University of South Australia

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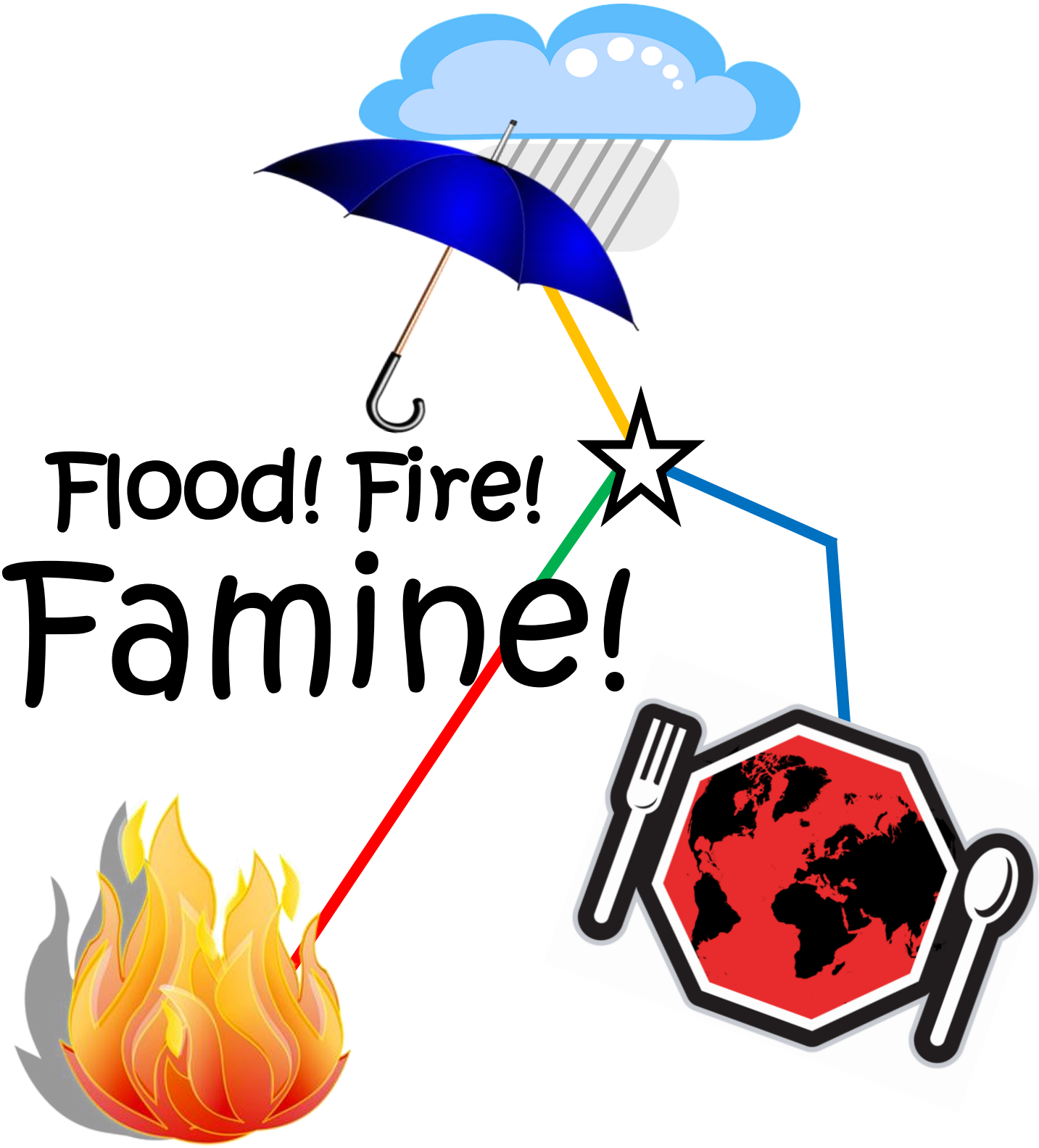

Flood! Fire! Famine!

STEM Innovation Experience

STEMIE

University of South Australia

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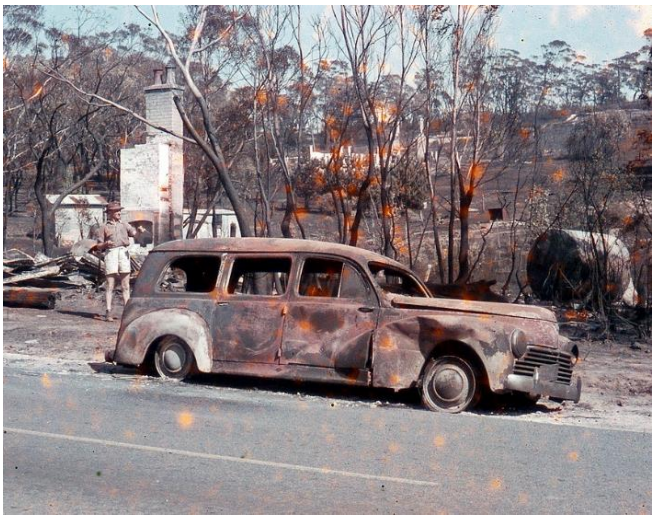
STEM Innovation Experience
Task Information

Flood! Fire! Famine!

Introduction



Australian ecosystems have evolved around fire, with some native plants even reliant on regular fires to assist with germination. Various floods have impacted in positive and negative ways on the landscape, and famine is a real issue during periods of drought.

However, recently the severity of these events has become more of a concern. Fires such as those in late 2019 and early 2020 created devastation across numerous states and floods have impacted on capital cities. The Brisbane floods in 2011 impacted on 200,000 people and more recently in 2022 across Queensland and New South Wales that saw the water level peak even higher than the 2011 floods.

Extreme weather events are predicted to become even more intense and destructive in the future as a result of greenhouse gas emissions both past and present. People will need to become better at managing these catastrophic events and find ways to reduce their impact in the future.

In *Flood! Fire! Famine!* you will learn about some of the science, technology, engineering and mathematics that goes into the management of risks associated with these events.

"Even with all our technology and the inventions that make modern life so much easier than it once was, it takes just one big natural disaster to wipe all that away and remind us that, here on Earth, we're still at the mercy of nature."
Neil deGrasse Tyson (Astrophysicist and science communicator)

"We learn from every natural disaster. Whether it's a fire or a flood, we learn something from it so we can respond to the next one better."
Malcolm Turnbull (Past Prime Minister of Australia)

Flood! Fire! Famine!

The STEM Innovation Experience (STEMIE) will focus on the STEM skills related to natural disaster management, including research and investigation into fire management techniques, prototyping a flood mitigation system, developing a chicken egg collection device, and mathematically modelling how various conditions can impact on food yields.

The Requirements

Flood! Fire! Famine! will require completion of the following tasks:

- Research into the science behind management of bushfires including a scientific investigation, as outlined in the Science Component.
- Design a prototype of a flood mitigation device, as outlined in the Technology Component.
- Design and create a functioning chicken egg collection device, as outlined in the Engineering Component.
- Mathematical modelling of livestock and crop yields using exponential graphs and dynamic spreadsheets, as outlined in the Mathematics Task.

Your school also needs to produce a United Nations style speech (either script, audio or video) with information about how humans can manage and reduce the risk of these events in the future.

Image:
United Nations General Assembly, New York
September 2019

STEMIE – The Three Parts

STEMIE will consist of three parts:

- The Learning Phase
  - This is completed at school and work is submitted through the UniSA STEMIE email address STEMIE@unisa.edu.au The purpose of this phase is to demonstrate the learning that has occurred within the experience and to provide evidence that students have met the requirements to qualify for the Regional Showcase event.

- The Regional Showcase
  - This part will consist of an online event with University of South Australia staff judging the Science, Technology, Engineering and Mathematics components that have been completed at school. Schools will have a 1 ½ hour judging timeslot to demonstrate their work in these four areas. At the conclusion of all judging, the winning schools will be notified via email. In the event of a tie between schools within a region, the online overall task will be used as a tie breaker to decide the winner.

- The STEMIE Final
  - The winner from each Regional Showcase event, in addition to any wildcard schools (selected by the panel of judges after all Regional Showcase events) will compete in unseen STEM challenges at the University of South Australia. Details of dates and locations can be found in the initial invite emailed to schools and will also be sent again to winning schools.

STEMIE – Referencing

Research elements used within STEMIE Checkpoint Submissions and the Regional Showcase need to be referenced. The preferred style of referencing may vary between each school participating in STEMIE.

UniSA Outreach recommends using the SACE Guidelines (or equivalent in each state) for Referencing Documents when submitting work for assessment within STEMIE.

The Student Guide to Referencing and *Guidelines for Referencing* documents can be found at this link https://www.sace.sa.edu.au/learning/research-advice/referencing

STEMIE – The Learning Phase

School Leaders and Teachers can choose how they implement The Learning Phase in their school. Components within The Learning Phase have been developed to be scalable from a small group of students to multiple classes interacting in the experience.

Throughout the Learning Phase, there are identified checkpoints where progress must be submitted. There are six (6) required tasks that must be submitted to qualify for the Regional Showcase. The additional tasks are optional for in school use only and do not need to be submitted to UniSA. Schools can use some, none or all of the optional tasks as they progress through STEMIE, but tasks R1 to R6 must be available for viewing via an online platform (website link, Shared Google drop box link or equivalent).

The range of assessment tasks requires team members to hold varied skill-sets, so working in teams with complementary abilities is advantageous. There are five key components within The Learning Phase – the Science, Technology, Engineering, Mathematics and Overall Summary components.

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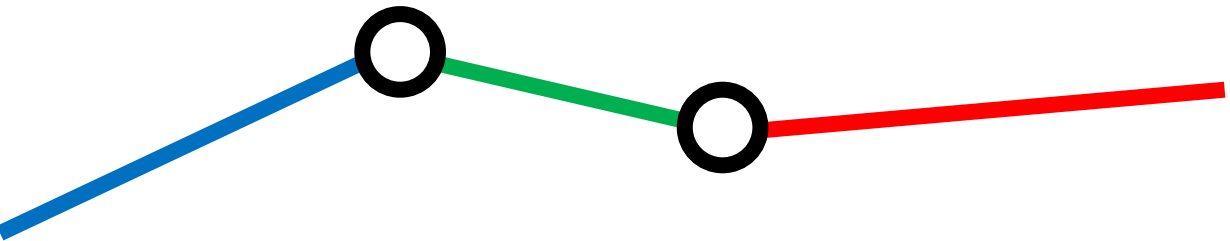

STEM Innovation Experience
Flood! Fire! Famine!

Science Component

Science Component – Background Information

Humanity is inextricably linked with fire. Throughout human history, fire has proven to be both a friend and a foe. Without it, human civilisation and technological development is unlikely to have succeeded to the extent it has. However, the devastation it can cause to human society can be extensive.

Fire also plays a major regulatory role in the Earth's ecosystems. Our environment, particularly in Australia, is often shaped by fire. While it wreaks devastation, it also brings new life and regeneration.

Science Component – The Requirements

Investigate the environmental role and influence of fire, with particular emphasis on how a changing climate both affects and is affected by fires.
Complete an investigation into one specific aspect linked to fire management.

Note – Unsafe investigations are not permissible. Ensure that any experiments follow your school's safety procedures and are approved by the relevant people in your school.

This can be achieved by completing some or all of the following:

- Research fire's role in human evolution, social development and civilisation, and expected prevalence and extent of wildfires in changing climatic conditions.
- Investigate the role of fires in Australia's natural ecosystems and human influence over the natural landscape, including:
    - Aboriginal and Indigenous land and fire management practices
    - Current bushfire management practices in Australia and lessons learnt from previous bushfires.
- Evidence-based suggestions for future human action to minimise the occurrence and effects of wildfires.
- Create and conduct a practical investigation including critical analysis of practical methodology and results to draw conclusions.

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Science Component – Practical Investigation

The practical investigation methodology needs to investigate a specific aspect of heat, heat transfer or combustion reactions. Links to the origins and determinants of wildfires, and their outcomes, will be looked upon favourably. The purpose for conducting this investigation is to support the research about bushfires and develop an understanding of how improved practices can reduce the impact and save lives.

Ideas for this investigation could include:

- Investigation into heat conductivity and heat transfer of various materials
- Examining the effect of fire on seeds and nuts from Australian vegetation
- Measuring the specific heat capacities of substances
- Analysing traditional and indigenous fire-starting methods and their efficiency
- Determining the insulation properties of different materials
- Other relevant investigation

The methodology for the investigation can vary from school to school, however the format for the submitted practical write-up must include the following headings:

Practical investigation methodology of your chosen experiment

- Hypothesis
- Aim
- Materials
- Method (including any safety requirements)

Results and conclusion from the experiment

- Results
- Conclusion

Discussion and analysis of the investigation methodology

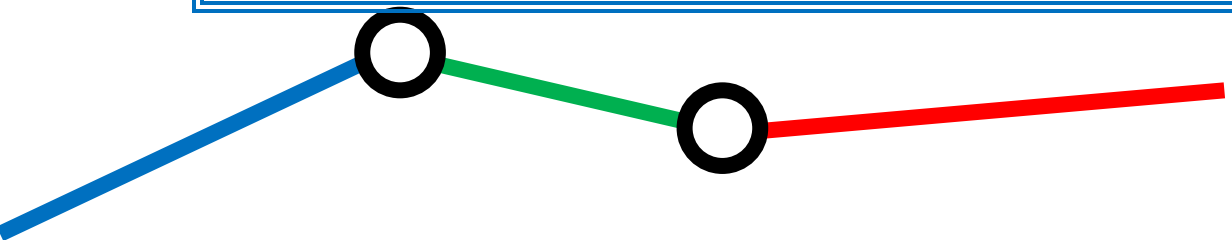
- Accuracy and precision of methodology
- Sources of random error
- Sources of systematic error
- Suggested improvements and limitations

Science Component – Elements for the Regional Showcase event

At the Regional Showcase event, students representing their school will be required to deliver a formal presentation to staff from the University of South Australia and demonstrate how bushfire management and survival plans can reduce impact and save lives.

This presentation will be held online via a Zoom link and time limits will need to be strictly adhered to.

The presentation should be a maximum of seven (7) minutes, with up to an additional three (3) minutes for questions from the UniSA Staff judging the presentation.



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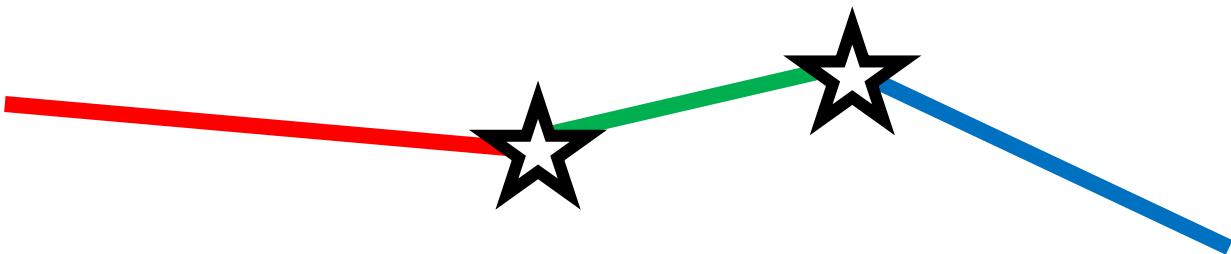
Flood! Fire! Famine!
STEMIE Regional Showcase
Science Component

School: _____

Criteria	Marks Available	Total Marks
1. Summary of the history of human interactions with fire.	**3 2 1 0 N/A**	
2. Understanding of the science behind bushfires.	**3 2 1 0 N/A**	
3. Incorporation of research and practical results into presentation to make informed decisions about fire management.	**3 2 1 0 N/A**	
4. Delivery of content knowledge, including the ability to answer questions posed by UniSA staff.	**3 2 1 0 N/A**	
5. Communication and interaction with UniSA staff, including the use of visual aids and appropriate presentation timing.	**3 2 1 0 N/A**	
Total Marks:		**/15**



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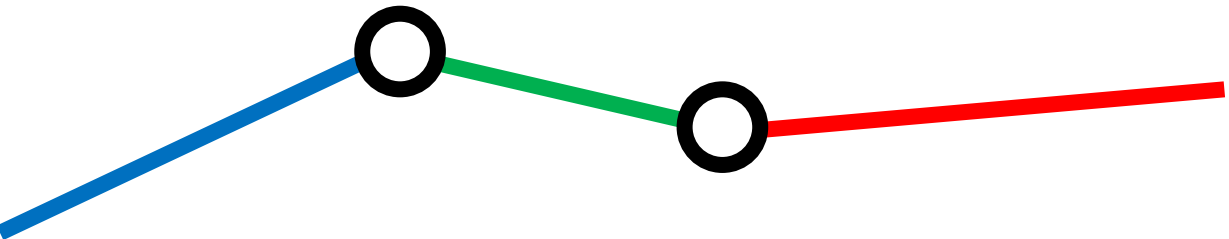

STEM Innovation Experience
Flood! Fire! Famine!
Technology Component

Technology Component – Background Information

Building codes and zoning consider the likelihood that an area may be prone to flooding. Measures can be taken to avoid flood exposure such as elevating buildings or at least installing raised windows and sealing doors, but sometimes it's not enough. To protect an area there may also be a need for floodwalls/ seawalls, floodgates, levees and evacuation routes to keep people safe. Flood gates can be a way of reducing the threat from rising flood waters by controlling water flow before it gets to a critical level.

Lower Light, SA 2016. Photo Credit – The Plains Producer

Technology Component – The Requirements

Create a Flood Level Indicator Prototype (FLIP) device.

This should include:

- Ability to detect three levels of water (simulated e.g. with switches)
- Demonstrate a warning device at the relevant threat level
- Demonstrate a reaction to the warning to mitigate the flood
- A 3D printed component in your prototype
- A team member/s to trouble shoot sample codes

This can be achieved by completing some or all of the following:

- Brainstorm and investigate various floodgates.
- Develop a detection system for three levels of water.
- Develop a way to make your device open a simulated flood gate.
- Design and create a 3D printed component using a CAD program for your prototype.
- Investigate additional ways to make your flood mitigation device more effective.
- Evaluate the development of your prototype.

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Technology Component – Flood Level Indicator Prototype (FLIP)

Create a Flood Level Indicator Prototype (FLIP) device using Arduino coding that can demonstrate 3 threat levels (green, orange and red). This prototype must detect *simulated* water levels (can be via manual input, such as switches or sensor inputs). Computer Aided Design (CAD) software can be used to create 3D printed components for your device. The physical attributes of the device do not have to be to scale but must be able to demonstrate the functionality of the prototype at the Regional Showcase.

At the Regional Showcase the device will be demonstrated for online judging via Zoom. The device will need to be set up prior to the judging timeslot. If the device has to be set up during the allocated timeslot, that time will result in a reduced time allocation to present the functionality of the device. The device does not need to be to scale, it does not have to respond to actual water levels, it just needs to be a proof of concept and demonstrate that the code responds to the three different levels. Water level can be simulated using switches or other sensors.

Technology Component – Elements for the Regional Showcase event

At the Regional Showcase event, students representing their school will be required to demonstrate their flood mitigation prototype.

As a minimum, the device should be able to show three threat levels and have a moving component to demonstrate opening a flood gate. Additional features could include linking the system to a display of the threat level on a screen, additional warning levels or features, a manual override button to open the flood gate or some other relevant feature.

The judging will be held online via a Zoom link. We recommend having a mobile phone or iPad in the meeting to allow the device to be easily viewed from different angles.

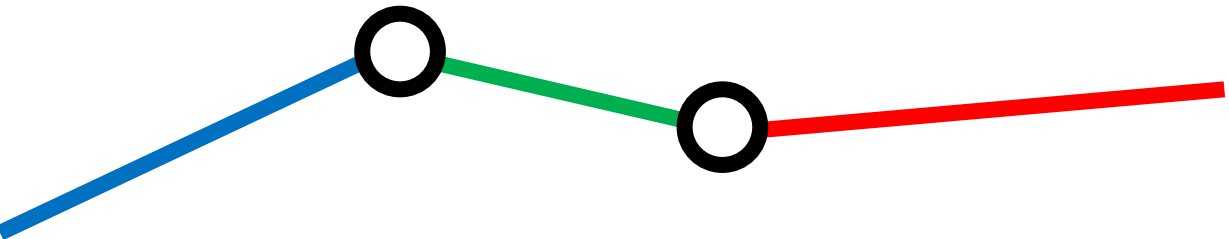
Programming Component – Elements for the Regional Showcase event

Along with demonstrating their prototype, students will also be required to complete a trouble shooting activity to find simple errors in a section of Arduino coding. The errors will be based on the activities covered in the student workshop “Introduction to Coding” section of the STEMIE Moodle.

UniSA staff will judge the device against the Technology Marks Sheet criteria. For additional functions and features to be awarded marks, they must be successfully demonstrated in the allocated judging time.

Troubleshoot a sample code with errors (errors will be based on the introduction to coding activities on the STEMIE Moodle) This will have a 2 minute time limit.

Each school will have a maximum of 10 minutes to demonstrate their prototype and 2 minutes to find the errors in the sample code supplied.



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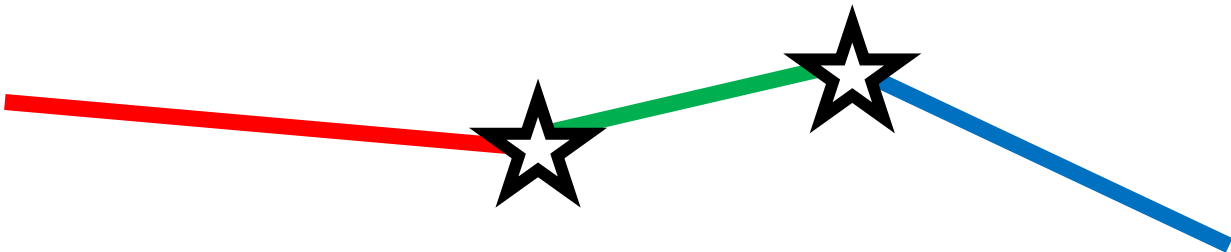
Flood! Fire! Famine!
STEMIE Regional Showcase
Technology Component

School: _____

Criteria	Marks Available	Total Marks
3D printed component	**1 Mark** – Printed but has visible scaffolding/rafting or general flaws in the print, and no obvious function in the device **2 Marks** – Well printed but only serves an aesthetic purpose **Or 3 Marks** – Well printed and has a set function in the device	
Input Detection *Does the device detect different levels?*	**+1 Mark** – Can detect levels but is inaccurate **+1 Mark** – Can detect levels accurately but requires manual input (e.g. button) **+1 Mark** – Can detect levels accurately and autonomously (e.g. sensor)	
Output Response *Contains audio/ visual warnings*	**+1 Mark** – LED output when level changes **+1 Mark** – Audio output when level changes **+1 Mark** – Simulated flood gate opens and closes	
Additional Features *These must be successfully demonstrated within the judging time limit*	**+1 Mark** – Additional relevant feature is successfully demonstrated **+1 Mark** – Another additional relevant feature successfully demonstrated **+1 Mark** – Another additional relevant feature successfully demonstrated	
Can find errors in the sample code?	**+1 Mark** – Can find 2 errors in the sample code **+1 Mark** – Can find additional errors in the sample code **+1 Mark** – Can find all errors in the sample code	
Total Marks:		**/15**



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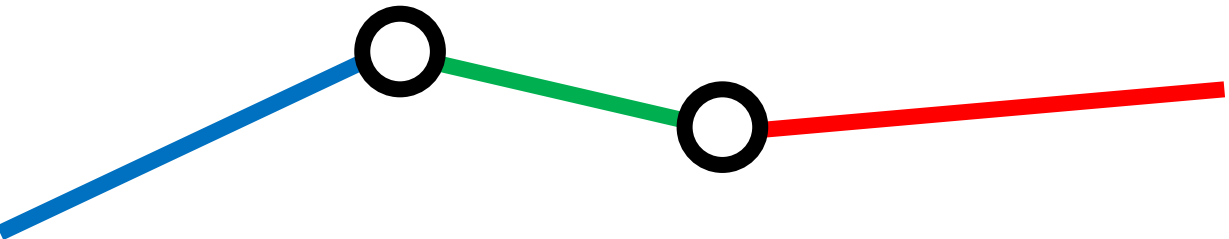

STEM Innovation Experience
Flood! Fire! Famine!

Engineering Component

Engineering Component – Background Information

Chickens are kept in two main types of production systems; cage and cage-free, which includes barn and free-range systems.

Some farms manage over 500,000 hens while smaller commercial operations might only have 1,000 hens. While caged systems are still the most common egg production systems, barn laid and free-range systems are increasing in popularity.

Improving hen health and welfare is an opportunity for productivity gains, but it is not without its issues. Egg collection in a barn laid or free-range system can be more complex. While nests are provided for egg laying, the collection of the eggs is more difficult than eggs laid in wire cages and egg collection devices need to accommodate for this.

Engineering Component – The Requirements

Design and construct an Egg Gathering Gadget (EGG) device that functions according to the set criteria.

This device will be demonstrated and judged online via Zoom at the Regional Showcase. A device such as an iPad, tablet or mobile phone will need to be a logged into the meeting to allow the judges to view the device from requested angles.

This can be achieved by completing some or all of the following:

- Brainstorm and investigate existing egg collection processes.
- Sketch designs for construction and testing.
- Test the properties of different types of construction materials (e.g. glue, masking tape, Lego, balsa wood, etc.) to evaluate the best construction method.
- Construct and test the egg collection device.
- Explain the functions of the preferred design.
- Produce sketches of the chosen design (by drawing and/or CAD packages).
- Construct the chosen design for testing at the Regional Showcase event.

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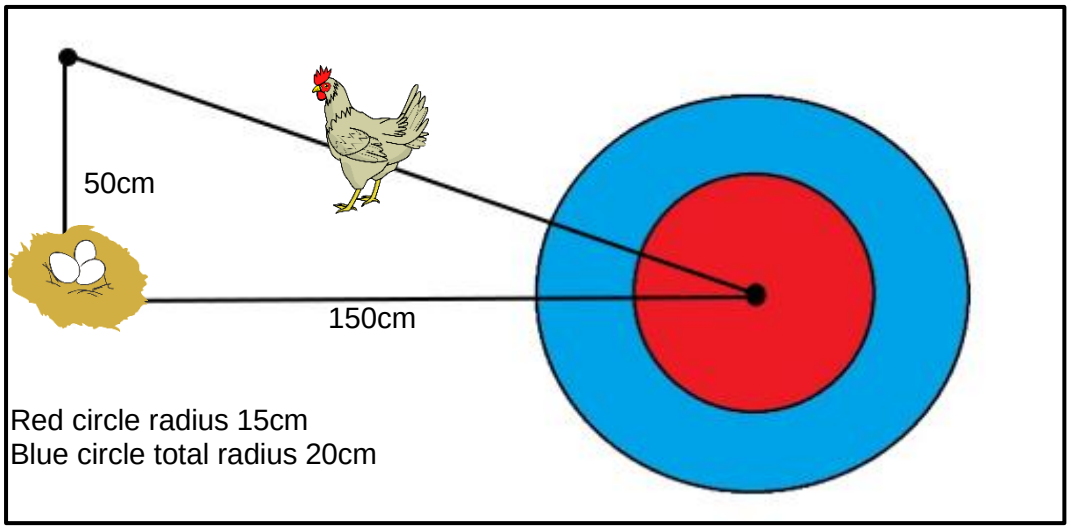
Engineering Component – Prototype Requirements

The device should be able to:

- move a 3D printed chicken off the track, without damaging it. The 3D printed head will fall off if the impact is too great.
- Collect an egg from the nest without breaking it
- Deposit the egg within the red zone without breakage
- Demonstrate additional features

At the Regional Showcase event, testing will need to be demonstrated along a specific test track as shown in the diagram below. The track surface needs to demonstrate the dimensions below using either tape; or the actual vinyl mat that can be purchased from Print Lord. (links available on the STEMIE Moodle). The track will need to be in place before the judging commences but any additional materials used on the track for the test run will need to be added and removed within the judging time limit.



Engineering Component – Elements for the Regional Showcase event

The judging of the Egg Gathering Gadget (EGG) prototype will be held via Zoom, we recommend having a mobile phone or iPad to view the prototype during its run.

Each school will place the chicken in their chosen location and orientation along the hypotenuse of the track.

Separate devices can be used for the two tasks, but additional marks are achieved if the one device can move the chicken and collect the egg.

Schools will be marked against the judging criteria.

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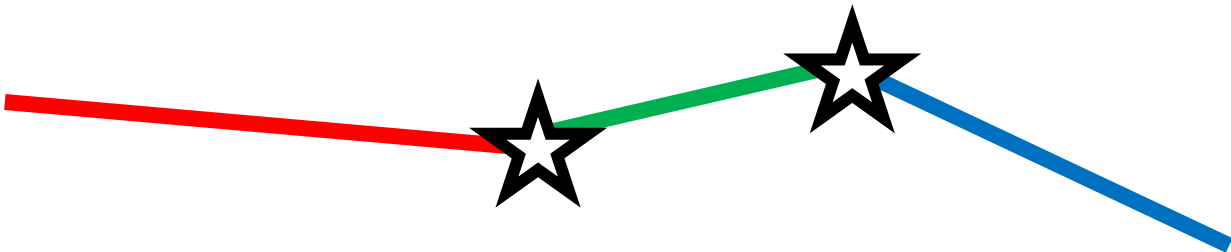
Flood! Fire! Famine!
STEMIE Regional Showcase
Engineering Component

School: _____

Criteria	Marks Available	Total Marks
Functionality *Ability to move the chicken* *Ability to collect the egg*	**1 Mark** – Can push the chicken off the path **Or 2 Marks** – Can push the chicken off the path with no damage to the chicken **1 Mark** – Collects the egg but causes breakage **2 Marks** – Collects the egg intact **Or 3 Marks** – Can push the chicken out of the way and collect the egg intact on the same run	
Accuracy *Accuracy of egg placement*	**1 Mark** – Egg placed in white zone **2 Marks** – Egg placed in blue zone **Or 3 Marks** – Egg placed in red zone **+1 Mark** – if egg is not broken	
Autonomy *Ability to function without human intervention*	**1 Mark** – Can navigate the track but needs manual input **Or 2 Marks** – Can navigate the track autonomously **+1 Mark** – Can place the egg in a carton without manual handling	
Additional features	**+1 Mark** – EGG device can produce a sound **+1 Mark** – Additional relevant feature **+1 Mark** – Additional relevant feature	
Total Marks:		**/15**



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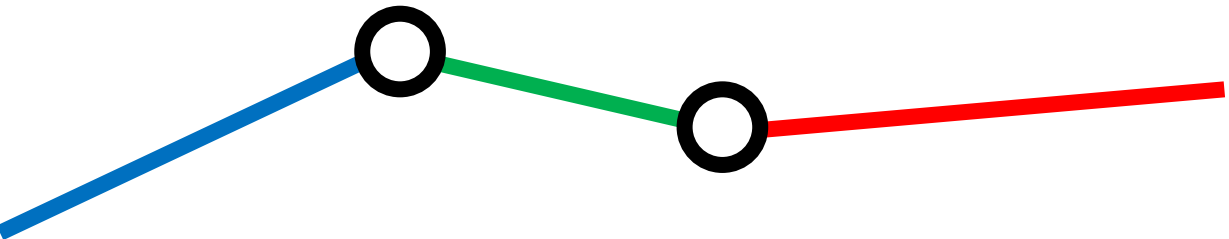

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STEM Innovation Experience
Flood! Fire! Famine!

Mathematics Component

Mathematics Component – Background Information

In agriculture the amount of crop grown, or product such as wool, meat or milk produced, per unit area of land is the yield. Farmers are reliant on many conditions to produce a good yield; events such as weather patterns, soil conditions, diseases or pests can impact on the yield. Mathematical modelling can help predict impacts from these afflictions.

Mathematics Component – The Requirements

Create an interactive spreadsheet that can account for an agricultural affliction that can impact on agricultural productivity, this affliction can be exponential.

List any assumptions made in your spreadsheet calculations.

Prepare answers for the seen questions.

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Mathematics Component – Dynamic Spreadsheet

The spreadsheet needs to include:

- The type of crop or product being considered
- Demonstration of the impact of a disease, pest, weather pattern or other affliction
- Colour coded identification of an increase and a decrease in the rate of change
- Graphs with trendlines and equations
- Future predictions modelled from researched data

A spreadsheet will need to be created that has the ability to instantly recalculate one factor in response to change in another factor (e.g. stock/crop density in response to a change in disease transmission rate). This spreadsheet will be demonstrated at the Regional Showcase.

Mathematics Component – Elements for the Regional Showcase event

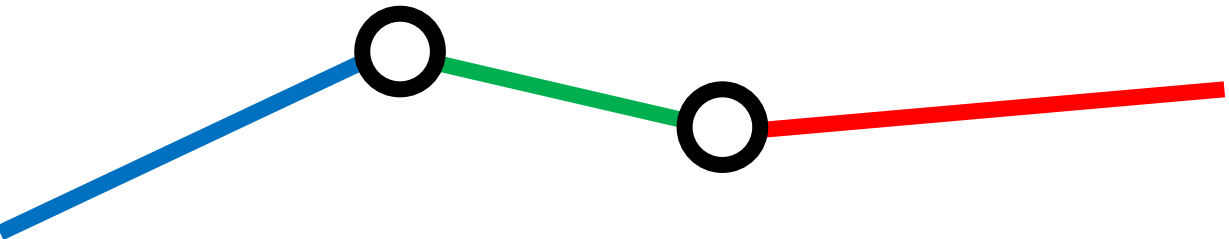
At the Regional Showcase event, students representing their school will be required to present their yield predictions and spreadsheet to UniSA Staff for judging. Schools will be assessed by means of Question and Answer. From a list of five (5) seen questions, students will need to respond to two (2) questions chosen by the judge, before being asked to respond to one (1) unseen question. Students will also need to demonstrate how the spreadsheet can recalculate the livestock/crop yield in their spreadsheet variations, as listed in the mathematics mark sheet.

Each school will be allocated a 10-minute timeslot for judging at the online Regional Showcase. The spreadsheet will need to be shared in the Zoom meeting during the judging timeslot.

UniSA Staff will judge the responses in a Question and Answer session, incorporating two (2) seen and one (1) unseen questions.

They will also judge the ability to demonstrate impact on livestock/crop yields due to changes in conditions caused by the chosen afflictions.

The spreadsheet will need to be on the device that is logged in to the Zoom meeting to allow it to be shared and viewed in the judging timeslot.



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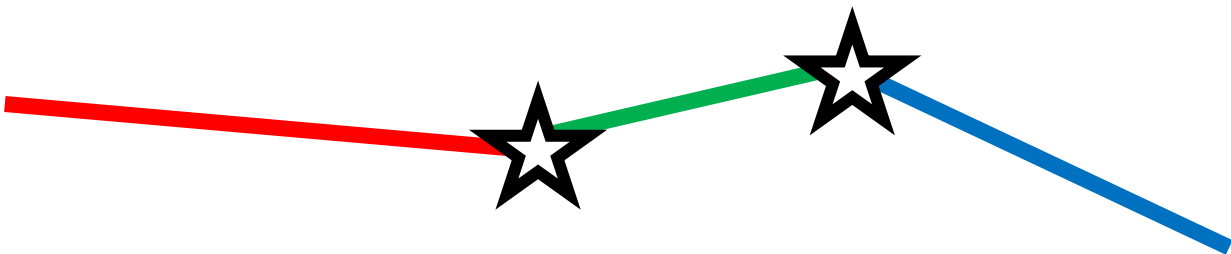
Flood! Fire! Famine!
STEMIE Regional Showcase
Mathematics Component

School: _____

Questions	Marks Available	Total Marks
1. Justify your chosen livestock/crop product and relevant affliction	**3 2 1 0 N/A**	
2. Explain how the livestock or crop yield is calculated	**3 2 1 0 N/A**	
3. Describe how your chosen affliction impacts on the yield	**3 2 1 0 N/A**	
4. Explain how you could maximise the yield	**3 2 1 0 N/A**	
5. Reflect on your graph of product yield over time, including variables within equations	**3 2 1 0 N/A**	
Demonstrate 2 variations using your spreadsheet (as requested by the UniSA Staff). Spreadsheet variation 1 – Show how your chosen affliction decreases the total yield. Spreadsheet variation 2 – Show how a change in the survival rate of the affliction can increase the yield.	**3 2 1 0** **3 2 1 0**	
Unseen Question 1.	**3 2 1 0**	
Total Marks:		**/15**



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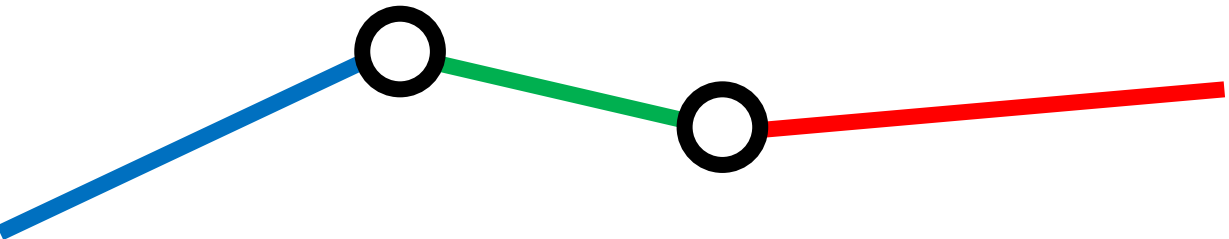

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STEM Innovation Experience
Flood! Fire! Famine!

Checkpoint Tasks and Overall Summary Component

Checkpoint Tasks and Overall Summary Component – Background Information
The Required Tasks need to be available for viewing via an online platform by the checkpoint dates. We recommend a website or similar platform with access via a link. If this is not possible, individual checkpoint tasks (R1-R6) can be submitted via a Google drive, drop box or similar with unrestricted access.

The purpose of these tasks is to ensure that progress has been made throughout The Learning Phase. It also allows the UniSA team to gather information relating to the implementation of STEMIE at each school site, and to gather any evidence of promotion of STEM within the school and the local and broader communities.

Overall Summary Component – The Requirements

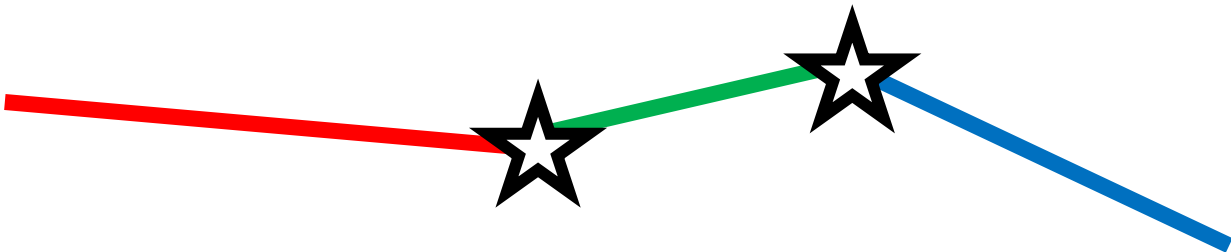
The Overall Summary Component consists of checkpoint task R6 (Required Task 6), the preparation of a United Nations Style speech about managing and reducing the effects of such catastrophic events and how STEMIE was delivered in the school.

Required Task R6 (United Nations Speech) needs to include:

- Speech presented as a transcript, as an audio file or video.
- Length of the speech must not exceed 3 minutes (or written equivalent)
- The speech must contain information about:
    - Description of how the STEMIE tasks were completed at your school
    - What has been learnt from the science, technology, engineering and mathematics tasks completed in STEMIE this year
    - How humans can manage and reduce the risks from flood, fire and famine in the future

- IN the event of a tie at the Regional Showcase, this task will be used to decide the winner that will progress to the STEMIE Final. A copy of the summary speech (written script, audio or video link) must be available to view online, send the link to STEMIE@UniSA.edu.au prior to the commencement of the Regional Showcase.

- Signed UniSA Media Release Forms must be supplied for anyone that appears in any photographs or video in the STEMIE tasks, and for anyone attending the STEMIE Final.



STEM Innovation Experience
Checkpoint Task Assessment

Assessment within STEMIE will be through an online platform (Website link is the preferred platform) Schools must submit the 6 required tasks to a satisfactory standard to qualify for the Regional Showcase event. There are 20 Assessable Tasks, only 6 are ***required*** and the 14 remaining tasks are ***optional***. If students or teachers have any questions they can send them to the UniSA STEMIE email address STEMIE@unisa.edu.au

Assessment – The Process

At school, groups of students will need to work through STEMIE to produce evidence of Assessable Tasks (at a satisfactory standard) for submission at Checkpoints throughout the year.

The submission requirements for each of the three Checkpoints are as follows:

- Checkpoint 0 (End of May) – optional checkpoint task
  Feedback will be provided for any schools that have sent a link to view tasks by the end of May. This is not a required deadline; it is optional for early feedback on qualification status to those schools working on STEMIE in Semester 1.

- Checkpoint 1 (Friday, Week 2 of Term 3)
  Required Task (R1) Submission of Timeline showing proposed dates and progress

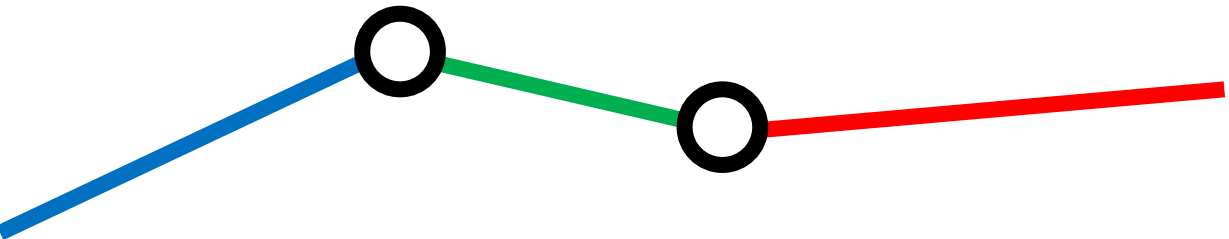
- Checkpoint 2 (Friday, Week 8 of Term 3)
  Required Tasks (R2-5) Submission of required tasks in each of the Science, Technology, Engineering and Mathematics components

- Checkpoint 3 (Last day of Term 3) – **Final Progress task**
  - **Required Task (R6)** Submission of STEMIE Summary Task

The deadline for all checkpoints is 8:00pm on the dates listed above. The link to access the content (website link, drop box link or other) need to be emailed to STEMIE@unisa.edu.au by this deadline so checkpoint submissions can be viewed online.

The link will be shared with other qualifying schools after checkpoint 3 so that students can see each other's progress. Unlisted links are recommended so they are not found by searching the content, but can be viewed when the specific link is supplied. Schools will need to ensure any students in the content have school media consent, or ensure the student can not be identified from any images on the platform.

School checkpoint tasks will be assessed to ensure they meet a satisfactory level. Work that does not demonstrate a satisfactory completion will be returned via email with feedback, along with an opportunity to resubmit. For a school to qualify to compete at their Regional Showcase event, all 6 required tasks must be submitted by Checkpoint 3.



Assessment

There should only be one submission to UniSA for each required task, regardless of how many students are working on STEMIE at the school. As long as the six required task submissions are to a satisfactory standard the school will qualify to compete at the Regional Showcase.

The person emailing the tasks to STEMIE@UniSA.edu.au needs to make the subject of the email and the label of the task the School Name and Task Number (e.g. R1)

Any unsuccessful submissions will have feedback and an opportunity to resubmit.
Marks earnt in the process of qualifying for the Regional Showcase event do not carry over into the event. That is, each school starts on an even level at the commencement of the Regional Showcase event.

The winner of the Regional Showcase event will be the school who, at the end of the event, has gained the highest number of marks at the Regional Showcase event. Winners will be emailed once all schools in that region have completed the judging process.

Assessment – Optional Tasks

The remaining 14 tasks on the matrix are optional, schools can choose to use them as part of their own assessment at school level, but they do not need to be submitted to UniSA. They are not compulsory.

Assessment – The STEMIE Final

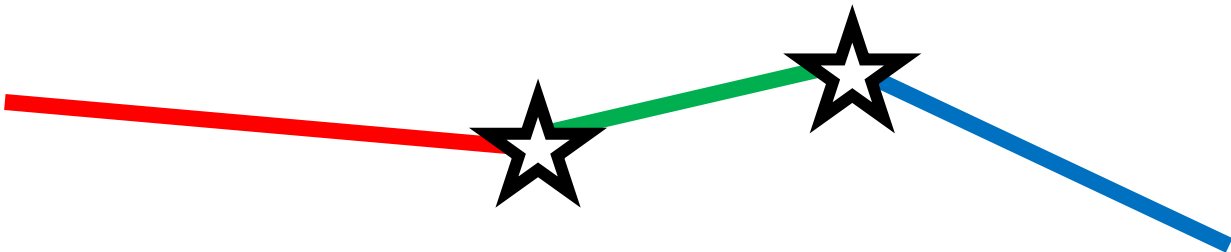
One school from each Regional Showcase will progress to the STEMIE Finals.

The school who wins their Regional Showcase event will be invited to the STEMIE Final, to be held at The University of South Australia, in November. Specific details will be supplied to winning schools.

In addition to the winners of the Regional Showcase events, there may be potential Wildcard entries into the STEMIE Final. These positions will be awarded to schools by UniSA Outreach at the conclusion of all the Regional Showcase events.

Marks awarded at the Regional Showcase do not carry over into the STEMIE Final. Each of the schools competing at the State Final will start on an even level with no advantage awarded to any school.

The school who gains the most marks at the STEMIE Final event will be crowned the winners of the STEM Innovation Experience for that year.



STEM Innovation Experience

Assessment Matrix

Science Tasks	Score	Technology Tasks	Score	Engineering Tasks	Score	Maths Tasks	Score	Overall Tasks	Score
S1. Referenced research into bushfires and their impacts, with emphasis on how a changing climate both affects and is affected by fires	1	**T1.** Referenced research into flood mitigation systems and other automated water alert devices	1	**E1.** Referenced research into modern industrial egg collection methods and how practices have improved, including animal welfare implications	1	**M1.** Referenced research into agricultural afflictions that affect crops and/or livestock	1	**R1. Checkpoint 1** Timeline, showing tasks and proposed progress	1
S2. Practical investigation of heat, heat transfer and/or combustion, including methodology, results and discussion	1	**T2.** Explanation of flood mitigation device, its components and their function, with annotated code samples	1	**E2.** Sketches, diagrams or 3D model (using CAD design program) of Egg Gathering Gadget (EGG) prototype	1	**M2.** Mathematical justification of afflictions selected to be modelled	1	**O1.** One page summary outlining how STEMIE is implemented at school	1
S3. Explanation of the relevance of the practical investigation to the topic of wildfires and how the results could influence future decision-making	1	**T3.** Evaluation of prototype development and discussion of any additional features.	1	**E3.** Summary of progress and changes to the prototype over time, and explanation of final design and its functional elements	1	**M3.** Interactive spreadsheet (including graphs) that can adjust to changes in variables governing affliction outcomes	1	**O2.** Promotion of STEMIE within the school community, local community or wider community	1
R2. Checkpoint 2 Photos of progress on investigation, with dates and captions	1	**R3. Checkpoint 2** Photos of prototype progress and screen shots of code development, with dates	1	**R4. Checkpoint 2** Photos of EGG prototype development & testing, with dates and captions	1	**R5. Checkpoint 2** Mathematical calculations/graphs/ screenshots/photos with dates	1	**R6. Checkpoint 3** STEMIE Summary Speech, how to manage and reduce the impact of floods, fire and famine. (3 min or written equivalent)	1
Possible Marks	4	**Possible Marks**	4	**Possible Marks**	4	**Possible Marks**	4	**Possible Marks**	4

Possible Total	20

Note: Only the Required Tasks (R1-R6) need to be shared with UniSA. All other tasks are for optional use within any internal school assessment.

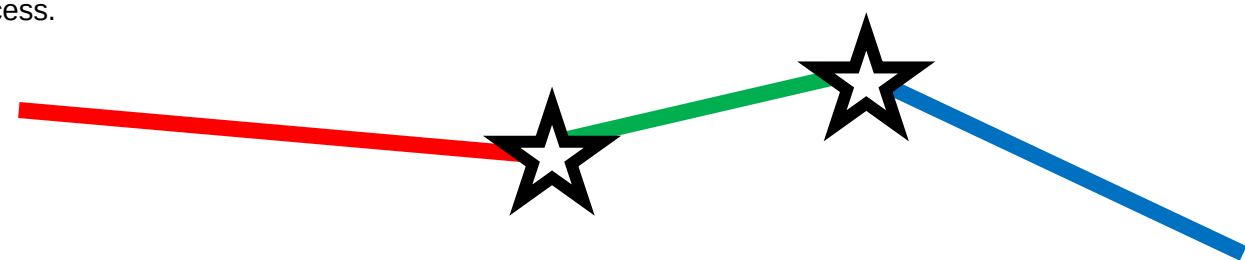
STEM Innovation Experience
Rules and Requirements

STEMIE Rules and Regulations

- While there is a competitive aspect to STEMIE, where possible, schools are actively encouraged to collaborate to share ideas, methodologies and resources.
- Accessing assistance from the wider community is also encouraged, should the required expertise to complete tasks not be available within the school.
- The first point of contact for any questions or queries relating to STEMIE is the Moodle site https://lo.unisa.edu.au/course/view.php?id=25118 This site contains electronic copies of resources provided to schools, additional web links, resources and student workshop activities.
- Additional questions can be sent to STEMIE@unisa.edu.au Teachers and their students are welcome to use this address to get assistance with their work.
- Question and Answer sessions can also be booked by schools (subject to staff availability). This will allow a UniSA staff member to Zoom link with your students and answer any potential questions they have or provide feedback on their ideas.

STEMIE Regional Showcase Judging Requirements

- To qualify for the Regional Showcase event, Required Tasks R1-R6 must be available for viewing online by the checkpoint deadlines, and to a satisfactory standard.
- The additional tasks on the assessment matrix are for optional use at school, they do not need to be submitted to UniSA for assessment.
- It is the responsibility of each school to ensure that the requirements for assessment at the Regional Showcase event are set up and that devices required to demonstrate the work during the Zoom meeting are functional.
- Each of the other Regional Showcase elements will have an allocated judging time, this will need to be strictly adhered to. Content of presentations or answers to questions that exceed the allocated judging time will not be considered.
- The supervision of students and set up of equipment for the Regional Showcase event is the responsibility of the school.
- Please ensure you have tested your devices and installed any required apps to access Zoom prior to the allocated judging time. One device must be portable during the judging of the technology and engineering tasks to allow the judges to view the prototypes from requested angles.
- The deadline for all Checkpoint items is 8:00pm on the date listed in the timeline. All submissions must be available online by this time and link received electronically via the UniSA STEMIE email STEMIE@UniSA.edu.au
- It is the responsibility of the school to keep copies of all work submitted
- Please ensure the student team representing the school and presenting ANY CONTENT at the Regional Showcase does not exceed a total of six (6) students.
- Teachers contributing to content during the judging allocations could result in the team being ineligible for the STEMIE Final position.
- Students and teachers are welcome to watch the presentations and assistance with IT issues, holding cameras etc. are not considered content linking in the judging process.



University of South Australia

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STEM Innovation Experience
Regional Showcase

STEMIE – The Regional Showcase

Students present a selection of their work in a judging timeslot via Zoom for the Regional Showcase.

Once qualified, a team of six (6) students will represent your school.

Each school will be judged on the following:

- Science Component – Formal presentation of the learning in the science activity.
- Technology Component – Judging of the Arduino coded prototype linked to their chosen theme.
- Engineering Component – Judging the function of the Engineering prototype
- Mathematics Component – "Question and Answer" session of seen and unseen questions and demonstration of their dynamic spreadsheet.

The dates for each of the Regional Showcase events are as follows:

- Allocation of judging timeslots opens in September; links will be sent to the schools contact teacher.
- Judging occurs as per allocated timeslots.
- Emails will be sent to announce the winners of each Regional Showcase once all the schools within that region have completed the judging process.

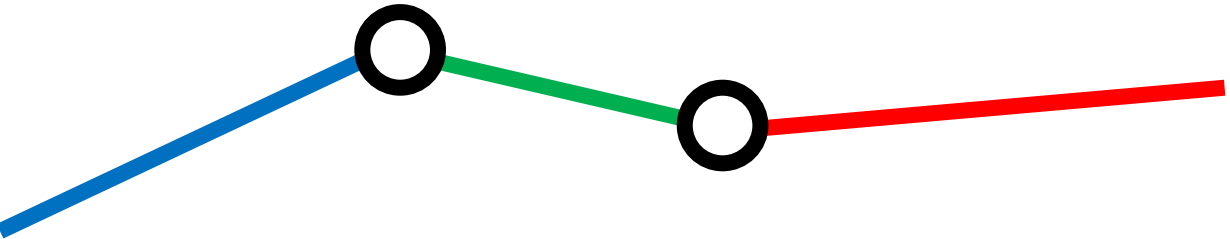
Schools will need to have the following on the day:

- Six (6) student representatives to present to judges, and their teacher to supervise.
- Presentation materials for the science component.
- Arduino coded Prototype for demonstration.
- Engineering device to be tested and judged.
- Dynamic spreadsheet and prepared answers to seen questions.
- Access to the Zoom link that will be sent to the school contact teacher on an iPad, Tablet, mobile device or similar to allow judges to view prototypes.
- Access to the Zoom link on a device that can share science presentation content and/or the mathematics spreadsheet.

Each school will be allocated a total on 1 ½ hours for their official judging timeslot, during which they will complete all assessment for the Regional Showcase event.

Students and their teacher will be required to be logged into the Zoom meeting for the duration of the judging timeslot.

In the event of a tie within a region, the overall task (Required Task 6) will be used to determine the winner. This needs to be available from the date of checkpoint 3, until the STEMIE Final date, via the online link supplied from the school.



STEM Innovation Experience
Task Information

The STEMIE Final

STEM Innovation Experience – STEMIE Final

The winners from each of the Regional Showcase event and any Wildcard entries will be eligible to compete at the STEMIE Final to be held at the University of South Australia.

The STEMIE Final will consist of a series of unseen STEM and teamwork challenges to be completed against the clock. Errors will result in time penalties, so accuracy is important. Schools from across South Australia and any participating interstate teams will be competing at the event. The winning team will be the fastest team (including any time penalties) to complete all the challenges on the day.

The event will be held in November. Specific details will be sent to the winning schools and can be found in the *Key Dates* tab on the STEMIE Moodle.

https://lo.unisa.edu.au/course/view.php?id=25118

A maximum of six (6) students per participating school, accompanied by their teacher, will compete in unseen STEM challenges on the day. The teacher will have duty of care for their students at all times, including lunch breaks.

All students that participate in the STEMIE Final will require a signed UniSA Media Release Form.

Note – Transport of students to and from the STEMIE Final is the responsibility of the school.

Further details about the event will be provided via email to the Regional Showcase event winners and any Wildcard entries closer to the date.

If you have any questions about STEMIE you can email
STEMIE@unisa.edu.au