BUSHFIRE brigade

2024

ANALYSIS & DESIGN REPORT

ITERATION 03

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Introduction

This report presents the comprehensive analysis, design, and development of Bushfire Brigade, a web application designed to educate children aged 8 to 12 living in bushfire-prone areas of Victoria. It begins by addressing the core problem and providing an in-depth analysis of the target audience to ensure their needs are thoroughly understood. The report then details the key features of the application, with each feature mapped to specific User Stories tracked in LeanKit. Furthermore, it reviews the iterative build process, demonstrating how the current iteration features effectively address the identified problem.

Project Overview

Problem Statement

As Victoria faces an escalating bushfire risk due to climate change, there is a pressing need to enhance bushfire education for children aged 8-12. Current educational programs are often too abstract, failing to provide the practical understanding and skills necessary for children to respond effectively in real-life bushfire situations (SBS News, 2020).

Project Summary

In Victoria, children in bushfire-prone areas are increasingly at risk due to the escalating frequency and severity of climate-related bushfires. Since 2000, there has been a ***significant upward trend in bushfire occurrences***, with notable peaks on 2014, and 2019. The Australian Bureau of Meteorology reports that Australia is warming faster than the global average, worsening the severity and frequency of bushfire events. Furthermore, traditional educational methods are often too abstract, leaving children unprepared for emergencies. A 2015 study found that **children aged 8-12 were able to discuss these topics to some extent but revealed significant gaps and misconceptions** (Towers, 2015). Currently, over 839 schools in Victoria have been identified as bushfire-risk by the Victorian Government, which is approximately over 27,000 students. Additionally, a more recent survey conducted with nearly 1500 Australians aged between 10 and 24 revealed that 64% of those surveyed had experienced bushfires, heatwaves, or drought between 2017 and 2020, wth ***88% believing they were not being adequately educated*** about how to protect themselves and their communities (Gough & Towers, 2020). Moreover, studies from the University of Melbourne show that **bushfire trauma can significantly disrupt schooling and slow the developmental progress of affected children**, emphasising the need for improved educational approaches that address the psychological impacts (Trounson, 2019). As bushfires become more frequent and intense, it becomes crucial to reformulate how we educate our youth on this subject, shifting towards more **interactive and experience-based learning strategies** that can effectively prepare them for such events (Pooley et al., 2021).

The Bushfire Brigade website, designed for children aged 8-12, offers interactive learning and tools like games, videos, and quizzes to provide practical bushfire safety knowledge. This new approach to bushfire education aims to better prepare young Victorians by equipping them with the necessary skills and confidence.

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Target Audience

Persona	Children aged 8-12 in BPA's	Guardians/Parents and Teachers
Name, Age	Jack, 10	Laura, 36
Location	Cann River, Gippsland, Victoria	Cann River, Gippsland, Victoria
Lifestyle	Active and curious, enjoys outdoor activities and exploring nature; lives in bushland and is familiar with the Australian bush.	Primary School Teacher and Mother; Active community member focused on safety and education. Previously lived in Kinglake, a town within a Bushfire Prone Area in Victoria that was severely impacted by the 2009 Black Saturday bushfires.
Motivations	Wants to be a bushfire safety "expert," earn badges, and keep his family, especially his younger sister, safe.	Driven by her past experience of losing her home and seeing her community struggle to recover, passionate about equipping her children and students with practical bushfire safety knowledge and ensuring they are prepared for bushfire emergencies.
Goals	Learn bushfire safety through engaging, interactive games and videos; feel confident and prepared.	To integrate engaging, comprehensive bushfire safety resources into her teaching and parenting.
Pain Points	Finds bushfire safety information boring and complex; feels anxious and overwhelmed; frustrated with traditional, unengaging lessons.	Struggles to find age-appropriate, engaging bushfire safety resources; Time-consuming to compile comprehensive resources from multiple sources; Challenges in maintaining student interest with traditional safety drills and materials.

Iteration 3

A summary of each Feature and how it links to the EPICS and User Stories for the project can be found in LeanKit while an overview is in the project architecture. The key deliverables include:

1. **Parent & Teacher Engagement and User Guide:**
   Develop comprehensive guides for parents and teachers to facilitate their engagement in bushfire education. This will include step-by-step instructions and best practices.
   Importance: *Engaging parents and teachers is crucial for reinforcing bushfire safety concepts and ensures that they can effectively contribute to the children's learning and preparedness.*
   Related User Story: US6.1 - "Empowering parents and teachers" which focuses on providing resources and support to enhance bushfire education for children.
2. **Bushfire Recovery with Audio Storytelling**
   Develop a section that combines bushfire recovery information with audio storytelling. This will include narratives of real-life recovery experiences, provide emotional support resources, and steps for rebuilding and recovery
   Importance: *Understanding bushfire recovery helps children and their families prepare for and cope with the aftermath of bushfires.*
   Related User Story: US7.1 - "Understanding Recovery After Bushfires," which aims to educate children about recovery processes and support mechanisms
3. **Gamification with Games, Quizzes, Simulation Learning and Badges:**
   Introduce interactive games, quizzes, simulation learning, and badges to make bushfire safety

education engaging. Games simulate real bushfire scenarios, quizzes test knowledge, and badges reward achievements.

Importance: *Gamification makes learning fun and interactive, increasing retention and motivation. Simulations provide practical experience.*

Related User Stories:US8.1 - "Learning Through Play," where children learn bushfire safety concepts through interactive and gamified experiences.

4. **Machine Learning Weather-Based Bushfire Simulator**

   Description: Develop a simulator that uses machine learning algorithms to create realistic bushfire scenarios based on various weather factors

   Importance: *The simulator provides a hands-on, dynamic way for children to explore how bushfires can develop and spread, helping them grasp complex concepts.*

   Related User Story: US9.1 - "Simulating Bushfire Scenarios," which focuses on using machine learning to create educational simulations that demonstrate bushfire dynamics.

Changes from the Previous Iteration (Iteration 3)

In **Iteration 2**, the focus shifted from bushfire risks and preparation to recovering from such events and most importantly consolidating understanding quizzes, games. This iteration introduced several key changes and new features to enhance the educational experience:

1. **Parent & Teacher Engagement and User Guide:**
- **Previous Iteration:** Focused on creating engaging educational content directly for children.
- **Current Changes:** Introduces detailed guides and best practices for parents and teachers, facilitating their active participation in bushfire education.
2. **Bushfire Recovery with Audio Storytelling:**
- **Previous Iteration:** Emphasised bushfire preparedness and survival skills.
- **Current Changes:** Adds a new section that combines bushfire recovery information with audio storytelling, featuring real-life recovery experiences and emotional support resources.
3. **Gamification with Games, Quizzes, Simulation Learning, and Badges:**
- **Previous Iteration:** Included basic interactive elements like charts and flowcharts.
- **Current Changes:** Expands on gamification by integrating interactive games, quizzes, and simulation-based learning, along with a system of badges to reward achievements.
4. **Machine Learning Weather-Based Bushfire Simulator:**
- **Previous Iteration:** Focused on static educational tools and interactive features.
- **Current Changes:** Introduces a machine learning-based simulator that creates realistic bushfire scenarios based on weather conditions.

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Risk and Mitigation Summary

The new Risk Registry created for this project was utilised to identify key risks and develop targeted mitigation strategies. Top 3 risks provided below:

1. **Negative Risk: Emergency Plan Misinterpretation (NR03)**
    - **Mitigation:** Use clear, simplified instructions, interactive simulations, multiple formats, and validate plans with experts.
2. **Negative Risk: Device Compatibility (NR04)**
    - **Mitigation:** Conduct cross-platform testing, implement responsive design, and consider Progressive Web App (PWA) development.
3. **Positive Risk: Unforeseen Benefits (PR01)**
    - **Mitigation:** Build a scalable framework, develop new versions for different audiences, seek additional funding, and market the success.

Testing Summary for Iteration 3

A testing plan was created to ensure the functionality, usability, performance, responsiveness, and accessibility of the updated features in the bushfire education platform.

- **Functional Testing -** *Verify all interactive features and content.*
  Tool Used: **BrowserStack**
  Result: All interactive features, including animations, games, and quizzes, operated smoothly and produced accurate results across different browsers and devices.
- **Usability Testing -** *Ensure the platform is intuitive and engaging.*
  Tool Used: **Wave**
  Result: The website was intuitive and easy to navigate for children, parents, and educators. All interactive elements were engaging and accessible.
- **Performance Testing -** *Assess media loading times and site performance.*
  Tool Used: **Lighthouse**, **GTMetrix**
  Result: Media loading times and video playback were smooth, with minimal lag, ensuring responsiveness across various screen sizes and devices.
- **Accessibility Testing -** *Ensure compliance with accessibility standards*
  Tool Used: **Axe**, **Responsinator**
  Result: The platform met WCAG guidelines, supporting keyboard navigation and screen reader functionality. Text visibility and colour contrast were appropriate for visually impaired users.

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