Disaster Resilience in Victorian Schools: Educating Students Using Interactive Lesson Plans

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INTERACTIVE QUALIFYING PROJECT (IQP)
OUR SPONSOR

Australian Institute for Disaster Resilience (AIDR)
Spread knowledge of disaster resilience to help build safer, stronger communities.

Help children develop knowledge, skills, and confidence to take action.
Preventing hazards from causing harm in the future

Preparing for a hazard before it occurs

Recovering from a hazard after it occurs

Responding to a hazard while it is occurring
AIDR TRACKS DISASTERS IN AUSTRALIA

Image Source: AIDR Knowledge Hub 1870-2020
8.25+ Million acres of forest burned in Australia (Woodward, 2020)

8x more land destroyed in Victoria and NSW than 2018 California Camp Fire (Tarabay, 2020)

Australia had the biggest fire season in modern history in 2019-2020 (Woodward, 2020)

FIRE SEASON IMPACTS 2019-2020

1,000,000,000+
Estimated animal deaths (University of Sydney, 2020)

30+ People Dead
Hundreds more injured (Tarabay, 2020)

2500+ Homes Destroyed
Thousands of communities devastated (Tarabay, 2020)

Image Source: Matthew Abbott for the New York Times
KEY FACTORS FOR DISASTER RESILIENCE

Involving the Community

Education

Using Technology
“To develop skilled and resilient communities, young learners need to understand the nature of risk in their local environment and their role in reducing exposure and vulnerability to harm.”

- Commonwealth of Australia, 2011
TECHNOLOGY MAKES THINGS INTERESTING

Simulations allow us to better reflect real-life scenarios.

Active learning helps students stay engaged and learn more.
COMMUNITY INVOLVEMENT

AIDR is a non-profit organization contributing to disaster resilience education throughout Australia.

The Country Fire Authority (CFA) provides firefighting and Emergency Services to areas in Victoria, Australia.

The Australasian Fire and Emergency Service Authorities Council (afac) is the peak body responsible for fire in the Australasian region.
COMBINING KEY FACTORS FOR DISASTER RESILIENCE
OUR MISSION

The goal of our project is to help **year 8 students** at Emerald Secondary College learn about bushfire **safety**, **knowledge**, and **awareness** to improve local disaster resilience.
Emerald Secondary College is a secondary school (middle/high school) located just outside the city of Melbourne in Victoria, Australia.
THE CLASSROOM

Gary Vear - digital technology teacher

Year 8 (13-14 year olds)

3 Classes of 20 students

Image Source: Emerald Secondary College
EMERALD IS A HIGH RISK BUSHFIRE AREA

LOCAL DISASTERS

2019 BUSHFIRE LOCATIONS

Image Source: AIDR Knowledge Hub 1870-2020

Data Source: NASA Fire Information for Resource Management System Satellite: Bushfire Data, December 2019
OBJECTIVES

1. Assess student knowledge
2. Develop lesson plans
3. Remotely deliver lesson plans
4. Prepare guidance for the future
FIRST OBJECTIVE

Assessing student knowledge
55 students responded to the pre-assessment

~85% of all students responded

For such a high risk area, students should be good or excellent
STUDENTS ARE UNAWARE OF HOUSEHOLD PLANS FOR BUSHFIRE

Student Pre-Assessment: What actions do you and your family take to prepare for the bushfire season?

- No plan or action: 14.5%
- No plan, but know ≥1 safety option: 38.2%
- Have a plan with family: 47.3%
Developing Engaging Lesson Plans
LESSON PROGRAM

- Pre-Assessment
- Lesson Plans
- Post-Assessment
Lesson plans

Unit 1: Disaster Resilience
Unit 2: Fire Dynamics
Unit 3: Local Risk Profile
Bushfire Response Poster
STRUCTURE OF EACH UNIT

1. Learning Objectives
2. Learning Material / Graphics
3. Games, Activities, and Quizzes
4. Interactive Project
5. Feedback Message Board
THIRD OBJECTIVE

Delivering lesson plans remotely
OVERVIEW OF LESSONS

Each lesson starts by outlining the learning objectives for that lesson. Go through the learning objectives to understand what content the lesson contains. The learning material in the lessons are designed to provide you with the background necessary to complete the games and quizzes throughout the lesson. Make sure that you scroll down and complete the activities on each page before clicking on a new tab.

UNIT 1: DISASTER RESILIENCE

UNIT 2: FIRE DYNAMICS

UNIT 3: LOCAL RISK PROFILE

https://sites.google.com/view/wpi-aidr-lessons/introduction

Website is accessible, intuitive, and reliable

Each unit has its own tab

Interactive games and activities are embedded
STRUCTURE OF EACH UNIT

1. Learning Objectives
2. Learning Material / Graphics
3. Games, Activities, and Quizzes
4. Interactive Project
5. Feedback Message Board
Learning Objectives

The following objectives outline what you will be able to do after this lesson:

1. Understand the difference between a hazard and a disaster
2. List the different types of impacts a disaster can have on people and places
3. Identify the four stages of the disaster management cycle
4. Explain how you can prepare for a disaster before it occurs
5. Identify natural hazards that occur in and around Australia and how they impact communities
The goal of disaster resilience is to build strong communities who understand local hazards and how to protect themselves from harm.

HAZARD VS. DISASTER

**Hazard**
An event or thing that can cause harm to people, their property, and the environment

**Risk**
The chance of a harmful event happening

**Disaster**
A really bad event, when lots of people are hurt or killed, and their property and natural environment are destroyed
The goal of disaster resilience is to understand local hazards and how to respond to them.

**Hazard**
An event or thing that can cause harm to people, their property, and the environment.

**Risk**
A measure of the likelihood of a potential hazard occurring and the potential severity of its impact.

**Disaster**
A really bad event, when a lot of people are hurt or killed, and their property and natural environment are destroyed.

**Vulnerable**
Community is not prepared and doesn’t know how to protect itself.

**Resilient**
Community is prepared for natural hazards that are likely to occur.
TYPES OF IMPACTS

Impacts are the effects or consequences of disasters on people and places.

Flip through the cards to explore the different types of impacts that can be caused by disasters.

Economic

Damage to property, roads, services, jobs, and other sources of income.
**THE 4 STEPS OF DISASTER RESILIENCE**

**Prevent**
Preventing future hazards from causing harm
- e.g. restricting building permits in high risk areas, land management and planned burning

**Recover**
Recovering from a hazard after it occurs
- e.g. repairing property, treatment for illness or injury

**Prepare**
Preparing for a hazard in case it occurs
- e.g. creating an evacuation plan, clearing vegetation

**Respond**
Responding to advice and warnings from emergency services
- Putting your preparedness plans into action
BUILDING AN EMERGENCY KIT

One of the easiest ways you can be prepared for a disaster is to build a family emergency kit.

Things you should include:

- Water
- Non-perishable Foods
- Paper Goods
- First Aid Kit
- Hygiene Supplies
- Comfortable Clothes
- Sleep Items
- Flashlight
- Batteries/Battery-powered radio
- Entertainment
MATCH EACH STATEMENT WITH ITS TYPE OF IMPACT BY CLICKING ON MATCHING DEFINITIONS

Click **Start** to begin this small quiz. You have **3 strikes** before the quiz ends. You can **try again** as many times as you’d like!

Disaster Impacts

<table>
<thead>
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<th>Disaster Impacts</th>
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<th>00:25</th>
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<tbody>
<tr>
<td>Emotional</td>
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<td></td>
<td></td>
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<tr>
<td>Social</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
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<td></td>
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</tbody>
</table>

- People must be evacuated from their homes and separated from their community
- A forest is completely burned down, killing animals and their habitat
- Millions of dollars are spent to help restore buildings and roads
- Someone experiences nightmares months after a disaster
- Someone is seriously injured

Once you are done, upload a screenshot of your quiz results to Compass for the 'Disaster Impacts' learning task!
NOW CREATE YOUR OWN EMERGENCY KIT!

Read the text on the game screen, then click Ready? to start the game.

Note: After completing level 5, do NOT click "You're all set! Print your checklist." Just take a screenshot of the level 5 completion screen.

* Make sure to turn on Scripts and Flash in your browser! *
DISASTERS IN YOUR AREA

As a class, you will create an interactive map that shows disasters in your area and their impacts on those communities. Watch the video instructions below to add a disaster pin to the map!

Click here to go to the AIDR Knowledge Hub
Interactive Project
CLICK THE FULLSCREEN BUTTON IN THE TOP RIGHT CORNER TO EDIT THE MAP

Note: You need a Google account to edit the map. After you fullscreen the map, click Sign in in the top right corner to log in, or make a new account if you don’t have one already.

UPDATE: Please don’t create a new layer with your name. You can just add a pin to someone else’s layer. Then write your name in the description of that pin.
HELP AND FEEDBACK

If you are stuck, need help, or want to provide feedback, please post in the bulletin below!
FINAL STUDENT PROJECT
Students ask any questions about bushfire behavior/safety.

Local and national fire experts answer their questions.

Introduces a connection between students and experts.
AnyHazard software simulates fires

Created interactive H5P videos for students to watch
WE PROVIDED STUDENTS WITH A MAP SCENARIO
STUDENTS CREATED RESPONSE POSTERS
STUDENTS CREATED RESPONSE POSTERS
STUDENTS CREATED RESPONSE POSTERS

- **Shelter Zone**: The area is at low altitude but the people trying to escape will cross the wind and through many hills.
- **Evacuation Zone**: The region where the fire will likely spread.
- **Rally Point**: The reason the rally point is here is because of the reservoir, the fire front can be slowed down because of the amount of water in its path.
- **Escape Routes**: Black lines indicate safe paths for evacuation.
- **Bushfire**: The fire starting position and its spread straight way.
- **Ravine**: The area to avoid due to the fire's path.
- **Roads**: Important transportation routes for emergency services and escape routes.
- **Hills**: Many hills around the fire starting position, speeding the spread straight way.
- **Reservoir**: The reservoir will decrease the spread of the fire front because of all the water.
STUDENTS CREATED RESPONSE POSTERS
Students post their projects online for experts to view

Fire experts provide feedback and answer student questions

Fire experts create a video response to student projects
FOURTH OBJECTIVE

Prepare guidance for the future
PREPARE GUIDANCE FOR THE FUTURE

Analysis of learning and feedback

Implications of student feedback

Recommendations
ANALYSIS

Analysis of learning and feedback

- Analyze long responses via coding
- Conduct statistical analysis of learning metrics
- Interpret successes and failures
POST ASSESSMENT ANALYSIS

Decrease of responses (36)

Learning fatigue

Rapid time frame
RECALLING BACKGROUND KNOWLEDGE OF BUSHFIRE

How would you rate your background knowledge of bushfires?

- Preparing for bushfires: 16.4% Very Poor, 38.2% Poor, 41.8% Moderate, 36.3% Good, 3.6% Excellent
- How bushfires spread: 3.6% Very Poor, 36.3% Poor, 54.5% Moderate, 3.6% Good, 0% Excellent
- How to respond to a bushfire: 0% Very Poor, 21.8% Poor, 40% Moderate, 36.4% Good, 1.8% Excellent
- Planned burning strategies: 1.8% Very Poor, 21.6% Poor, 12.7% Moderate, 7.3% Good, 66.4% Excellent
SELF-REPORTED BUSHFIRE KNOWLEDGE IMPROVED
SELF-REPORTED BUSHFIRE KNOWLEDGE IMPROVED

Overall Student Self Reported Knowledge

- Pre-Assessment
- Post-Assessment

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Pre-Assessment</th>
<th>Post-Assessment</th>
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<tr>
<td>Very Poor, Poor or Moderate</td>
<td>60</td>
<td>29</td>
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<tr>
<td>Good or Excellent</td>
<td>40</td>
<td>71</td>
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</table>

PERCENT OF STUDENTS

KNOWLEDGE LEVEL
KNOWLEDGE ABOUT DISASTER RESILIENCE IMPROVED

Assessing students on stages of Disaster Resilience before and after Lesson Plans

<table>
<thead>
<tr>
<th>RESPONSES</th>
<th>Pre-Assessment</th>
<th>Post-Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent</td>
<td>50.9</td>
<td>72.7</td>
</tr>
<tr>
<td>Prepare</td>
<td>78.2</td>
<td>93.9</td>
</tr>
<tr>
<td>Respond</td>
<td>72.7</td>
<td>84.8</td>
</tr>
<tr>
<td>Recover</td>
<td>61.8</td>
<td>81.8</td>
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<tr>
<td>All Four Stages</td>
<td>20</td>
<td>39.4</td>
</tr>
<tr>
<td>Correct</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MEASURED IMPROVEMENT IN STUDENT KNOWLEDGE OF BUSHFIRE

**Pre-Assessment**

- Fire safety and reducing flammables: 65.1%
- Evacuation plans or survival kits: 1.8%
- Seeking a shelter area: 1.8%
- Backburning/Planned burning: 20.0%
- Fire response or resources: 3.6%
- Wait for instructions: 3.6%

**σ² = 0.85 responses**

**Post-Assessment**

- Fire safety and reducing flammables: 35.3%
- Evacuation plans or survival kits: 23.5%
- Seeking a shelter area: 5.9%
- Backburning/Planned burning: 10.3%
- Fire response or resources: 10.3%
- Wait for instructions: 14.7%

**σ² = 1.88 responses**
STUDENTS KNOW MORE ANSWERS: VISUALIZING THE IMPLICATION OF VARIANCE ($\sigma^2$)

Pre-Assessment
$\sigma^2 = 0.85$ responses

Most common response

~68% of all responses

All coded responses

Post-Assessment
$\sigma^2 = 1.88$ responses

Most common response

~68% of all responses

All coded responses
Student Feedback: Did communicating with your community experts (CFA, AIDR, AFAC) help you learn

- Yes: 69.7%
- No: 30.3%

Student Feedback: Did using technology (games, simulations, etc.) help you learn more?

- Yes: 93.9%
- No: 6.1%
STUDENT FEEDBACK: OVERALL POSITIVE SENTIMENT

Overall student sentiment about the Lesson Program

<table>
<thead>
<tr>
<th>STUDENT SENTIMENT</th>
<th>PERCENT OF STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Poor or Poor</td>
<td>7.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>21.7</td>
</tr>
<tr>
<td>Good or Excellent</td>
<td>68.6</td>
</tr>
</tbody>
</table>
Student long response: Identify two aspects of the project you enjoyed
Student long response: Identify aspects of the Lesson Program you dislike

- Nothing, enjoyed everything: 41.2%
- Too much reading: 8.8%
- Instructions unclear: 2.9%
- Miscellaneous suggestions: 29.4%
- Project: 5.9%
- Confusing: 11.8%
RECOMMENDATIONS FOR THE FUTURE
PRIMARY RECOMMENDATIONS

1. More concise information/instructions

2. Use a better website creation platform to have better results with activities that rely on Java/Flash/HTML5

3. Enable navigation and feedback on H5P interactive videos

4. Integrate with a learning management system (Compass, Canvas, Blackboard etc.)

5. Create a more effective and thought out Final Project
ANYHAZARD AND SIMTABLE

Video Source: Wildfire Today, SimTable Demonstration
WEBSITE DEMO

https://sites.google.com/view/wpi-aidr-lessons/introduction
ACKNOWLEDGEMENTS

Thank you to everyone involved in this project! Your efforts made it the great success it turned out to be! A special thanks goes out to these people:

Brigid Little
AIDR Representative

Gary Vear
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CFA, AIDR, and AFAC
Local fire experts in Victoria

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Founder and CEO of Simtable

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Lesson Plan Website:
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