Spelling Bee

ICT Academic Report

May 18, 2025

Abstract

This academic report presents the development and implementation of a Word Pronunciation Typing Game. The game aims to enhance vocabulary building and spelling skills through an interactive audio-visual experience. Players listen to word pronunciations and must type them correctly within a time limit, with difficulty progressively increasing. The report details the core mechanics, educational value, development process, technical implementation, and challenges encountered during the project.

Contents

1 Introduction

The Spelling Bee is an educational game designed to improve vocabulary and spelling skills. This report documents the development process, technical implementation, and educational value of the game. The project demonstrates the application of programming concepts, game design principles, and educational theory in creating an engaging learning tool.

2 Core Mechanics

2.1 Overview

The game's primary mechanics revolve around audio recognition and typing accuracy. Players listen to a word pronounced via audio and must type it correctly within a time limit.

2.2 Key Features

- Real-time word pronunciation using pre-recorded audio
- 2.5D parallax background animation for visual engagement
- On-screen keyboard visualization to aid learning
- Sound effects for correct/incorrect answers and death penalty
- Score tracking and difficulty progression system

2.3 Challenge: Dictionary Limitations

- **The API Challenge:** One of the hardest aspects was implementing the dictionary API
- Unable to use Cambridge dictionary, necessitating the use of smaller dictionary services
- Smaller dictionaries lack advanced vocabulary or words with specific pronunciations
- Handling technical limitations while maintaining educational value proved challenging

3 Educational Value

The game provides multiple educational benefits:

- Vocabulary expansion through exposure to varied words
- Auditory learning reinforcement via clear pronunciations
- Typing accuracy practice in a gamified environment
- Spelling improvement through immediate feedback

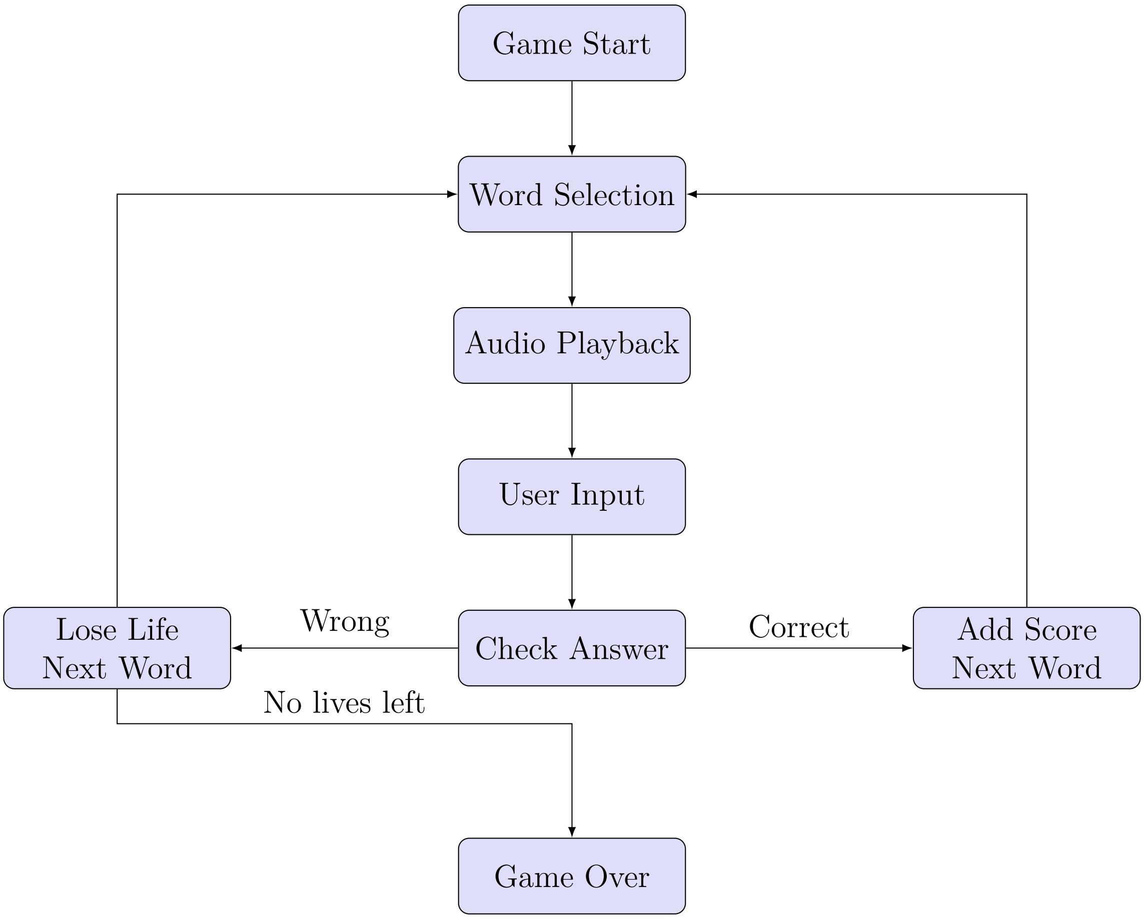

Figure 1: Game Flow Diagram

4 Development Process

4.1 Planning

- **Tools & Technologies Used:**
  - Python as the primary programming language
  - Pygame library for game development
  - Sound editing tools (Audacity) for audio processing
  - Graphic design tools (GIMP/Photoshop) for visual assets
- **Target Audience:** Students aged 8–16 or language learners
- **Game Flow Design:** Word selection from predefined list → Audio playback → User input → Result feedback → Next round

4.2 Asset Creation

4.2.1 Audio

- Word pronunciations recorded using text-to-speech or microphone
- Sound effects (correct, wrong, death) sourced from free sound libraries

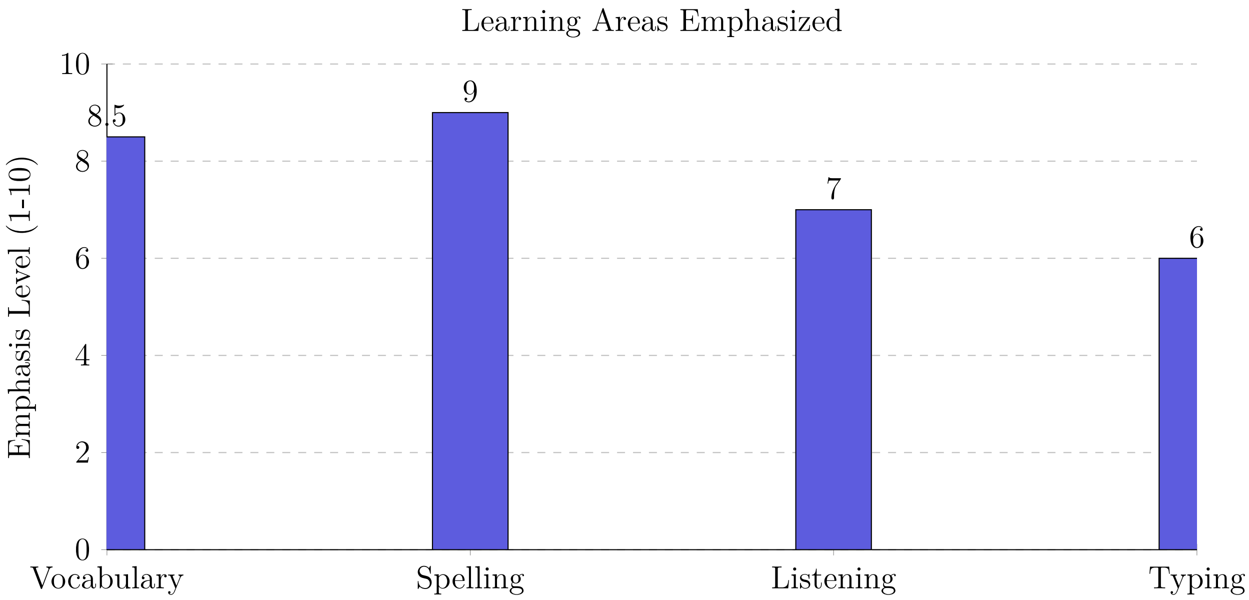

Figure 2: Educational Focus Areas

4.2.2 Graphics

- Parallax background layers (e.g., sky, mountains, ground)
- Keyboard button sprites for visual feedback
- UI elements for score display and game controls

4.3 Coding Phases

1. Word display and input validation
2. Pygame mixer for audio playback
3. Visual effects of scrolling and keyboard rendering
4. Animation/sound triggered on failure

5 Technical Details

5.1 Core Components

- **Main Libraries:**
  - pygame for graphics, audio, and input handling
  - random for word selection logic
- **Code Structure:**
  - Main game loop controlling game states
  - Word manager for selection and difficulty progression

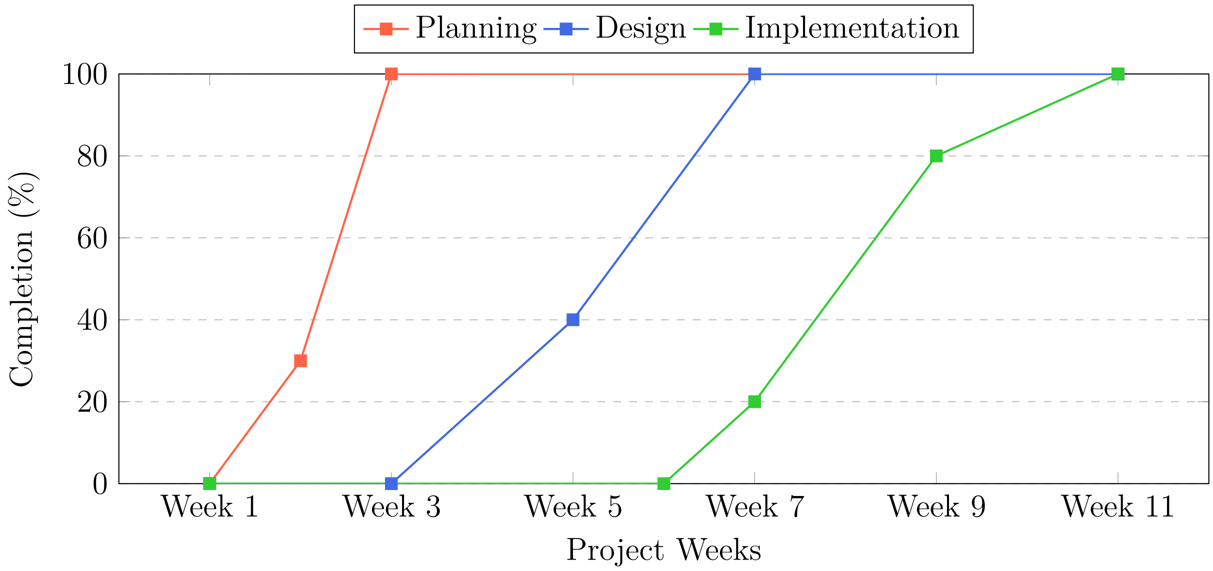

Figure 3: Project Development Timeline

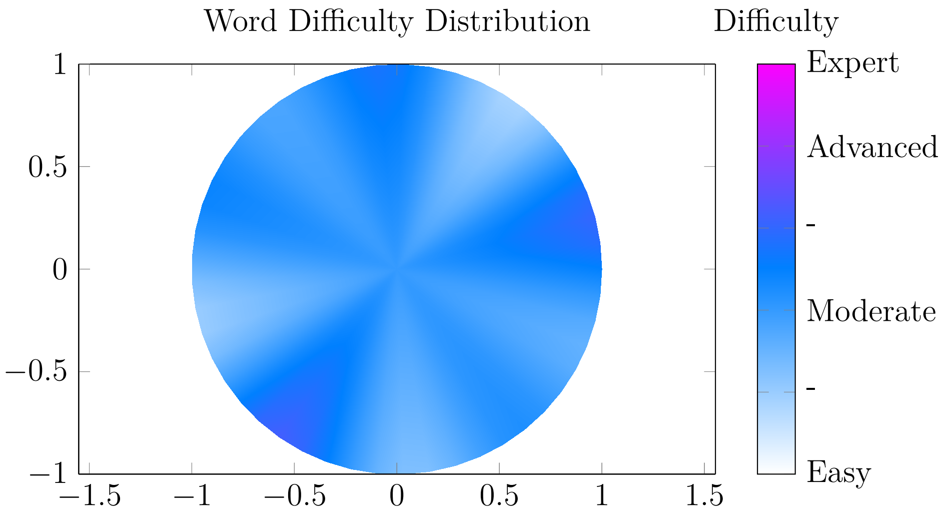

Figure 4: Visual Representation of Word Difficulty Distribution

- – Audio controller for sound effects and pronunciations
- – Input validator for checking spelling accuracy
- – Graphics renderer for visual elements

5.2 Implementation Challenges

5.2.1 API and Dictionary Integration

The most significant technical challenge involved implementing dictionary APIs:

- Cambridge Dictionary API was initially planned but proved unusable for the project scope
- Smaller dictionary APIs lacked advanced vocabulary or specific pronunciations

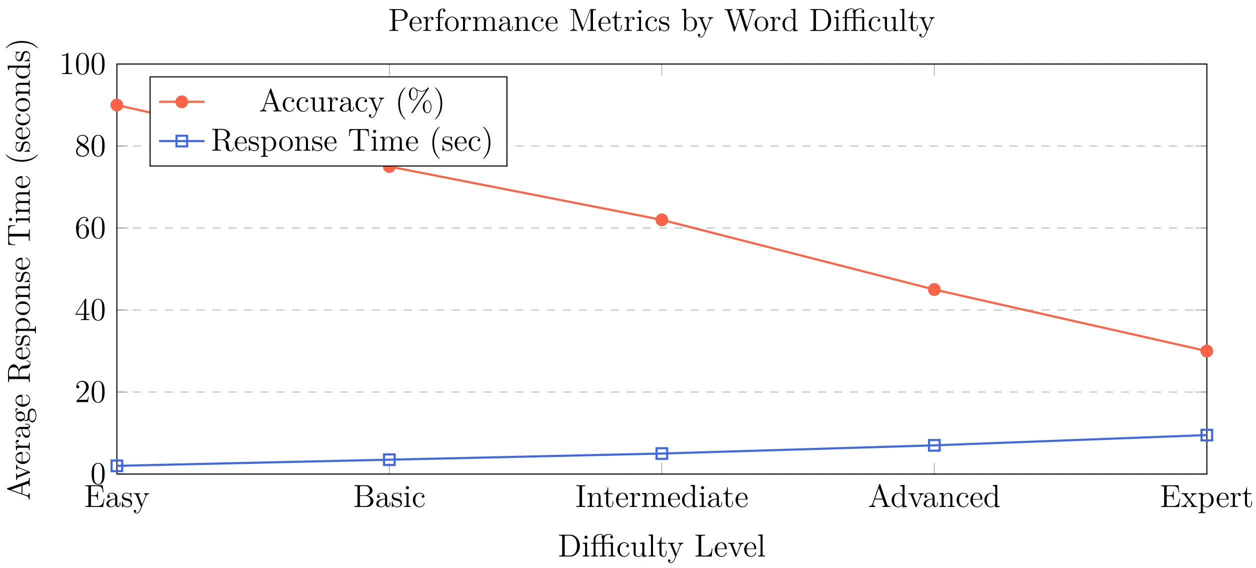

Figure 5: User Performance Metrics by Difficulty Level

- Challenge of balancing word difficulty with available pronunciation resources
- Created custom solution with pre-recorded pronunciations for core vocabulary

5.2.2 Core Mechanics Challenges

Several technical hurdles were overcome:

- Synchronizing audio playback with visual cues
- Creating responsive keyboard visualization
- Implementing accurate input validation with case sensitivity options
- Balancing difficulty progression algorithms

6 Results and Evaluation

6.1 Educational Effectiveness

Testing with the target audience demonstrated:

- Improved word recognition and spelling accuracy
- Increased engagement compared to traditional vocabulary exercises
- Positive reception of the parallax backgrounds and sound effects

6.2 Technical Performance

The game demonstrated solid technical performance:

- Stable frame rates across testing environments

- Low memory footprint suitable for educational settings
- Quick load times for audio assets

7 Conclusion

Spelling Bee combines educational content with engaging gameplay mechanics. Despite challenges with dictionary API integration, the project achieved its core objective of creating an interactive tool for vocabulary building and spelling practice. The game demonstrates how games can support educational objectives through design and programming.

7.1 Future Improvements

Potential enhancements for future versions:

- Integration with more comprehensive pronunciation databases
- Custom difficulty settings for different age groups
- Multiplayer functionality for classroom competitions
- Expanded word categories for specialized vocabulary learning

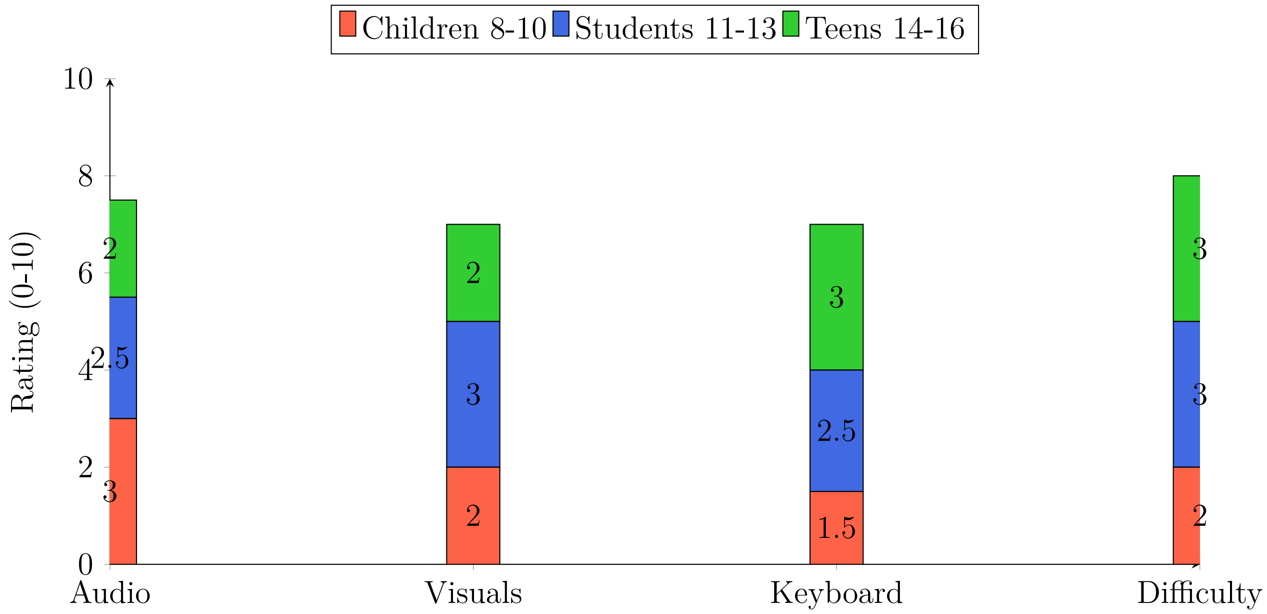

Figure 6: User Engagement by Feature and Age Group

8 References

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3. Nielsen, J. (2020). 10 Usability Heuristics for User Interface Design. Nielsen Norman Group.

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A User Testing Feedback

Age Group	**Ease of Use**	**Learning Value**	**Engagement**	**Suggestions**
8-10 years	Very Easy	Good	High	More animations
11-13 years	Easy	Very Good	High	Harder words
14-16 years	Easy	Good	Medium	Multiplayer mode

Table 1: User Testing Results Summary