Lab 1 – ReasonED.io Product Description

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1.   Introduction

The rise of the Internet as a global phenomenon has allowed people to communicate with each other to an extent never seen before. On top of this, every person can potentially have their voice heard by thousands, if not millions. Unfortunately, this has led to a proliferation of misinformation. Logical fallacies, which are errors in judgment used to substantiate claims, are prevalent in social media, and as there is too much information posted for it to be independently fact-checked, it becomes users' responsibility to determine which posts contain logical fallacies. An example of one such post is shown in Figure 1.

Figure 1: Causation Fallacy

The post shares an ancedote about how this person was treated rudely by a flight attendant and then claims that this is why American Airlines is bankrupt. This is a case of the causation fallacy, as it suggests that one event (rude flight attendants) has caused another event (bankruptcy) without proper research validating this claim. This post has since been shared by over two thousand people, so it can be seen that logical fallacies like this can cause major damage to a company's or individual's reputation if users browsing the site are not aware of said fallacies.

Although computer literacy and detecting logical fallacies is more important than ever, educators do not have the resources necessary to teach these concepts to younger students. A report titled "Teaching Critical Thinking in K-12" said that 86% of 4th-grade teachers

emphasized teaching deductive reasoning, but this percentage plummeted to 39% of 8th-grade teachers emphasizing this. Additionally, according to a global survey conducted by Cambridge in 2019, 50% of teachers said they do not have enough time to teach these skills, and only 21% of teachers said they had sufficient resources to do so. Resources that help students learn how to reason and avoid fallacies must be tailored to the age of the students, and deductive reasoning is a skill that must be taught throughout a student's schooling, which means that different levels of resources are required. As a result, even teachers that are capable of helping their students with this may not have an impact in the long-term if the grades above do not reinforce these concepts.

There is a clear need for an application that addresses all of these concerns while being easy to use by both educators and students. Team Crystal proposes ReasonED.

2.   Product Description

ReasonED will be a website that teaches students how to identify and correct logical fallacies through educational games. Games will vary in complexity and subject matter so that students of all ages can learn through the website and provide a strong foundation for a lifetime of deductive reasoning. All games will introduce logical fallacies and present them as fun characters, though games for younger players will have certain concepts simplified.

2.1.   Key Product Features and Capabilities

As mentioned in Section 2, all games will be accessible via the ReasonED website. Games will be playable for free and will not require an account, but registration will be needed to save progress. Each game will be made for a certain age demographic and have an in-game tutorial, and the website will have corresponding readings on logical fallacies for each game. Text-to-speech will also be implemented as an accessibility feature in the games. For educators,

the website will have printable graphics and links to external resources related to logical fallacies

and reasoning in general.

2.2.   Major Components (Hardware/Software)

The frontend will be written in HTML, CSS, and JavaScript, using the Tailwind

framework for CSS and Next.js for React. The backend will use Node.js for the web server and

PostgreSQL for all databases. The games will use Godot, a game engine, and will be

programmed in a combination of C# and GDScript. Hosting will be provided by 000webhost.

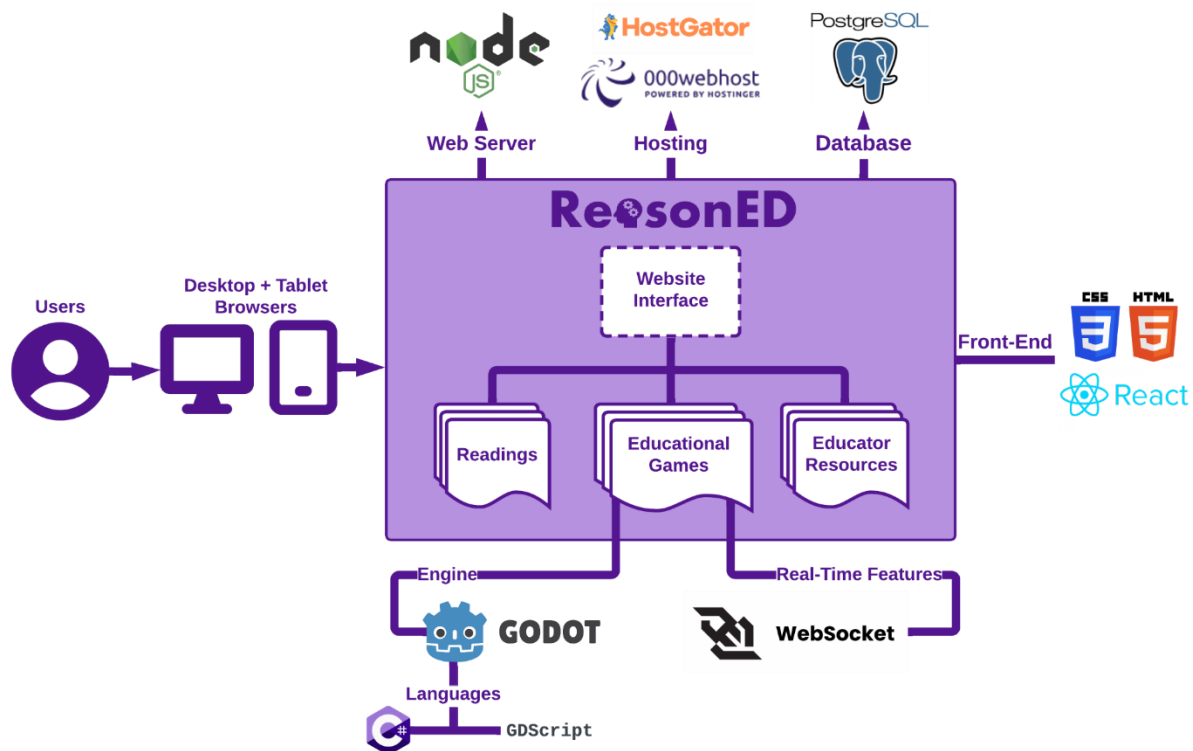The real world product (RWP) MFCD is shown in Figure 2.

Figure 2: Multi-Functional Component Diagram

3.   Identification of Case Study

While the scope of ReasonED as an educational tool is wide enough to be usable by the public, it is primarily being developed for students and educators.

3.1.   Intended Users

Broadly speaking, ReasonED caters to two groups of people: "customers" and "end users". The customers group consists of not only K-12 schools, but also universities and even educational publishers. The end users group, of course, consists of students of all ages, but it also includes educators. ReasonED will be designed so that the public may also use the website as end users.

3.2.   Intended Use

ReasonED intends to be a platform where educators can teach their students how to apply deductive reasoning in a fun and engaging manner. It will either be used as a supplement to traditional classroom learning or as a standalone resource in the case of schools unable to effectively provide resources on critical thinking in their curriculum. Because ReasonED will be an educational website, it is envisioned that it will be whitelisted on school networks so that students may use it during their free time.

3.3.   Case Study Group

As an educational resource, ReasonED will require collaboration with educators and school administrators if it is to be widely adopted. With time, it is envisioned that ReasonED will even become a part of school curriculums worldwide.

3.4.   Future Use

Although ReasonED is intended to be used by schools, it will be designed so that others can make use of the logical fallacy resources on the website. Anyone interested in improving their reasoning skills and engaging in thoughtful discourse will be welcome to use ReasonED.

4.   Product Prototype Description

The ReasonED prototype will consist of three different games: Straw Manny, Hasty Harry, and Slope Sadie. Each of these games will be meant to teach a different logical fallacy and how to circumvent each one. Straw Manny will focus on Manny, a knight who has only practiced on strawmen and so has not developed his combat skills; players will need to determine which monsters make use of the strawman fallacy in order to fight them. In Hasty Harry, the astronaut Harry makes hasty generalizations about the planets and creatures he lands on, so players will need to accurately assess information about each planet to prevent Harry from jumping to conclusions. The final game, Slope Sadie, will revolve around the slippery slope fallacy. In this platforming game, the snowboarder Sadie will need to be safely guided down a steep slope and avoid pitfalls.

4.1.   Prototype Architecture (Hardware/Software)

The prototype architecture will be identical to the RWP's architecture. The frontend will be relatively simple and be written in HTML, CSS, and JavaScript. The Tailwind framework will be used for CSS, and Next.js will be used for everything else. Meanwhile, the backend will use Node.js for general server work and PostgreSQL for the databases. The games themselves will use the Godot game engine and will be programmed in a combination of C# and GDScript, the latter of which being a part of Godot. All of this will be hosted by 000webhost. The prototype MFCD is shown in Figure 3.
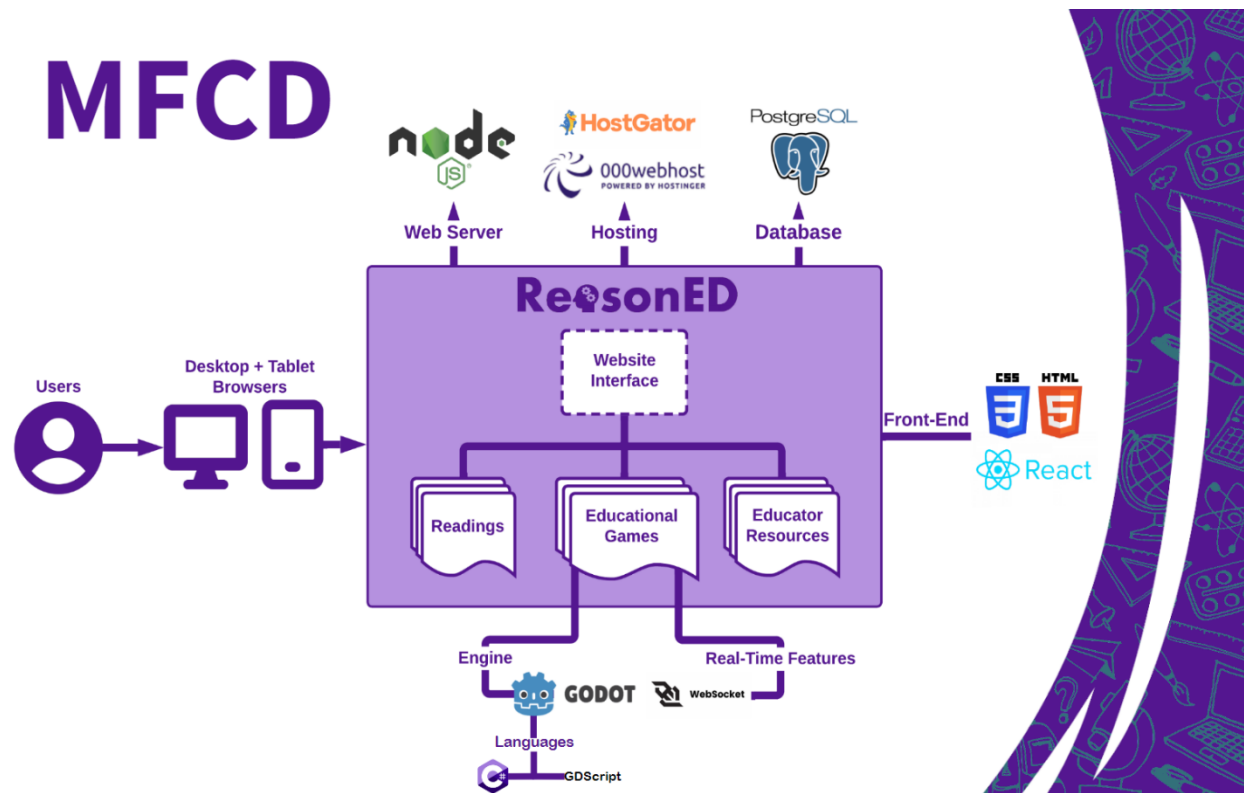
Figure 3: Prototype Multi-Functional Component Diagram

4.2.   Prototype Features and Capabilities

The three games will each be tailored for a specific age group: Straw Manny for elementary schoolers, Hasty Harry for middle schoolers, and Slope Sadie for high schoolers. For the prototype, each game will be two-dimensional, have in-game tutorials, and be compatible with PC and tablet interfaces. Progress in each game will be tracked, and printable graphics will be supported for educators. For accessibility, only a text-to-speech function will be added for each game. A table for the planned differences between the prototype and RWP is shown 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: Feature differences between RWP and Prototype

4.3.   Prototype Development Challenges

One of the biggest challenges for the prototype will be ensuring compatibility between all supported devices; because the games will run on tablets, a balance must be struck between graphics and performance. As ReasonED will cater to both students and educators of all kinds, accessibility is another concern to be addressed. Text-to-speech will be useful for students playing the games, but continuous dialogue between developers and educators will be needed to determine the kind of resources and tools the latter will most benefit from. Finally, because of the wide range of students ReasonED will support, tailoring each game for a specific demographic will pose a challenge. While developing the games as web applications will help mitigate some of these concerns, testing and communicating with potential users will be an ongoing process.

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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