Australian Government
Department of Education

Best Practice Guide:

Run school-industry STEM partnerships

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Opportunity through learning

Disclaimer

This Best Practice Guide is a summary of elements of the *National STEM School Education Resources Toolkit*. The Australian Government Department of Education commissioned Dandolopartners International to develop the Toolkit to assist schools and industry to establish new STEM initiatives, form school-industry partnerships, and evaluate existing and future STEM initiatives.

The Toolkit uses real-world examples of events and activities offered by education departments, industry and other providers. Inclusion of references and links to external sources does not imply endorsement of any company, product or program by the Australian Government.

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How do I run a STEM school education initiative?

This guide is designed for schools, businesses and others who would like to get involved in STEM school education initiatives, but aren't sure exactly how to go about it.

You can use this guide to identify and develop a STEM education initiative for your school or organisation.

Any school or organisation can get involved in STEM education initiatives

Whether you are in a school, early learning centre, business or other organisation, there is always a way to get involved with STEM education to suit your aims (as well as your budget).

Initiatives do not have to be large or expensive to be worthwhile and you don't always need to start from scratch. There are many existing initiatives you can join and build on, and many opportunities for partnerships, especially between businesses and schools. See Step 3 below for more information. Depending on aims, capability and budget, you could also start your own initiative.

How to plan and run a STEM education initiative

There are five key steps to follow when thinking about starting a STEM education initiative. They are shown in the table below and explained in full in the following sections.

Step 1. Decide what you want to achieve	Identify the problem you want to solve and what success looks like
Step 2. Pick who you want to target	Identify who should benefit from the initiative, and who should be able to participate
Step 3. Choose the best option	Consider whether you want to create your own initiative or build from an existing initiative, then compare options and choose your initiative
Step 4. Think about how it will work	Identify what staff / who will be involved and how. Consider key implementation issues and identify next steps
Step 5. Plan to evaluate	Identify when and how you will measure success and what monitoring and evaluation will look like

Step 1: Decide what you want to achieve

- *Identify the problem you want to resolve or the opportunity you want to realise*—STEM education generally aims to improve student engagement, achievement, or both. Sometimes initiatives aim to resolve existing problems. Sometimes initiatives aim to take up new opportunities. With your end goal in mind, you can think through what would best achieve it. Aim for no more than 2-3 objectives so your initiative remains manageable. You want to ensure your objective is clear, is focused on students, and avoids assuming what the initiative should be about (to avoid being set on a particular initiative because it sounds interesting or new but is actually not effective)

> For example, the Queensland Mineral and Energy Academy↗ (QMEA) offers a range of initiatives to schools and students including events, teacher professional learning and industry personnel in schools.
>
> QMEA objectives for these initiatives are to:
>
> - Increase and broaden students' knowledge and understanding of the sector and attract more students into STEM subjects.
> - Provide pathways for young people in Years 7 to 12 into the resources sector and other STEM-related careers.

- *Identify what success looks like*—specific objectives mean initiatives can more easily measure success. Vague objectives such as "improve STEM education" do not help identify *what* you could be doing, are difficult to measure and are open to different interpretations e.g. do you want to improve participation, engagement, achievement or all? Examples of measuring success include:

	Engagement	Achievement
Short-term success looks like	Attentive students in class Uptake of STEM subjects for next year	Improved results Improved range and quality of skills
Long-term success looks like	Enrolments in STEM at university and TAFE An intelligent, critical society who can meaningfully question and influence scientific policy and news	Improved career pathways Increase in STEM employment More skilled STEM workforce

Step 2: Pick who you want to target

- *Identify who should benefit from the initiative*—some initiatives work better for particular groups, so this helps to narrow down what an effective initiative could be for your particular objective and target group. For example, you might choose to target a particular groups to improve equity, because this group is:
    - Falling behind in either engagement or achievement compared with their peers (e.g. CSIRO's Indigenous STEM Education Project↗ runs six programs to increase STEM participation among Aboriginal and Torres Strait Islander students).
    - Under-represented in STEM either at school or in the workforce (e.g. cloud computing company Salesforce↗ particularly focuses on under-represented youth in STEM).
    - Under-served, or doesn't get the same exposure as other students (e.g. the Shell Questacon Science Circus↗ runs science presentations to inspire young people in regional areas to value and engage in STEM learning and career possibilities).

It can be tempting to pick a large target population, or several groups. But it's important to think about what is realistic and where you can have the most impact. Often the more specific your target population, the better you can meet their needs.

- *Identify who should be able to participate in the initiative*—ideally, the initiative should focus only on the target population. Sometimes this isn't possible because targeting might not be practical. Including only the students you want to benefit can cause too much disruption. For example, running a museum excursion that targets only lower-performing students may not be possible, as it may be difficult to run a trip with only part of the class.

  Think about what would be practical and effective for the students you want to benefit.

Step 3: Choose the best option

- *Learn and understand what is known already about what works in STEM education*—Check your understanding in three key areas:
    - What is generally good practice for STEM education? To increase student engagement and achievement, STEM education in the classroom needs to reflect what's happening in STEM's exciting fields outside the classroom.
    - What is best for the group that I am looking to target? There are different challenges and strategies for targeting STEM education to different groups. For example, different age groups engage with STEM differently, and some groups need additional support.
    - What kinds of initiatives generally work well, when? There are many different things you can do to support STEM education. These include professional development, classroom activities and beyond.

- *Build on what is already happening in STEM education*—you don't have to start from scratch. Building on what others are already doing can help you achieve greater impact, and it can save time, effort and resources. Consider whether:
    - There are existing resources you could base your initiative around
    - There is an existing initiative that suits your outcomes for the students you're targeting
    - You already have an established relationship or knowledge of a potential partner
    - There is an intermediary organisation which could link you with potential partners.

For example:

- reSolve: Mathematics by Inquiry developed resources for teaching maths↗ and professional development for maths teachers
- The iSTEM curriculum,↗ developed by Regional Development Australia Hunter's ME Program and local businesses, is material for an elective subject that teaches STEM in an integrated way to Year 9 and 10 students
- Digital Technologies Hub↗ is a curated collection of resources for teachers and schools to help implement the new Digital Technologies Curriculum
- Evidence for Learning's Teaching and Learning Toolkit↗ shares ideas, resources and evidence about different approaches you could try using digital technologies, collaborative learning and more.

- *Acknowledge what is possible for you and what constraints you face* - consider what is realistic and possible for you to achieve. For example:
    - How big is your budget?
    - What time and resources do you have for setting up, taking part, and evaluating the initiative?
    - What level of commitment can you make to finding a potential partner and coordinating with them?
    - Do you face other potential barriers or opportunities?

Practical considerations may mean you remove options from your shortlist. Varying constraints make different options easier or harder to achieve. This is important to understand, and factor into your decision-making.

- *Consider your options and chose your initiative*—to choose your initiative you need to bring together all the knowledge and thinking from this step. You need to choose between your options by considering:
    - Effectiveness: How well would the initiative achieve your identified outcome for the students you wish to target?
    - Practicality: How easy would it be to design and implement this initiative?

See the diagram at the end of this Guide for a template to bring your ideas together and come to a decision. You can also use it to show others why you want to proceed with a particular initiative.

When you are filling in this kind of template, ensure you:

- Are realistic and fair when rating options. Your top option does not have to be 5-star and a green light. In fact, you might have a red light for practicality and four stars for effectiveness, but are certain the initiative would be worth the effort so you choose it anyway. Equally, a green light and a 2-star rating could be a great way to start making an impact for students. The ratings are only to help guide the process.
- List initiatives that are slightly different as separate options (e.g. Option 1: a 7-day initiative to work on real-world problems and Option 2: a 3-day program to work on real-world problems).
- Note why you've given an option a particular rating (this makes your decision-making process more transparent).

But don't:

- Include options that are clearly impossible
- Calculate all the time, effort and resources required to understand practicality. Just your sense of how hard it would be is enough at this stage.

Step 4: Think about how it will work

- *Identify who will be involved and how*—think of the key roles that need to be filled first and who might fill them e.g. project manager, co-ordinator, support staff. Key roles include:

Role	What they do during set-up	What they do when the initiative is running	Who usually does this?
Project manager (either at school or organisation)	Ensure everyone is working towards the same goal and that progress is matching expectations	Ensure the initiative is running smoothly	Often a school leader or subject teacher / or an industry employee who is passionate about (or the 'champion' for) the initiative
Key partner representative	Working with project manager to develop initiative, expectations for their organisation or school	Organise their ongoing contribution to the initiative (whether that's resources, volunteers, funding or other)	At a school, this role might be a subject teacher or head of department In larger organisations, this might be a head of social responsibility or similar. In smaller organisations, it could be an employee 'champion' for the initiative
Co-ordinator	Ensure those involved in developing and implementing the initiative are around the same table	Organises for those needed to run and take part in the initiative (e.g. the experts to run classes)	Project manager or another key senior teacher
Communicator	Ensure those involved in the initiative agree about key design and implementation decisions Ensure those who will be participating (students and their teachers / parents) know about the plans for the initiative	Keep the following groups up to date with details on when the initiative will run and what they need to do: • Students • Parents • Staff	Project manager (or school administration)
Initiative 'staff'	Show they are interested in taking part in the initiative and willing to do training if required, or talk with partner to understand their perspective	Contribute their time and resources to taking part in the initiative (e.g. taking classes, doing demonstrations, participating in professional learning)	Teachers or volunteers who want to be involved in the initiative

- *Consider key implementation issues and identified next steps*—there is no 'one size fits all'. Consider who will be affected and what resources you need to make it happen, which partners you need to work with, and who needs to be kept in the loop.

Step 5: Plan to evaluate

- *Identify when you will measure success*— determine whether you are measuring long-term or short-term outcomes. You don't have to wait for the program to finish to evaluate its success. In fact, if an initiative runs for a long time, is a new or innovative idea, or a major investment, you might want to know whether it has been successful early on. That way you can make adjustments to make the initiative more effective while it is still running. You may also want to do an evaluation before a major decision point, such as expanding the initiative to more students, or making an appeal for funding.
- *Identify how you will measure success* – this will depend on what you want the initiative to achieve. You can set up ways to capture the information you need to measure success, creating a greater chance of monitoring and evaluating what you want to achieve.
- Monitoring and evaluation will allow you to know:
    - Whether the initiative has been successful (has it achieved, or is on track to achieve, the intended objective?)
    - What should happen with the initiative (continue it, shut it down, scale it up, change who participates).

(see the *Best Practice Guide: Evaluate school-industry STEM partnerships* for more information)

Template: Choose your initiative

This template is designed to easily compare different initiative options, to help you decide which one to choose for your school or organisation.

Once you have identified a number of initiatives you're interested in:

- List them in the table, putting each option in an individual row. If you have two slightly different variations of an option, have a row for each variation.
- Rate each option based on its effectiveness based on a scale of 1 to 5 stars (see key for guide on ratings), and state what information supports this rating
- Rate practicality based on a traffic light scale (see key for guide on ratings), and state what information supports this rating

This table aims to give you a clear summary of the options. It is not going to tell you what the right or wrong option is. Ideally, there would be some options that are highly effective and easy to achieve, but in most cases you will have a mix of ratings.

	Option	Effectiveness		Practicality	
	Sentence description of the option	How well would the option achieve your identified objective for your target audience (the students you want to target)?		How easy would it be to design and implement the option?	
		Rating	What supports this rating	Rating	What supports this rating
1		☆☆☆☆☆		◯	
2		☆☆☆☆☆		◯	
3		☆☆☆☆☆		◯	
4		☆☆☆☆☆		◯	

Key

Star ratings:
1 star: I am 20% confident this option will achieve the objective for my target audience
2 stars: I am 40% confident this option will achieve the objective for my target audience
3 stars: I am 60% confident this option will achieve the objective for my target audience
4 stars: I am 80% confident this option will achieve the objective for my target audience
5 stars: I am 100% confident this option will achieve the objective for my target audience

Situations that should give you confidence:

- Where an option demonstrates one of the principles of quality STEM initiatives
- Where an option has a sizeable impact on achieving an objective
- Where there is evidence the option is good for achieving my objective
- Where there is evidence the option is good for my particular target audience

Traffic light ratings:

- Easy to achieve
- Challenging but achievable
- Difficult to achieve (i.e would take an extraordinary amount of effort or resources)