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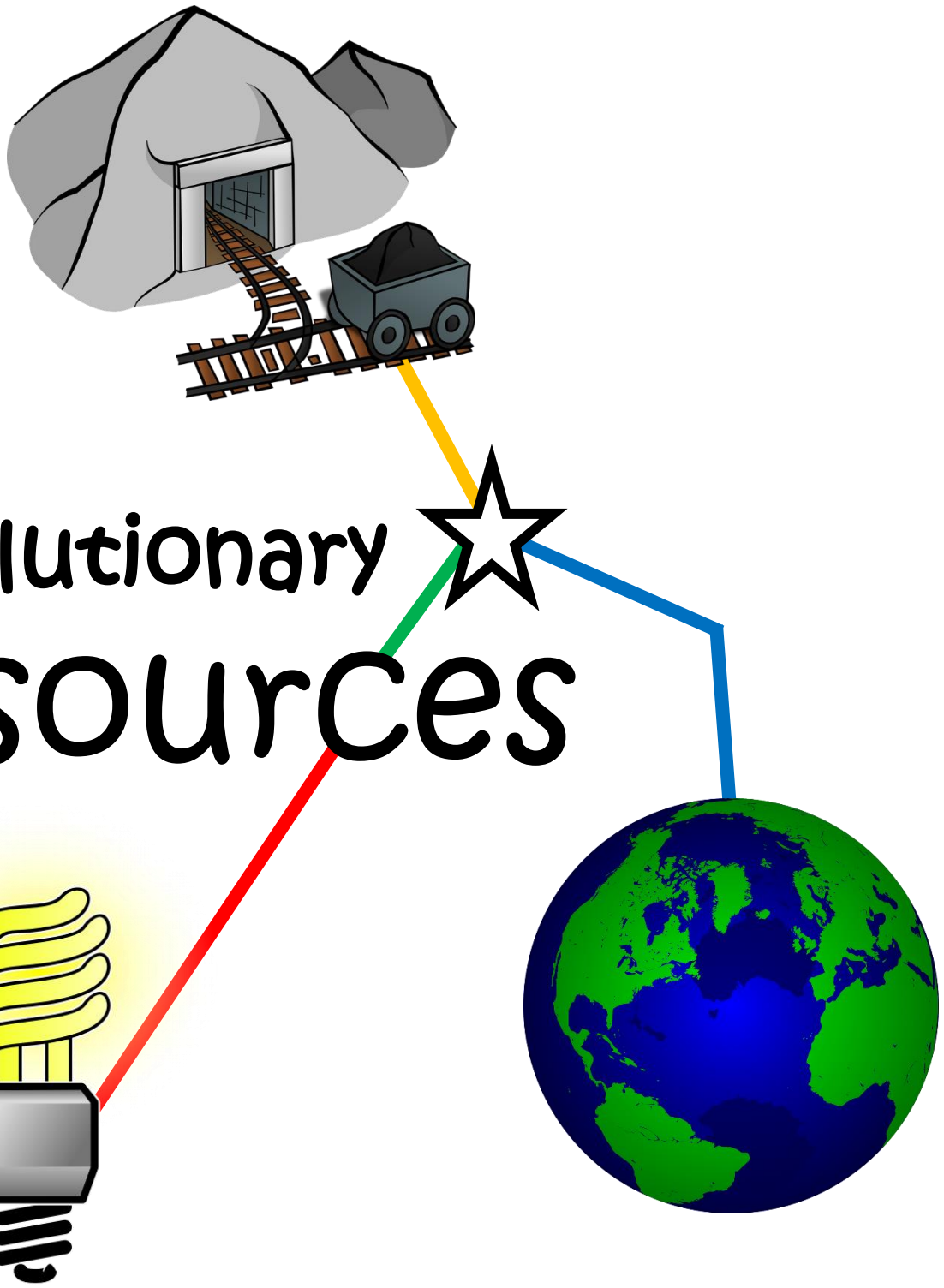

Revolutionary Resources

STEM Innovation Experience

STEMIE

University of South Australia

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STEM Innovation Experience
Task Information

Revolutionary Resources

Introduction

Australia is well known for its mineral resources. These materials have driven the Australian economy, immigration and development since gold was first discovered in 1851, triggering the first gold rush. Today Australia is seen as a global leader for supplying multiple mineral resources, not just gold.

Mineral ores supply elements that are essential for modern day living, and even environmentally friendly energy alternatives such as solar, wind or hydroelectric power production require the use of minerals.

As our population continues to grow, our reliance on resources will continue to increase. We need to manage these assets successfully while balancing the environmental needs to ensure a sustainable future.

In *Revolutionary Resources* you will learn about some of the science, technology, engineering and mathematics that goes into the management of our resources.

Image source: https://www.minerals.org.au/minerals-facts

"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased and not impaired in value"
Theodore Roosevelt (U.S. President 1901-1909)

"Unless someone like you cares a whole awful lot, nothing is going to get better. It's not"
The Lorax (Dr Seuss children's book and movie character)

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Revolutionary Resources

The STEM Innovation Experience (STEMIE) will focus on how humans manage resources and manage energy production while balancing environmental requirements. The students will engage in activities focussing on STEM skills related to resource management.

The Requirements

Revolutionary Resources will require completion of the following tasks:

- Research into everyday items and their production from raw materials, as well as a chemistry-based student design practical investigation.
- Development of an environmental control system within set parameters using Arduino coding.
- Design and create a payload transport system within set parameters
- Mathematical modelling of energy consumption and distribution using dynamic spreadsheets

Your school also needs to produce a summary task in the form of a mock social media campaign about your work in STEMIE this year. How STEMIE was delivered in your school, the tasks completed and any promotion of STEM throughout the program. This will include creating relevant #hashtags, photos, blogs, posts and/or videos.

STEMIE – The Three Parts

STEMIE will consist of three parts:

- The Learning Phase

This is completed at school and work is uploaded to an online platform with the link sent to 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.

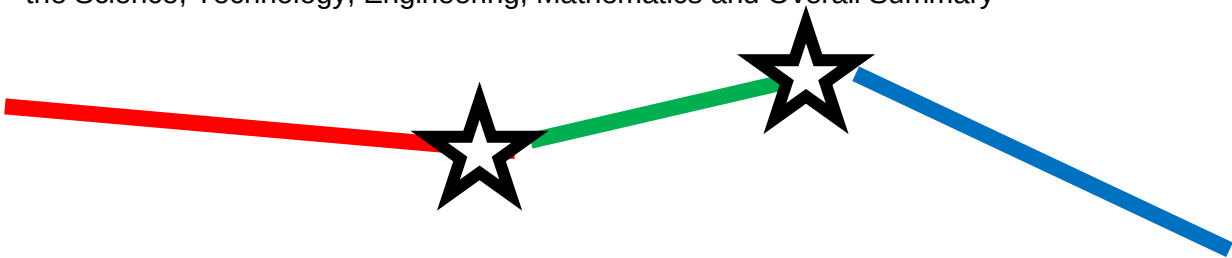
The Student Guide to Referencing and Guidelines for Referencing documents can be found at this link https://www.sace.sa.edu.au/learning/research-advice/referencing

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 or equivalent is preferred).

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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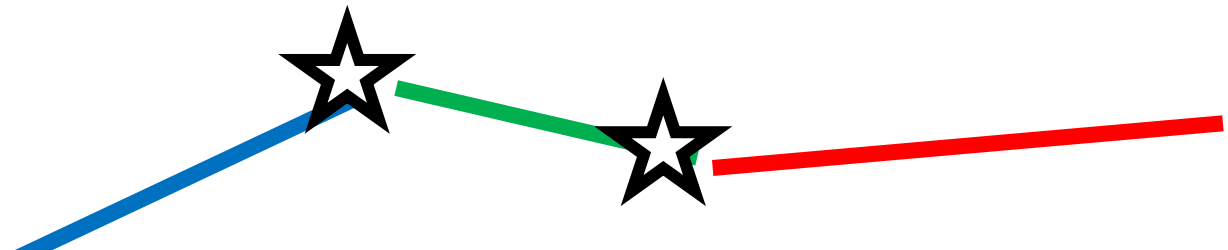

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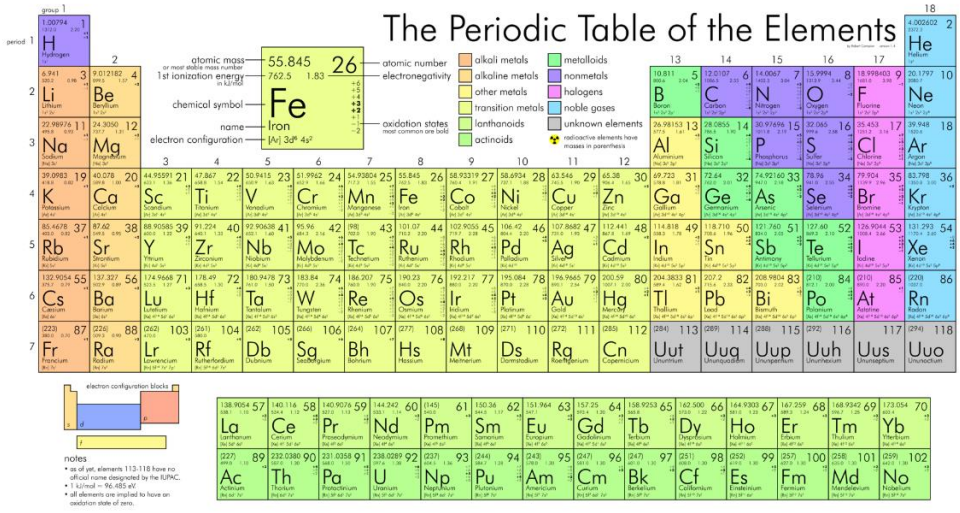
STEM Innovation Experience
Revolutionary Resources

Science Component

Science Component – Background Information

Management of mineral resources impacts our lives every day. From the roads we travel on to the mobile phones we use, minerals form part of nearly every aspect of modern living.

Utilising the elements from mineral ores requires knowledge of chemical processes as well as understanding the material properties each element has.



Science Component – The Requirements

Focussing on everyday items, investigate the pathway of an element from the natural source to the finished product.

Complete an investigation into one specific aspect of chemical reactions involving metals.

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 covering the following criteria:

- Research the process of locating, collecting, moving and processing of relevant raw materials.
- Describe the natural and ecological implications of the collection process.
- Explain the community consultations that need to be considered before commencing collection and processing, and any environmental rehabilitation required afterwards
- Create and conduct a practical investigation, including the 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 a chemical reaction involving metals. The purpose for conducting this investigation is to highlight the chemical properties of specific elements used in the production of everyday items.

Ideas for this investigation could include:

- The metal reactivity series
- Flame tests
- Acid/base reactions
- Conductivity
- Properties of metals
- Electrochemistry/electroplating
- Other relevant investigations

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

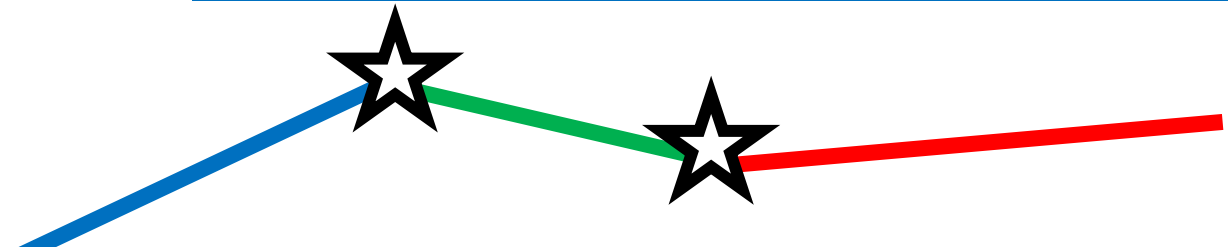
- Accuracy and precision of methodology
- Sources of random error
- Sources of systematic error
- Suggested improvements and limitations

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 we can manage resources to transform elements from raw materials to processed items.

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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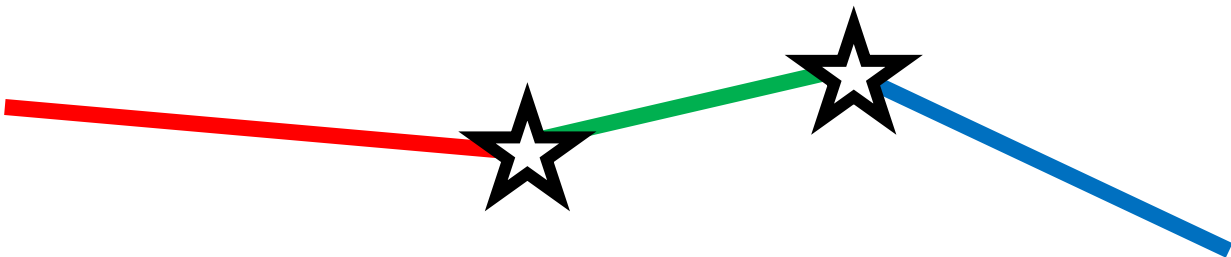
Revolutionary Resources
STEMIE Regional Showcase
Science Component

School: _____

Criteria	Marks Available	Total Marks
1. Summary of the process of getting your chosen element into the final product.	**3 2 1 0 N/A**	
2. Understanding the science behind chemical reactions involving metals.	**3 2 1 0 N/A**	
3. Incorporation of research and practical results into presentation to make informed decisions about resource 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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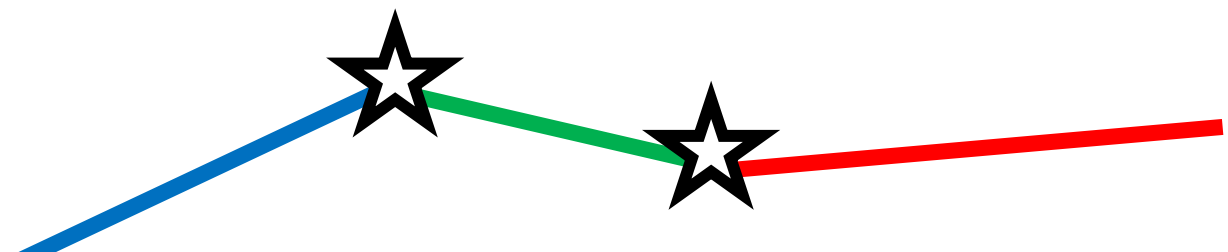

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STEM Innovation Experience
Revolutionary Resources

Technology Component

Technology Component – Background Information

Accessing resources often requires working in challenging environments. To ensure the safety of all employees, conditions need to be managed and any potential hazards identified and dealt with. Conditions such as air quality and temperature control must be monitored and maintained to ensure a safe working environment.

Technology Component – The Requirements

Create an "Environmental Awareness Response System" (EARS) device that can detect relevant conditions at a mine site.

This should include, at a minimum:

- Ability to detect a change in conditions
- Demonstrate a response to that change
- A 3D printed component in your prototype

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

- Brainstorm and investigate various detection devices in mine sites such as stone dust barriers, temperature sensors, movement sensors, air quality sensors etc.
- Design and create a prototype to detect and respond to a change in your chosen conditions
- Design and create a 3D printed component using a CAD program for your prototype.
- Investigate additional ways to make your device more effective.
- Evaluate the development of your prototype.

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Technology Component – Environmental Awareness Response System (EARS)

Create an Environmental Awareness Response System (EARS) device using Arduino coding that can detect a change in your chosen condition and respond to it accordingly. 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, the responses it responds to can be simulated, it just needs to be a proof of concept and can use LED's or other devices to simulate responses.

Technology Component – Elements for the Regional Showcase event

At the Regional Showcase event, students representing their school will be required to demonstrate their EARS device.

As a minimum, the device should be able to detect and respond to a change in conditions and can use manual input. Additional points are gained by automating the detection and response or adding visual outputs, audio outputs and relevant additional features.

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.

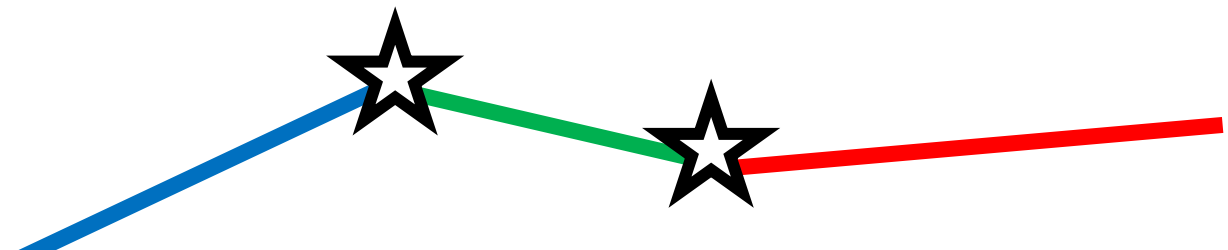
Programming Component – Elements for the Regional Showcase event

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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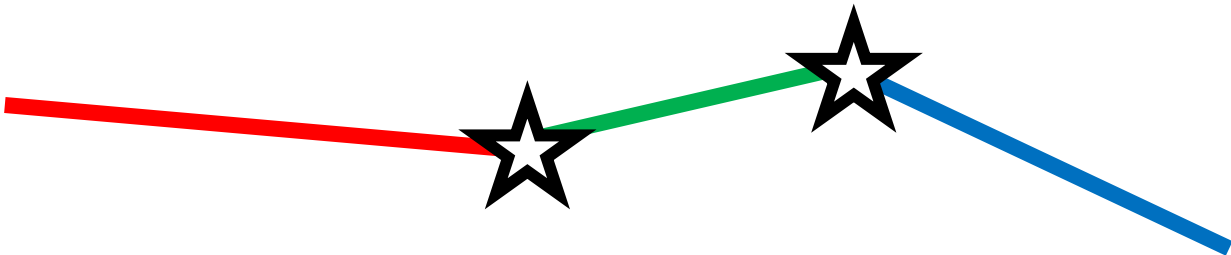
UniSA Education Futures

Revolutionary Resources
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 a change in a relevant condition?*	**1 Mark** – Can detect a change in a relevant condition but is inaccurate **2 Marks** – Can detect change in a relevant condition accurately **Or 3 Marks** – Can detect changes to multiple conditions accurately	
Output Response *Can respond to counteract the change in conditions* *Can respond with a warning signal*	**1 Mark** – Adjusts to the condition change but requires manual input e.g. button **Or 2 Marks** – Adjusts to the condition change autonomously e.g. sensor **+1 Mark** – LED and audio output in response to the change in conditions	
Additional Features *These must be successfully demonstrated within the judging time limit*	**+1 Mark** – Additional relevant feature successfully demonstrated **+1 Mark** –Another additional relevant feature **+1 Mark** –Another additional relevant feature	
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 code **+1 Mark** – Can find all errors in the sample code	
Total Marks:		**/15**



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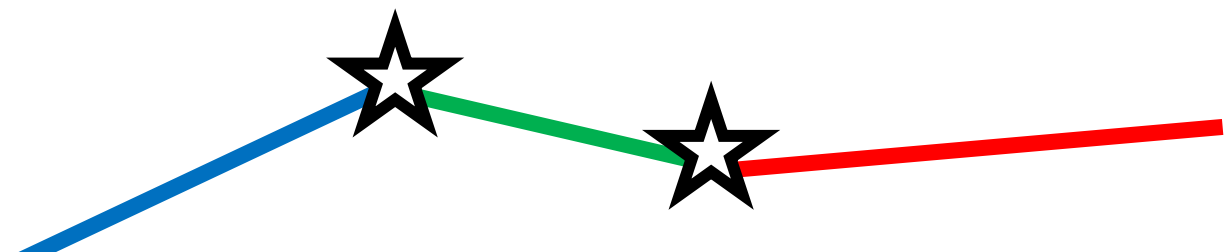

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STEM Innovation Experience
Revolutionary Resources

Engineering Component

Engineering Component – Background Information

Transport systems in the mining industry can have very specific requirements, not just for getting payloads or people to various locations but most importantly to ensure they meet strict safety requirements. Transport can be via inclined roads, shafts that work as underground roads, or vertical shafts that often require a cage or similar structure for transporting goods and people.

Image source: www.australianmining.com.au/news/bhps-next-chapter-to-come-from-automation/

Engineering Component – The Requirements

Design and construct a system to transport the Pringle POD from the raised platform to the target zone within specific parameters.

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 transport systems
- 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 transport device/s
- 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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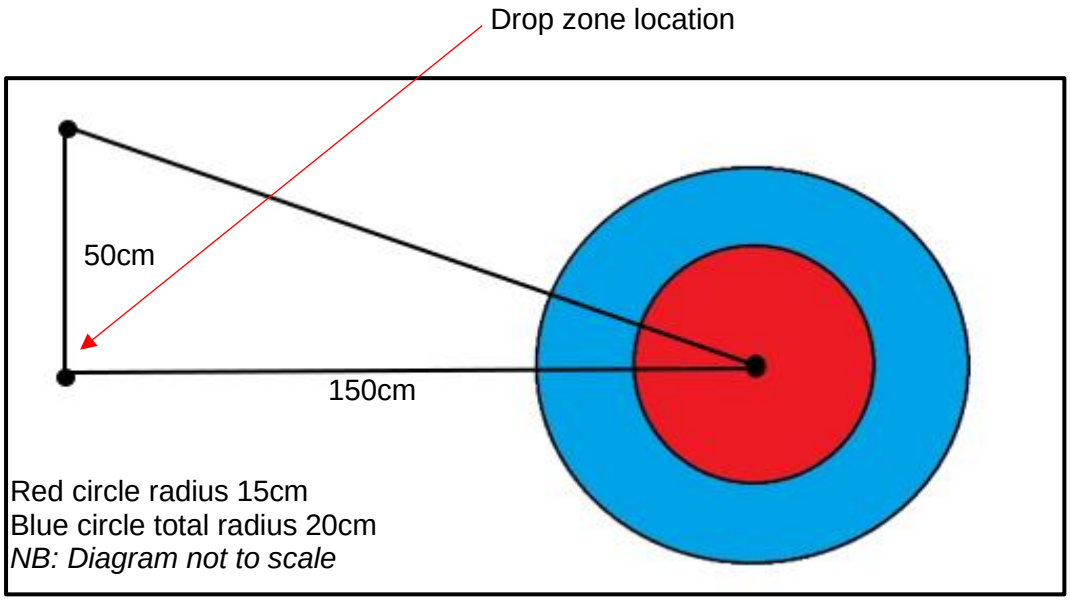
Engineering Component – Prototype Requirements

The device should be able to:

- Move the Pringle POD from the raised platform and lower it 80cm to the drop zone
- Transfer the Pringle POD to a device that will transport it to the red target zone.
- Demonstrate an ability to use an alternative route to get to the red target zone.
- The condition of the Pringle will need to be assessed at the drop zone and red target zones. The contents of The Pringle POD must be accessible at these points without the need to remove packaging/tape, etc.

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 Pringle POD device will be held via Zoom, we recommend having a mobile phone, iPad or similar device in the meeting to view the prototype during its run.

Each school will set up their transport system and will have two attempts with the best result recorded as their final score. All attempts must be completed within the judging time allocated.

Separate devices can be used for the lowering and transport of the Pringle POD.

Schools will be marked against the judging criteria.

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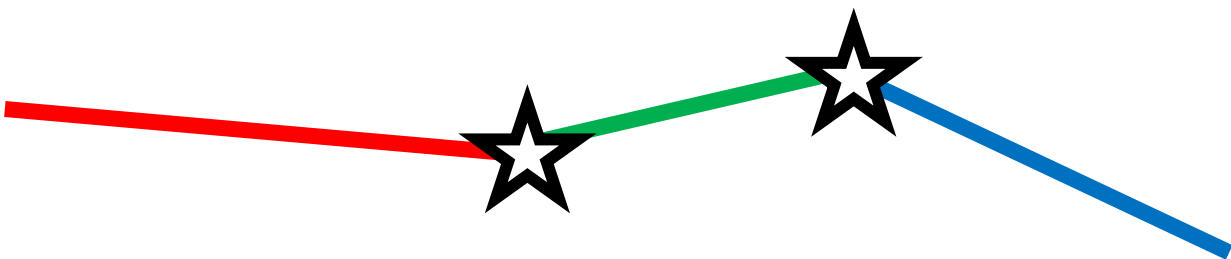
Revolutionary Resources
STEMIE Regional Showcase
Engineering Component

School: _____

Criteria	Marks Available	Total Marks
Functionality *The use of simple machines within the transport system and the ability to travel to the destination*	**1 Mark** – Can demonstrate the use of gears and/or a pulley within the system **+1 Marks** – Can demonstrate another aspect of machines (e.g. levers, screws, clamps, hydraulic components, etc.) **+1 Mark** – Can deliver the Pringle POD from the table to the map level **+1 Mark** – Can move the Pringle POD along the shortest route **+1 Mark** – Ability to move the Pringle POD via the alternative route	
Accuracy *Ability to move the Pringle POD to the red zone via the shortest route*	**1 Mark** – Pringle POD stops in white zone **2 Marks** – Pringle POD stops in blue zone **or 3 Marks** – Pringle POD stops in red zone **-1 Mark** – if the Pringle is broken during transit	
Autonomy *Ability to travel without human intervention*	**1 Mark –** Can deliver the Pringle POD to map level, may use manual input. **+1 Mark** – Can autonomously deliver the Pringle POD to the map level **+1 Mark** – Pringle POD can be transferred to the transport device autonomously **+1 Mark** – Pringle POD (once in transit) doesn't require any human intervention	
Additional Features	**+1 Mark** – Additional relevant feature **+1 Mark –** Additional relevant feature **+1 Mark –** Additional relevant feature	
Total Marks:		**/15**



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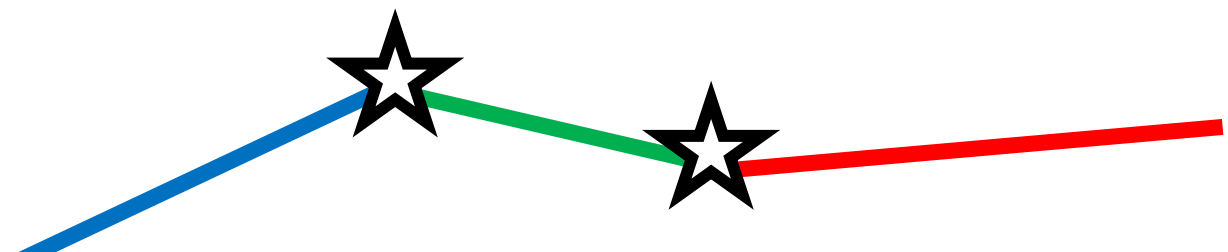

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STEM Innovation Experience
Revolutionary Resources

Mathematics Component

Mathematics Component – Background Information

Energy distribution is a complex balance of supply and demand. Baseload, or the minimum required energy to keep power generators running, is only one factor. Energy production requires a rapid response to changes in energy demand and different sources of power can respond at different rates. Mathematical modelling can help manage future energy requirements.

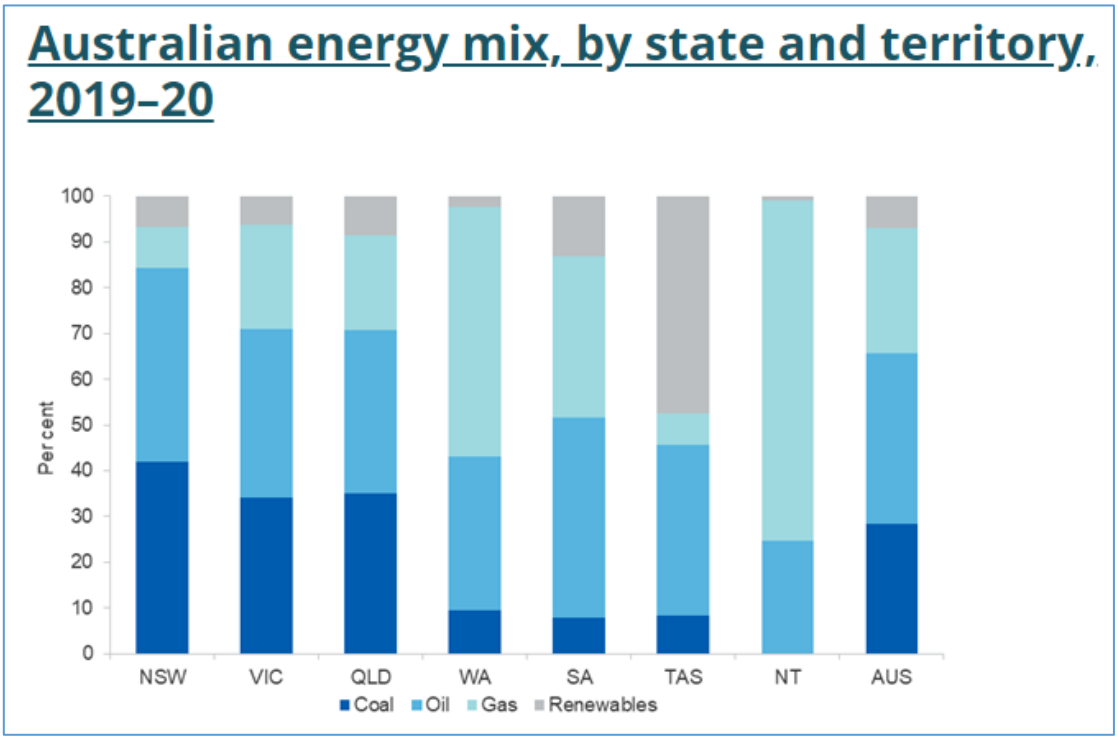

Image source: https://www.energy.gov.au/data/states-and-territories

Mathematics Component – The Requirements

Create an interactive spreadsheet that can predict energy demand in 2030 based on current energy consumption trends and justify the desired mix of renewable and non-renewable sources to produce energy supply and seasonal variations.

List any assumptions made in your spreadsheet calculations.

Prepare answers for the seen questions.

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Mathematics Component – Dynamic Spreadsheet

The spreadsheet/s should include:

- Which state or territory you are modelling your data on
- The type of energy sources being considered
- Demonstration of the minimum energy required from non-renewable sources
- Variations in energy demand based on population data
- Seasonal variations in energy demand
- Relevant graphs with trendlines and equations

The spreadsheet will need to be able to demonstrate the ability to instantly recalculate future projections of energy use subject to population fluctuations and account for seasonal variations. This spreadsheet will be demonstrated at the Regional Showcase.

Mathematics Component – Elements for the Regional Showcase event

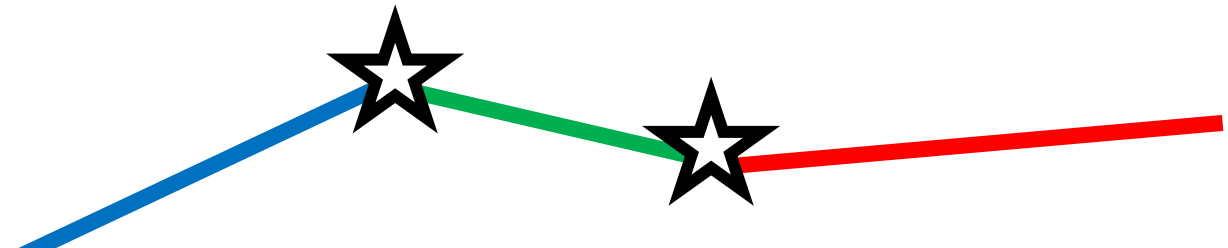
At the Regional Showcase event, students representing their school will be required to present their spreadsheet to a STEMIE representative for judging. Schools will be assessed by means of Question and Answer. From a list of five (5) seen questions, students will need to respond to two (2) questions 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 energy production requirements in two (2) 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 dynamic spreadsheet and the ability to demonstrate energy consumption variations caused by seasonal and population changes.

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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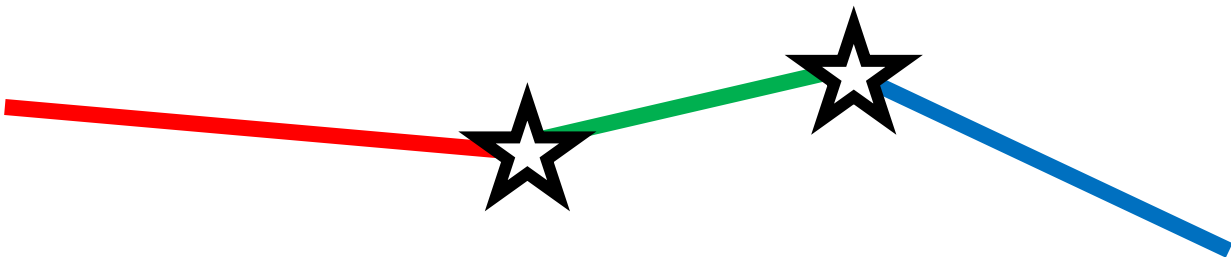
UniSA Education Futures

Revolutionary Resources
STEMIE Regional Showcase
Mathematics Component

School: _____

Questions	Marks Available	Total Marks
1. Explain how your energy production is calculated and any assumptions made	**3 2 1 0 N/A**	
2. Reflect on your graph/s showing the future trends and how you extrapolated the data on your graph/s	**3 2 1 0 N/A**	
3. Justify your chosen ratio of renewables to non-renewables	**3 2 1 0 N/A**	
4. Describe how the national grid can impact on your state's energy production (off loading excess or bringing in energy from interstate)	**3 2 1 0 N/A**	
5. Explain how your energy mix can cater for seasonal fluctuations in energy demand	**3 2 1 0 N/A**	
Demonstrate 2 variations using your spreadsheet (as requested by the UniSA Staff) Spreadsheet variation 1 – Show how energy requirements would change if there was an increase or decrease in the population expected in 2030 Spreadsheet variation 2 – Show how season variations can impact on your energy mix	**3 2 1 0** **3 2 1 0**	
Unseen Question	**3 2 1 0**	
Total Marks:		**/15**



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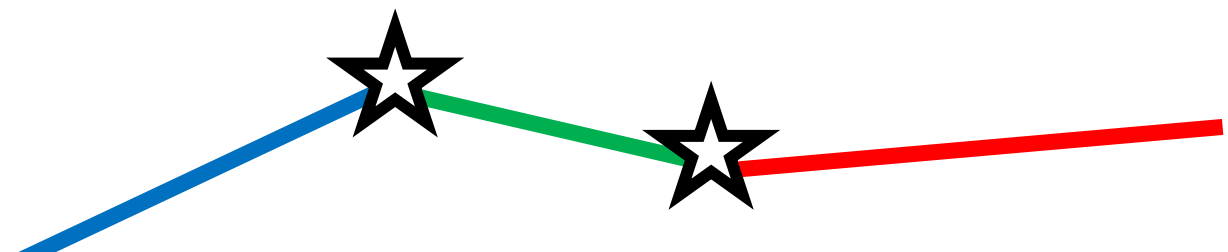

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STEM Innovation Experience
Revolutionary Resources

Checkpoint Tasks and Overall Summary Component

Checkpoint Tasks & 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.

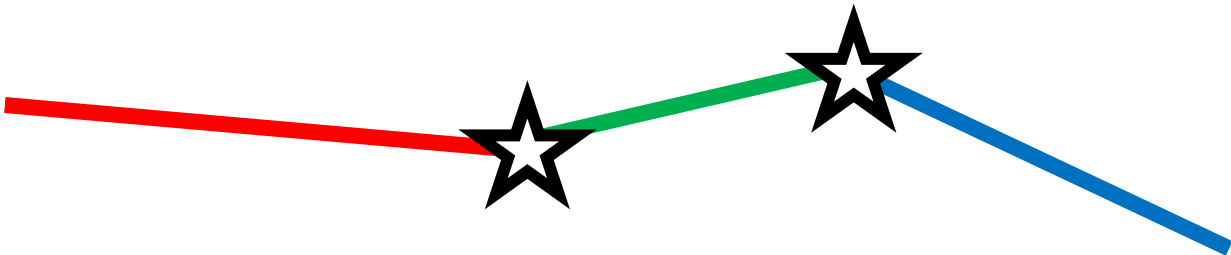
Overall Component – The Requirements

The Overall Summary Component consists of checkpoint task R6 (Required Task 6), the social media campaign based on STEMIE Revolutionary Resources.

This will include information about how STEMIE was delivered in the school, the STEM tasks completed at school and any promotion of STEMIE that occurred.

Required Task 6 (R6) - Social Media Campaign Criteria:

- This is a mock campaign and does not actually need to be uploaded to social media.
- Length of the social media campaign consists of relevant hashtags, photos, posts, blogs or video (must not exceed 500 words or multimedia equivalent).
- The social media campaign proposal 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 their resources
    - Relevant photos, posts, videos, hashtags, etc.
- 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.
- 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.



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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.

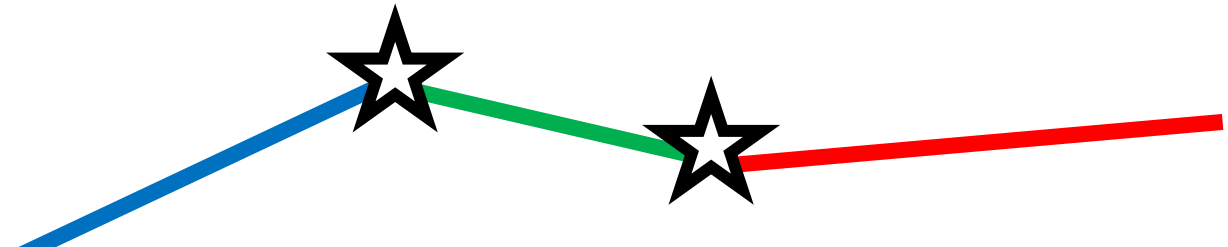
The submission requirements for each of the three Checkpoints are as follows:

- 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 cannot 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 link containing the required tasks needs to be emailed to STEMIE@UniSA.edu.au
The link must be viewable without the use of passwords. Websites or similar online platforms are preferred, but if this is not possible the link can be to a Google Drive or Drop Box.

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

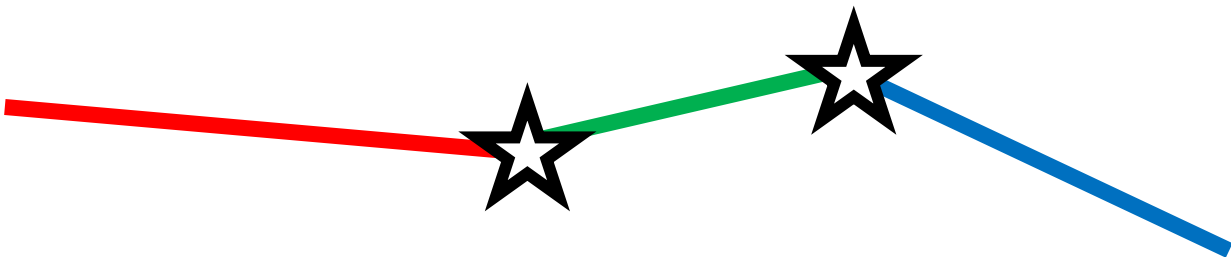
One school from each Regional Showcase will progress to the STEMIE Finals.

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.



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STEM Innovation Experience

Assessment Matrix

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Science Tasks	Score	Technology Tasks	Score	Engineering Tasks	Score	Maths Tasks	Score	Overall Tasks	Score
S1. Referenced research into the production of everyday items from raw materials	1	**T1.** Referenced research into control systems to make worksites more comfortable and safer	1	**E1.** Referenced research into transport systems within mine sites	1	**M1.** Referenced research into supply and demand of energy from both renewable and non renewable sources	1	**R1. Checkpoint 1** Timeline, showing tasks and proposed progress	1
S2. Practical investigation into an aspect of elemental chemistry focussing on metals	1	**T2.** Explanation of EARS device, its components and their function, with annotated code samples	1	**E2.** Sketches, diagrams or 3D model (using CAD design program) of Pringle POD transport system prototype	1	**M2.** Mathematical justification of energy production estimates being modelled	1	**O1.** One page summary outlining how STEMIE is implemented at school	1
S3. Explanation of the relevance of the practical investigation to manufacturing processes	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 daily, seasonal or population fluctuations	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 prototype development & testing, with dates and captions	1	**R5. Checkpoint 2** Mathematical calculations/graphs/ screenshots/photos with dates	1	**R6. Checkpoint 3** STEMIE "Revolutionary Resources" social media campaign	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.

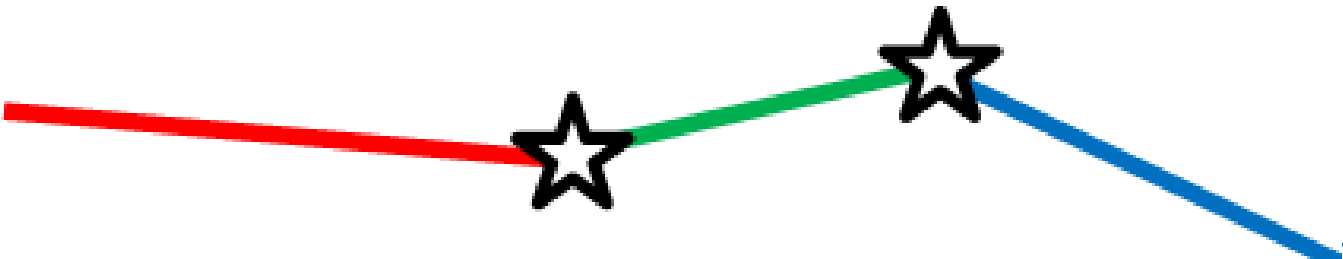
STEM Innovation Experience
Rules and Requirements

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.



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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.

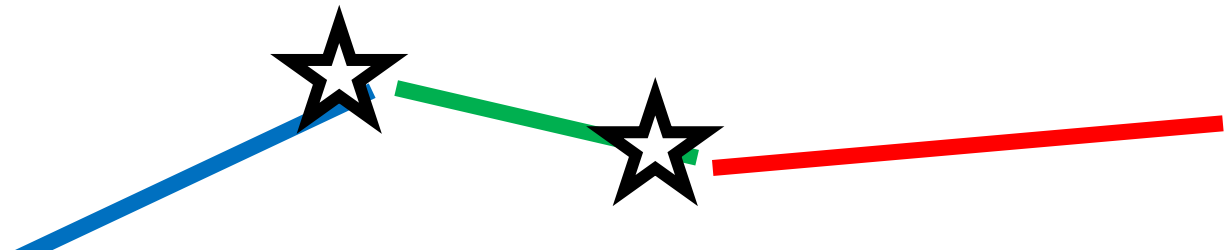
Schools will need to have the following on the day:

- 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.



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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, but will not be able to assist students with the challenge content in any capacity.

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