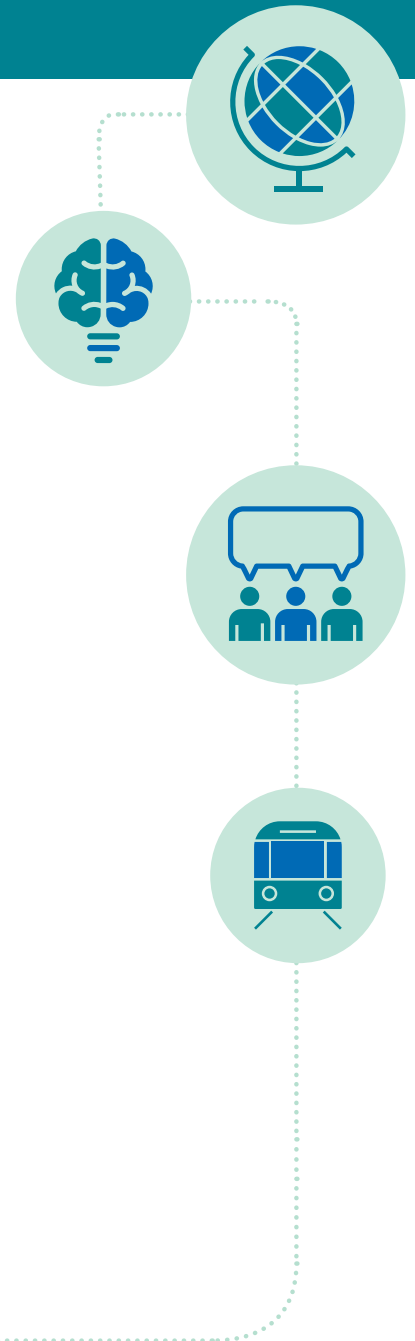# Metro Minds STEAM Challenge

Project guide and design folio

These resources are part of Sydney Metro's FastTracking the Future education program for years K-10 that is focused on providing learning experiences for students about the Sydney Metro project; its purpose, construction and environmental and social context.

Student name

Class and School

Teacher

Conduct an investigation to identify different ways in which an individual, the community or the environment might be impacted by changes from the new Sydney Metro in your local area.

Your goals are to:
- collect and interpret data
- understand the needs of users
- identify opportunities for designed solutions

❶ Identify different points of view

Indicate the different user groups in your community or people working on the Sydney Metro that you will survey, interview, observe or research.

- ☐ commuters
- ☐ school students
- ☐ tertiary students
- ☐ travellers with disabilities
- ☐ parents with small children
- ☐ senior citizens and pensioners

- ☐ businesses operating close to Sydney Metro stations
- ☐ residents living close to Sydney Metro stations and tunnels
- ☐ people working on the Sydney Metro project
- ☐ _____
- ☐ _____

❷ Gather perspectives

Design a survey and/or plan an interview. Select or write questions that you think will elicit opinions, wants and needs from your participants.

- ☐ What are some of the problems that have affected you in the past when using train services in Sydney?
- ☐ What are your current experiences and knowledge of the new Sydney Metro?
- ☐ How has Sydney Metro affected your neighbourhood, your lifestyle, your plans or your work so far?
- ☐ Predict how Sydney Metro might affect your neighbourhood, lifestyle, plans or work in the future.
- ☐ Describe any concerns regarding the design, construction or operation of the Sydney Metro in your area?
- ☐ Describe anything that might prevent or discourage you from using the Sydney Metro in the future?
- ☐ Describe any difficulties or problems that might arise for you when using the Sydney Metro?

- ☐ Do you think Sydney Metro will have a positive, negative or nil impact on the following?
  - You personally
  - Your local community
  - The greater Sydney region
  - Traffic congestion in your local area
  - The environment in your local area
  - Growth and jobs in your local area
  - The community feel and spirit in your local area
  - Types of housing options in your area
  - The capacity of public transport to meet demand in Sydney
- ☐ _____
  _____
- ☐ _____
  _____

❸ Empathise

List some important issues, problems or needs you identified from your research	Describe how the user group is affected by the problem

NSW GOVERNMENT

sydney METRO

Complete the following tasks to help you deconstruct the problem and define it in a simply-worded design challenge.

Your goals are to:
- select one problem that you believe is worth solving
- compose a problem statement and write a driving question

Tip: Choose a Sydney Metro challenge statement or compose your own. Get inspired, visit **sydneymetro.info/explore-the-challenges**

❶ Compose a problem statement

Elaborate on the problem you have chosen by identifying these three elements:

ⓘ A problem statement clearly describes the problem your project will address.

The issue of…	
affects… *(who or what?)*	
and has a negative impact by… *(how?)*	

Now write your draft problem statement ensuring it includes the above three elements and meets the criteria listed below.

_____
_____
_____
_____
_____

Criteria

Check that your problem statement:
- describes how people, places or things are harmed or disadvantaged
- focuses on only one problem
- contains no more than three sentences
- does not include a solution

The problem statement for our project is:

_____
_____
_____
_____
_____

Problem statement exemplar

Read the exemplar problem statement below then re-work your draft until you are satisfied that it clearly explains the problem your project will address.

"Many Sydney Metro customers value how their stations look, feel and contribute to their community. People being unfriendly and discourteous concerns them. They want a station and precincts to be nice, friendly environments."

❷ Write a driving question

Re-read your problem statement then experiment with different wordings by saying out loud "How can we...?" while inserting and substituting different verbs from the list below. Play with the wordings and explore several options until your driving question has a similar structure to the exemplar below.

i *A good driving question will drive you to do further research and motivate you to come up with creative solutions. It does not specifically tell you what kind of solution you are to produce. It is an open-ended design challenge explained in one sentence.*

Driving Question Exemplars

"**How can we <u>encourage</u>** stronger communities through the design of Sydney Metro stations and precincts?"

"**How can we <u>persuade</u>** more people to leave their car at home and use Sydney Metro?"

"**How can we <u>enable</u>** customers with accessibility needs to easily move between an interchange and Sydney Metro without the need for assistance?"

Drafts

How can we _____

_____?

How can we _____

_____?

How can we _____

_____?

Here is a selection of action verbs that you can choose from to assist you in writing a driving question for your project:

accommodate	deliver	form	optimise	restore
adapt	design	free	overcome	retrieve
advance	determine	fund	persuade	reverse
advocate	develop	grow	prepare	safeguard
assist	devise	help	preserve	save
avoid	distribute	implement	prevent	secure
build	educate	improve	promote	sell
change	enable	increase	protect	simplify
clean	encourage	influence	provide	solve
conciliate	engage	maximise	raise	stimulate
construct	enhance	mediate	reduce	support
control	establish	minimise	reform	teach
cure	expand	modernise	rehabilitate	train
debunk	extend	motivate	renew	troubleshoot
decrease	fix	negotiate	repair	upgrade

The driving question for our project is:

_____

_____

_____

_____

Brainstorm numerous ideas. All ideas are acceptable and all ideas are to be recorded. To assist with creative flow do not judge the ideas until you have finished generating a pool of potential solutions. (Print extra pages for extra ideas as required.)

Your goals are to:
- imagine, generate and record a diverse list of original ideas using general descriptions and/or simple two-dimensional representations
- evaluate all ideas against a criteria for success and identify the most original and practicable solution

Generate an **Idea** *Sketch and/or describe the idea*	

Indicate the **Design type**	☐ **Product**	☐ **Performance**	☐ **Service**	☐ **Environment**
Pros *Discuss, predict and identify the advantages of this idea. Give reasons for your opinions.*	☐ It is a **problem solver**	☐ It is **practicable**	☐ It is **protective**	☐ It is **progressive**

Cons *Discuss, predict and identify the disadvantages of this idea. Give reasons for your opinions.*	**Costs**	**Contingencies**	**Constraints**

Definitions of key terms

Product	a tangible item designed for an identified user or consumer
Performance	a form of creative artistic expression designed to engage, inform and persuade an audience
Service	an action or program that serves or meets an identified need of an individual, a demographic or a natural environment
Environment	a designed space that provides a conducive setting for human or non-human activity
Problem-solver	the idea has potential to address the problem or meet the need
Practicable	you have the means and skills to make this idea a reality and put it into practice

Protective	the idea conserves natural resources and minimises harm to the natural environment
Progressive	the idea is original and innovative and it has the potential to be 'ground-breaking'
Costs	these are the costs of implementing the idea in terms of time, expense and its impact on the environment
Contingencies	these are the new problems that might be created if the idea were to be implemented
Constraints	these are the factors that could make it too difficult or impossible to implement the idea

Identify the processes and materials needed to produce your designed solution and then make a prototype.

Your goals are to:
- do a risk assessment
- write an action plan
- produce a first version or model of your designed solution

❶ Resources

List all of the resources that you will need to produce or implement your solution:

Digital technologies	
Identify any device, app, program, platform, system, coding tool or web design tool you will need to make your solution.	
Materials	
Identify any physical substance, tangible item or tools you will need to make your solution.	

❷ Risk assessment

Pitfalls	
Play it safe. Identify any possible risk of accident or injury to yourself during the implementation of your plan.	
Prevention	
Explain how you will prevent accidents or injuries from happening.	

❸ Action Plan

#	**What** action is to be taken?	**Who** is responsible for this action?	**How** will it be achieved?	**Where** will this action take place?	**When** is this step due to be completed?	✓
1						
2						
3						
4						
5						
6						

Check that your product, service or environment is fit for purpose and that it meets the needs of the user.

Your goals are to:
- find a group of users, or an audience, to test your prototype
- collect and consider feedback from the users
- produce several iterations and make improvements
- assess the suitability of the solution to achieve its intended purpose

❶ Nominate a test group

Indicate the individuals or groups who have agreed to test your designed solution.

ⓘ Before proceeding gain approval from your teacher to engage this group for testing purposes.

_____

❷ Collect feedback

Observe and interview a user group using your designed solution. Write down your observations of what they did, said, thought and felt.

Did

_____

_____

_____

Said

_____

_____

_____

Thought

_____

_____

_____

Felt

_____

_____

_____

❸ Make modifications

Reflect on the users' behaviours, interactions and feedback and suggest improvements to your product.

_____

_____

_____

_____

❹ Evaluate the designed solution

The intended purpose of our designed solution was to _____

_____

We believe our designed solution is effective because _____

_____

Our final product meets the needs of the user/s in the following ways: _____

_____

Rate your designed solution against these three criteria:

	On track				Exceeds expectations
The innovation is an original and creative idea which is highly suitable for users.	1	2	3	4	5
The idea solves all or most aspects of the identified problem/challenge.	1	2	3	4	5
All aspects of the innovation are realistic, achievable and could be used in the real world.	1	2	3	4	5