on fallacy identification skills and curated for multiple grade levels ranging from elementary to high school. As educators lack the time needed to create their own resources, a solution must emphasize ease of use by being quick for educators to set up and easy to guide students through. Team Crystal is proposing a software solution: ReasonED.io.

2. Product Description

ReasonED.io will be a game-based learning website that improves the ability of users to identify logical fallacies through simple, age-appropriate games. The website will host an elementary school collection of games, a middle school collection of games, a high school collection of games, and an adult collection of games, respectively. They will all share the same goal of introducing and improving logical fallacy identification skills, but the difficulties and approaches will vary depending on the age group.

One game series that the website will host is one in which each game revolves around a logical fallacy personified as a fun character with a unique quirk. The character will encounter different disagreements (e.g. disagreement with another character) that they need to respond to. All but one of the potential responses will be a logical fallacy corresponding to the character. Players must help the characters choose valid responses to progress the game. Each game in this series will be curated for elementary, middle, and high school students through changes to the complexity of the scenarios and responses. A few of the games in this series will be:

- **Straw Manny:** This character is always building straw houses that keep falling down. Players need to help Straw Manny find the best materials to build a sturdy house, 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 Sally:** 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.

While the concepts and scenarios are simplified for younger ages, these games aim to plant the seeds of critical thinking and encourage kids to recognize flawed reasoning. The fallacy characters serve as memorable guides in this educational journey.

2.1. Key Product Features and Capabilities

ReasonED games will be playable directly on the website. Logging in or downloading will not be necessary to play. Signing up will be completely free. ReasonED games will be curated for elementary, middle, and high school respectively to support year-long learning and

continuous learning over all grade levels. Thus, it 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. The games will include In-game tutorials. The text in the games will have text-to-speech options for better accessibility. The website will contain readings to help introduce the concept of logical fallacies to each individual age group. This is to provide brief background knowledge to users in case they are accessing the site outside of a school lesson. These readings will have text-to-speech options as well. Because our solution is a website, once it is whitelisted on school networks, students can access it in their free time during school. Given how schools are pushing to incorporate more technology into lessons, ReasonED has the potential to gain a lot of exposure even outside of language arts classes.

2.2. Major Components (Hardware/Software)

Users will interact with ReasonED.io through Desktop and Tablet browsers. The components being developed are the website interface, its collection of games, and its educator resources. The following software tools will be utilized to build those components.

Back-End:

ReasonED will use a Node.js web server, which offers scalability and flexibility. ReasonED games will be built using Godot engine, with C# and GDScript as its programming languages. Godot is a powerful open-source engine for two-dimensional games and can allow us to create engaging game-based learning experiences all within the web browser allowing us to reach a large audience from a variety of devices. Either HostGator or 000webhost will be used to host the website.

Front-End:

ReasonED will use React, which enables responsive and interactive user interfaces that will make learning more enjoyable, in addition to HTML and CSS. It will use a PostgreSQL database, which is known for its reliability and performance and can assist in storing user data securely.

Development Tools:

Git and GitHub will be used for version control as they are a reliable way to track changes in the codebase. Trello will be used to keep track of tasks, issues, and milestones. JavaScript libraries such as Mocha and Chai will ensure the reliability of the code through testing. The IDE of choice is Visual Studio Code, which provides a smooth and efficient coding experience for the team. Discord and Zoom will serve as the primary means of communication and coordination among team members.

3. Identification of Case Study

3.1. Intended Users

ReasonED, at its core, is a dynamic educational platform meticulously crafted to cater to a diverse set of users, transcending traditional educational boundaries. The primary beneficiaries of this innovative platform are categorized into two groups: **Customers** and **End Users**.

Customers:
1. **K-12 Schools:** ReasonED aims to play a pivotal role in K-12 education, supporting educators in enhancing critical thinking skills among students.
2. **Colleges and Universities:** In higher education, ReasonED serves as a valuable supplement to classroom learning, offering an interactive and gamified approach to logical fallacy education.
3. **Educational Publishers:** ReasonED becomes a sought-after resource for educational publishers seeking innovative tools to elevate their offerings.

End Users:
1. **K-12 Students (including Homeschoolers):** ReasonED transforms logical fallacy education, providing a dynamic and accessible learning experience.
2. **College Students:** College students find ReasonED a complementary tool to reinforce their understanding of logical fallacies, with a gamified environment adding an interactive layer to traditional coursework.
3. **Educators:** Educators at all levels discover a valuable ally in ReasonED, providing an interactive and engaging resource to enhance logical fallacy education.
4. **General Public:** While designed primarily for educational institutions, ReasonED is intentionally crafted to be accessible to the general public.

3.2. Intended Use

The intended use of ReasonED revolves around providing engaging and effective logical fallacy education to different educational stakeholders. It serves as a supplement to traditional classroom learning, offering an interactive and gamified approach to enhance critical thinking skills.

3.3. Case Study Group

To further enhance the utility and accessibility of ReasonED, we envision collaboration with local schools to gain approval for the platform's usage in their educational environments. By working closely with school administrators and educators, we aim to integrate ReasonED into their curriculum as a valuable tool for logical fallacy education.

3.4. Future Use

As ReasonED evolves, we envision a future where the user base extends beyond traditional educational stakeholders. Lifelong learners, enthusiasts of critical thinking, and those interested in fostering a culture of logic and reasoning are all welcomed into the platform's versatile embrace. Our goal is clear: to create a widely accessible and adaptable tool for logical fallacy education, fostering critical thinking across diverse user-profiles and enriching the educational landscape.

4. Product Prototype Description

The prototype is an immersive representation of the envisioned ReasonED platform, providing stakeholders with a tangible experience of its key features. Operating within a simulated environment, the prototype offers a dynamic preview of the planned functionalities, interactions, and educational gamification. Here's a breakdown of the prototype:

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 vs. Prototype

4.1. Prototype Architecture (Hardware/Software)

- Front-End
    - Framework: React
    - Languages: JavaScript, HTML5, and CSS
- Back-End
    - Web Server: Node.js

- Languages: JavaScript, C#, GDScript
- Engine: Godot
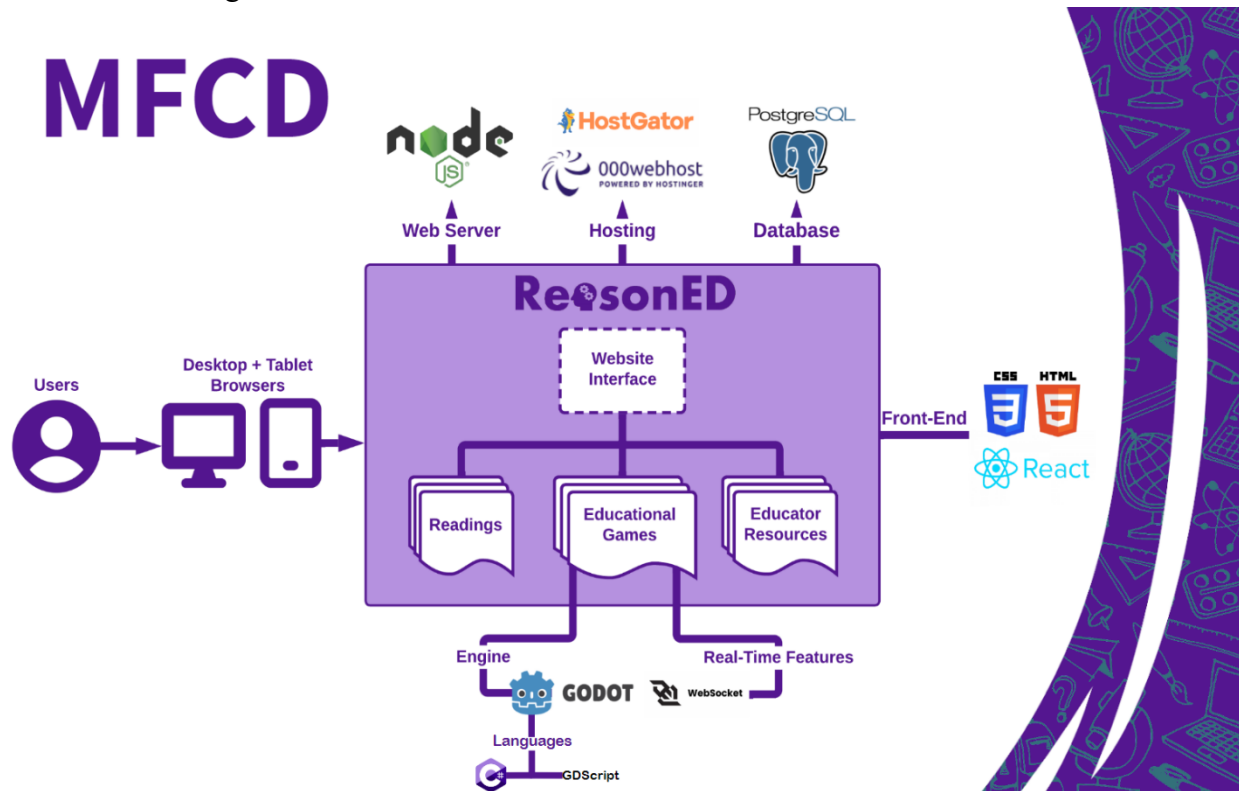- Database: PostgreSQL
- Hosting: HostGator

Figure 2: Multi-Functional Component Diagram

4.2. Prototype Features and Capabilities

- At least one game for elementary, middle, and high school, respectively
- 2D Characters & Animations
- In-Game Tutorials
- PC & Tablet Compatibility
- Text-to-Speech
- Printable Graphics
- Progress Tracking

4.3. Prototype Development Challenges

While developing the ReasonED prototype, certain challenges will also appear in each of the prototype's features and capabilities:

1. **Technical Compatibility:** The challenge lies in addressing the fragmentation of devices and operating systems. Ensuring a consistent and optimized user experience across

various PCs and tablets, each with different specifications and screen sizes requires testing and adaptation.

2. **Characters and Animations:** Implementing diverse characters with interactive animations demands overcoming challenges related to animation complexity. Balancing engaging visuals, and interactivity, and ensuring smooth performance across devices will be a key focus.

3. **Accessibility Integration:** Crafting a customizable Text-to-Speech feature introduces challenges in accommodating diverse user preferences. Striking the right balance between customization options and a seamless user experience poses a design and development challenge.

4. **Educator Tools and Progress Tracking:** The challenge is to develop educator tools that are not only comprehensive in tracking progress but are also user-friendly. Designing intuitive interfaces for printing graphics and tracking student progress will require a deep understanding of educator needs and preferences.

5. **Diversified Educational Games:** Developing educational games for different K-12 levels presents the challenge of maintaining both diversity and consistency. Each game should be tailored to the specific educational needs of its target audience while ensuring a cohesive overall experience.

Addressing these challenges will involve close collaboration between developers, designers, educators, and potential users. Continuous testing, user feedback loops, and an iterative development approach will be instrumental in refining the prototype to meet the standards set by ReasonED.

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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