$$P \rightarrow Q$$

$$\neg Q$$

$$\therefore \neg P$$

LogicPath

“Level up your thinking”

CS410 – Fall 2025

Team Emerald

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Team Bio

Paul Schacht:

Paul is a senior at ODU, studying Computer Science. His personal interests include software development, music production, and philosophy.

Krishna Paneru:

Krishna is senior at ODU, studying Computer Science. Her personal interest include software development, cooking and social work.

Caleb Anderson:

Caleb is a senior at Old Dominion University, studying Computer Science with a minor in Cybersecurity. He also recently completed his AWS Cloud Practitioner certification, and is currently working on personal projects involving Java, Python, and Rust.

Team Bio cont.

Mia Lai:
Mia Lai is a Computer Science Major at Old Dominion University. She is in her fourth year and has some previous experience in web development.

Trent Thorne

Trent is a Computer Science Major at Old Dominion University. He formally was a member of the US Coast Guard and is looking to start a career in software engineering.

Background

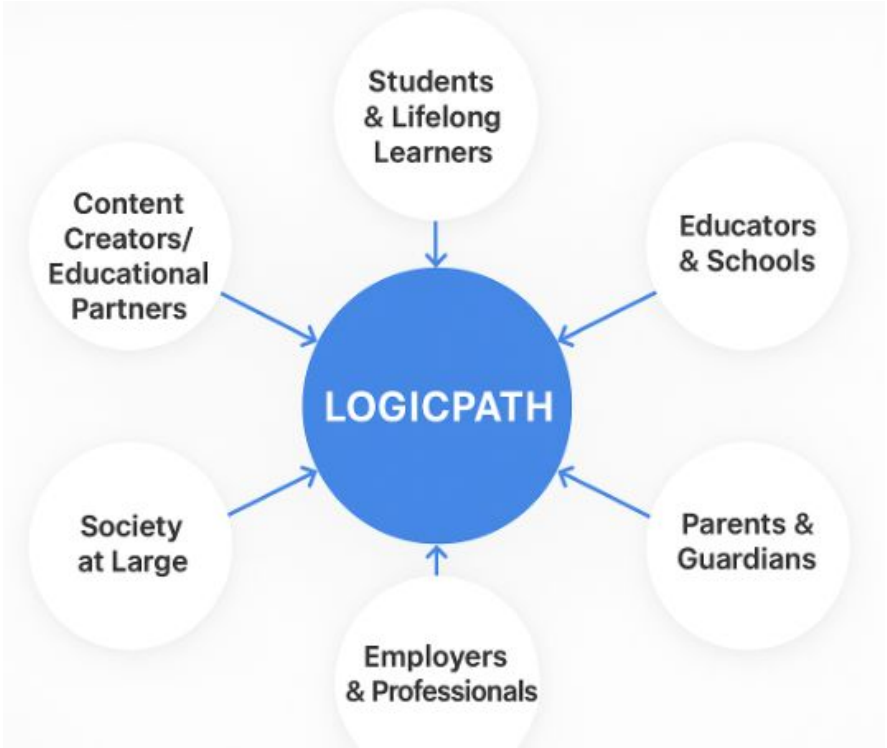
- Critical thinking is an essential skill
  - Spans across multiple domains like academics, civic engagement, personal decision-making, and more
  - Enables people to evaluate arguments, analyze information, and problem solve more efficiently
- Logic is the foundational bedrock of critical thinking
- *It can be viewed as a fundamental scaling stat where 'leveling it up' improves various aspects of your life*.
- Despite the value of logic and critical thinking, many of us struggle to develop it

Problem Statement

The existing educational resources surrounding logic, especially formal logic, are often dry and intimidating. Many traditional education resources rely on abstract symbolism and heavy technical terminology. ***Despite logical thinking being an incredibly important skill, there are no engaging, accessible resources on logic.*** Studies show that individuals who engage in more deliberative reasoning are better able to identify misinformation, while those who rely primarily on emotion show decreased ability to discern between accurate and inaccurate claims (Martel et al., 2020). In an era of rampant misinformation, the ability to parse and evaluate arguments has become more important than ever (Martel et al.).

Users/Customers/Stakeholders

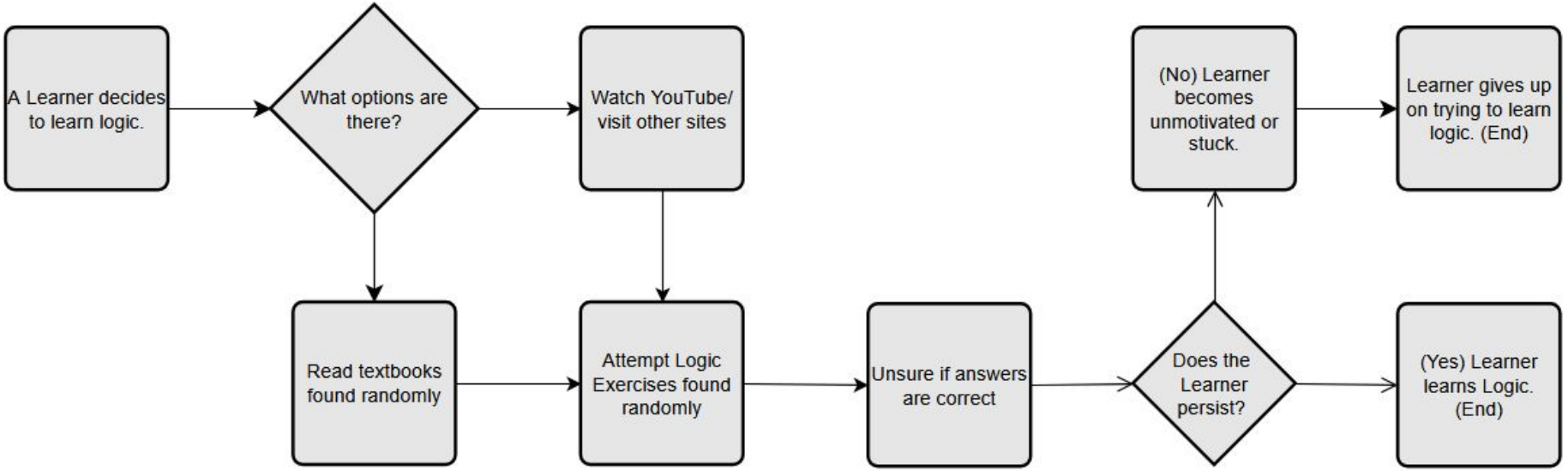
- **Users**
  - High School & College Students
  - Lifelong Learners
  - Educators
- **Customers**
  - Individuals
  - Schools / Educational Institutions
- **Stakeholders**
  - Students & Learners
  - Schools & Educators
  - Parents
  - Employers
  - Society



Problem Characteristics

- **No engaging resources in Logic**
  - Traditional logic resources are text-heavy and dry due to a lack of interactive and engaging content
  - Learners lose their motivation, reducing skill development
- **Poor real-world application**
  - Logic resources often focus on the theory, or at most, applies it to distilled, non-relevant arguments
  - Learners may struggle to apply formal reasoning skills to real-world situation

Current Process Flow



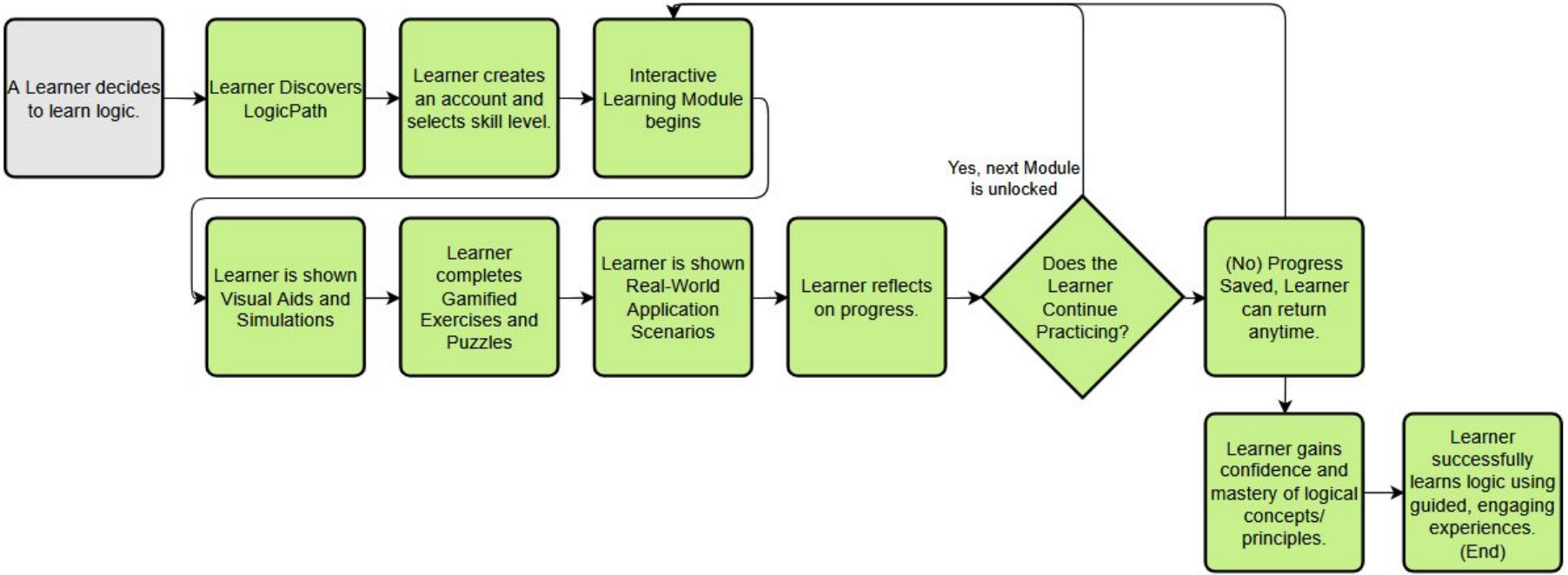
Solution

LogicPath is an interactive learning platform designed to make learning formal logic engaging, accessible, and fun. Delivered as both a web and mobile app, **LogicPath** blends education with interactivity and gamification to create a dynamic learning environment.

Solution Characteristics

- **Interactive Learning Modules**: Step-by-step lessons that gradually introduce concepts from everyday reasoning to formal logic.
- **Gamified Exercises & Puzzles**: Logic quests, challenges, and streak rewards to motivate continued practice.
- **Visual Aids & Simulations**: Diagrams and flowcharts to make abstract concepts easier to understand.
- **Real-World Applications**: Lessons tied to analyzing news, debates, and personal decision-making.

Solution Process Flow



Major Functional Component

Presentation Layer

User Interface
- Web Application

Student/Learner Profile
- Registration/login

Social/Engagement Features
- Sharing progress

Application Layer

• Learning Module Engine

• Gamification & Motivation Engine

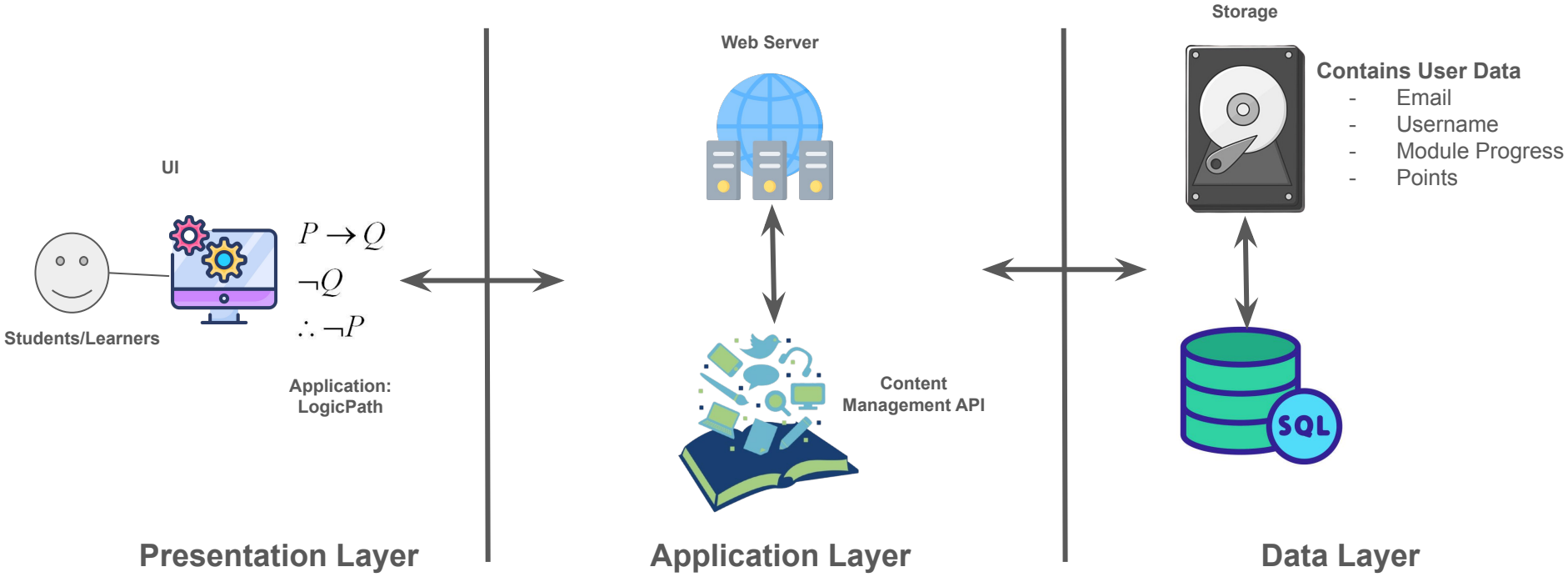
• Adaptive Learning Engine

• Assessment & Feedback Manager

• Content Management System

Data Layer
- User Data
  Profiles, preferences, learning history
- Store Data
  Address, Name, course Id
- Container Data

Major Functional Component Diagram



What LogicPath Will Do

- Provide Core Learning Goals
  - Provide a clear learning modules on the logic
  - Allow learns to apply theoretical concepts to practical contexts
- Contain Gamified Engagement
  - RPG Quest-style learning path with skills
  - Levels, points, and achievement tracking to motivate continued engagement
- Adaptive Learning Features
  - Personalized difficult adjustments based on user performance
  - Immediate feedback for failed attempts
  - Progress tracking menu for self-assessment
- Supporting Tools
  - Glossary/wiki on additional information
  - Tutorials the integrate theory with practice

What LogicPath Will Not Do

- **Replace formal classroom instruction**: This is a supplemental, engaging tool, not a full curriculum replacement.
- **Provide “brain training” without context**: Unlike Lumosity, exercises won’t be abstract games with no connection to real-world logic.
- **Act as a debate forum or social media platform:** There will not be debate between users. The focus is on building debate skills by analysing examples not through an active forum.

Competition Matrix

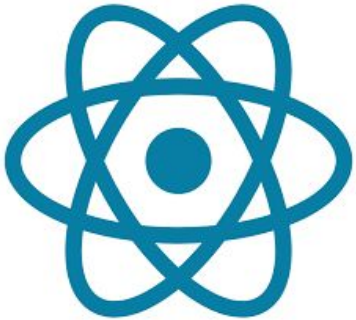
	Brilliant.org	Khan Academy	Lumosity	LogicPath
Reasoning	✓ Covers reasoning indirectly through math and problem-solving challenges	✓ Offers some content on critical thinking (mostly in test prep, reading, and argument analysis)	✓ Offers some content on critical thinking (mostly in test prep, reading, and argument analysis)	✓ Dedicated lessons on reasoning, from everyday logic to formal logic
Informal/Formal Logic	✗ Not a focus. Touches on reasoning in math only	✗ Minimal exposure (Basics on arguments in some humanities courses)	✗ None. Only focuses on brain games not structured logic	✓ Core feature is progressive modules on informal and formal logic
Engagement	✗ Limited gamification, mostly traditional problem sets	✗ Engagement relies on video format and quizzes	✓ Strong gamified elements using streaks, leaderboards & mini-games	✓ Gamified quests, challenges, and streaks tied to logic learning
Skill Development	✗ Builds math, CS, and puzzle-solving skills but not transferable logic skills	✗ Academic skills in specific subjects, but weak in general reasoning	✗ Improves short-term memory and focus, not reasoning skills	✓ Structured path to build long-term logic and critical thinking abilities
Theory Development	✗ Some exposure to STEM theories, but no logic theory foundation	✗ Mostly focused on applied content, theory limited	✗ No theory, only experimental games	✓ Lessons explicitly develop both logic theory and application

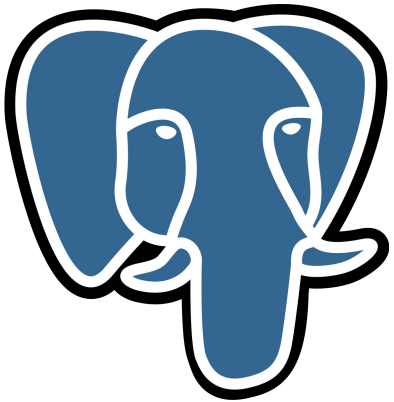
Development Tools

- **IDE**: VSCode
- **Version Control**: Git & GitHub
- **CI/CD**: GitHub Actions & Workflows

Tech Stack

- **Front-end Languages**: HTML, CSS, Javascript, React
- **Back-end Languages**: Node.js
- **Database**: PostgreSQL





Glossary

- **Logic:** the systematic use of symbolic and mathematical techniques to determine the forms of valid deductive argument.
- **Formal/Informal Logic:** Formal logic is based off deductively valid reasoning. Informal logic is based off natural languages.
- **IDE**: Integrated Development Environment
- **CI**: Continuous Integration
- **CD**: Continuous Deployment

References

Martel, Cameron, et al. “Reliance on Emotion Promotes Belief in Fake News.” Cognitive Research: Principles and Implications, vol. 5, no. 1, 7 Oct. 2020, pp.1–20, cognitiveresearchjournal.springeropen.com/articles/10.1186/s41235-020-00252-3, https://doi.org/10.1186/s41235-020-00252-3.