**Australian Government**

**Department of Education**

# Best Practice Guide:

# Evaluate school-industry STEM partnerships

**October 2019**

*Opportunity through learning*

# How do I evaluate a STEM education initiative?

This guide is designed for schools, businesses and others that would like to evaluate a STEM education initiative. You can use this guide to:

- Understand the value of evaluation
- Adopt an evaluation framework for your STEM education initiative

## Why are evaluations important?

Evaluations can seem intimidating but they're just a series of common-sense steps. Evaluations are important because they help you understand the impacts of an initiative.

| What can a STEM education initiative evaluation do for you? | What can a STEM education initiative evaluation do for others? |
|---|---|
| An evaluation tells you whether the initiative had a positive impact, so you can:<br><br>• Be confident what you are doing makes a difference<br>• Decide to continue / stop the initiative<br>• Change the initiative where it needs to be improved<br>• Show value to funders and stakeholders | When you share your evaluation's results, you help build shared knowledge about what works, where and for whom.<br><br>This gives others a better shot at choosing the STEM education initiative that will work best for them. |

## Conducting an evaluation

There are six steps every evaluation has in common. Each step can be adjusted, depending on the nature of the initiative and the evaluation. This means your evaluation will be 'fit for purpose':

## Step 1: Decide the purpose of your evaluation

- *Identify what decisions or actions you want to make / take with the results of your evaluation*—for example, decide to continue the initiative or not, scale it up, refine the design or use it to find potential industry / school partners.

- *Share the purpose with your stakeholders*, otherwise they might be worried about what the evaluation means for them.

## Step 2: Pick who needs to be involved and how

- *Identify your stakeholders and how they need to be involved*—consider who would be interested in your evaluation, e.g. school or business leadership, staff, students or parents.

- *Allocate roles in a way that best suits the purpose of your evaluation*—consider who should be in key roles (e.g. co-ordinator or researcher), and where additional resources / people are needed.

- *Consider how to make your evaluation independent*—even small steps make a difference, e.g. interviews are run by a teacher not involved in the initiative.

## Step 3: Build your evaluation framework

An evaluation framework describes and organises the information that you need to collect in an evaluation. Figure 2 provides a template, with a menu of measures for you to pick which ones suit your initiative.

- *Understand your evaluation framework*—while every evaluation is different, STEM education initiatives have enough in common that we can start from a standard evaluation framework. For example, all *evaluation frameworks start with the key evaluation question: Did the initiative achieve its objective(s)? To* answer this question, you need evidence about the initiative. Evidence can be grouped into four categories: design, implementation, outputs and outcomes.

**Table 1. Components of an evaluation framework**

| Key evaluation question: Did the initiative achieve its intended outcomes? | | | |
|---|---|---|---|
| **Design** | **Implementation** | **Outputs** | **Outcomes** |
| Does the initiative's design maximise success? | How has the initiative been implemented in practice? | What has the initiative produced or delivered? | What impacts, effects or consequences has the initiative had for students? |

- *Customise the evaluation framework to include measures important to your evaluation*—you can customise your evaluation framework by identifying which measures to use underneath each category of evidence. This way, you can tailor your evaluation framework to be as large and complex or short and simple as you want. Each category of evidence has distinct measures, focusing on different aspects of the initiative:

    **Design:**
    Design measures generally ask whether there was justification or evidence for particular design decisions of an initiative, or whether a process took place to make specific design decisions.

    **Implementation:**
    Implementation measures fall into two groups that look at whether the initiative lived up to expectations:

    - The rollout of the initiative—e.g. did the initiative meet its intention to organise five scientists to mentor chemistry school students?

    - Generic program factors—e.g. did the initiative deliver what it was supposed to on time and within budget?

**Outputs:**

You can think about outputs as things produced on the way to achieving outcomes. There are three kinds of output measures:

- o Number of 'things' the initiative produced (e.g. resources, equipment / technology distributed).

- o Number of people the initiative reached (e.g. number of students or teachers).

- o Time spent in initiative-related activities (e.g. teacher hours in professional learning).

It is also important to capture demographic information (e.g. age, gender, location) as an additional measure so you can analyse 'who received what?' to determine if some groups received more resources or opportunities than others.

**Outcomes:**

Outcome measures look at what actually changed as a result of the initiative, which is usually the hardest part of an initiative to measure.

Outcomes can be about student engagement or student achievement, which ideally you would be able to measure directly (e.g. you might observe students are engaged in a STEM class or you might analyse test results to show achievement).

Where direct measures aren't available to you (it might be hard to get evidence about a specific set of students), you can use proxies. A proxy is something associated with what you are trying to measure. Common examples in education include:

- o **Behaviours as proxies:** You might infer that particular behaviours will lead to improved engagement or achievement, e.g. students asking harder questions in class might reflect improvements in achievement.

- o **Beliefs as proxies:** You might hear or observe particular beliefs and infer these beliefs will lead to improved outcomes, e.g. if teachers enjoy teaching maths, this might improve students' engagement.

- o **Engagement as a proxy for achievement:** You might measure positive impacts on student engagement but have no means of capturing impact on achievement. Research shows that improved engagement is linked to improved achievement, so you might infer that improvements in engagement would likely lead to improved achievement.

Table 2 provides a menu of measures underneath each category of evidence. Use this as a starting point and select measures that would help you answer the questions about design, implementation, outputs and outcomes for your initiative. Tailor measures so they are relevant to your initiative and add more measures if needed.

**Table 2. Potential measures for an evaluation framework**

| Key evaluation question: Did the initiative achieve its intended outcomes? | | | | |
|---|---|---|---|---|
| **Design**<br>**Does the initiative's design maximise success?** | **Implementation**<br>**How has the initiative been implemented in practice?** | **Outputs**<br>**What has the initiative produced or delivered?** | **Outcomes**<br>**What impacts, effects or consequences has the initiative had for students?** | |
| Potential measures for design | Potential measures for rollout | Potential measures for things produced | Direct measures of engagement and achievement | |
| Were decisions on the following backed by evidence / information?<br>• What problem should the initiative aim to solve / what objective did the initiative have to achieve?<br>• Who should be the focus of the initiative?<br>• What type of initiative should be used?<br>• How to implement the initiative<br>  ○ Was rollout designed to get best uptake / deliver best quality of initiative?<br>• Whether or not to reach out for partners<br>• Did the resources / activity co-ordinate with curriculum? | • Did the initiative try to engage the target population?<br>• Was rollout carried out in a way to get best uptake / deliver best quality of initiative?<br>• Did the initiative deliver on its intentions to:<br>  ○ Develop x many resources<br>  ○ Host x many visits<br>  ○ Deliver the number and type of experts or providers planned (e.g. science students or experienced teacher professional learning mentors)<br>  ○ Deliver professional learning as part of initiative? | *How many of the following did the initiative produce, e.g.:*<br>• Teaching / student resources<br>• Products or resources delivered to schools<br>• Experts for visiting schools<br>• Experts for coaching / mentoring teachers<br>• Events or expos held or visited<br>• Teacher professional learning sessions<br>• Lessons observed / led by experts or other teachers | *Direct measures of engagement*<br>• Are students more engaged and attentive in class?<br>  ○ Particularly students in the target population?<br>• Are enrolments in STEM subjects increasing?<br>  ○ In short term?<br>  ○ In long term? | *Direct measures of achievement*<br>• Are students' results improving?<br>• Are students' skills improving (e.g. through critical thinking skills test)?<br>• Do teachers / employers have positive feedback on achievement / performance of students?<br>• Depth of understanding in subjects<br>• Retention of concepts |
| | | | Proxies to measure engagement and achievement | |
| | | | *Potential behaviours to use as proxies* | *Potential beliefs to use as proxies* |
| | | Potential measures for people reached | *Are students or teachers demonstrating best practice behaviours or actions, e.g.:*<br>• Teachers integrating technology in the classroom?<br>• Teachers adapting material / resources / skills from professional learning for their classes' abilities<br>• Teachers enabling inquiry-based learning?<br>• Students asking and answering questions that demonstrate a deeper understanding and interest | *Are students or teachers demonstrating beliefs that indicate engagement or achievement outcomes, e.g.:*<br>• Do teachers feel more confident since undertaking professional development?<br>• Are students less anxious about certain topics or subjects?<br>• Teachers believe students' proficiency has developed<br>• Students have aspirations for taking STEM subjects later in their education or for STEM careers |
| | | *How many of the following did the initiative reach, e.g.:*<br>• Student attendees<br>• Teacher attendees<br>• Parent attendees<br>• Page visits on a website | | |

| Key evaluation question: Did the initiative achieve its intended outcomes? | | | |
|---|---|---|---|
| **Design**<br><br>**Does the initiative's design maximise success?** | **Implementation**<br><br>**How has the initiative been implemented in practice?** | **Outputs**<br><br>**What has the initiative produced or delivered?** | **Outcomes**<br><br>**What impacts, effects or consequences has the initiative had for students?** |
| | Generic program measures | Potential measures for time spent | |
| | *Did the initiative:*<br>• Get developed and delivered on time<br>• Get developed and delivered on budget<br>• Comply with appropriate probity / process<br>• Establish appropriate governance structures<br>• Complete monitoring / reporting<br>• Communicate and engage with stakeholders (e.g. other year level or subject teachers, parents) | *How much time spent doing initiative activities, e.g.:*<br>• Student hours in activity / using resources / equipment<br>• Teacher hours spent in professional learning<br>• Hours spent mentoring other teachers or observing their lessons<br><br>Potential measures about who received the initiative<br><br>*Who received the initiative in practice?*<br>*For students, by:*<br>• Student year level<br>• Student ability<br>• Demographics, e.g. SES, gender, ethnicity, geographic location<br>*For teachers, by:*<br>• Year level they teach<br>• Subjects they teach<br>• Years of experience teaching (in general, and for specific subjects)<br>• In-field / out-of-field experience | |