# Stage 1 STEM learning framework

Identify and define phase

Table 1 Prompts and learning tools for identify and define phase

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| What we are looking for | Question prompts to guide learning (Observations) | Possible learning tools |
| Identify how people design and produce familiar products, services and environments.  | Who designs things?Can you find some things that have been designed in our space? Why were they designed?What do designers need to think about when making a design? | [Gallery walks](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/555#.Xt77TF56o-M.link)[Brainstorming](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/542#.XuG1y9K_Pjc.link)[Using keywords](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/565#.XuG1y1Nze-U.link)[STEM journal/design folio](https://docs.google.com/presentation/d/1riWdXBRu5ug9DQ1ib2tBIvDy8jBnSCNsYUvmJPLwtY4/template/preview) |
| Identify and explore information and ideas from source materials. | Where is...?How would you compare …? How would you group … to show …?What facts or ideas show ….?  | [Simple graphic organiser](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/599#.Xtmqei5RGpE.link)[Design thinking – design folio](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/619#.Xt7_L7K7Sz8.link)[Learning intentions and success criteria](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622#.Xt7_L-KcCy4.link) |
| Identify and explore others’ needs. | Can you list three different …...? What are they thinking? Why did they choose ….?Who were the main characters in the story? How do they feel when …...? What ways could we help them?How would you describe what they need? | [plus, minus interesting](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/551#.Xtnd8n2lkn8.link)[hot seat](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/569#.Xtneb2YcUgs.link)[Empathy map (DOCX 84.3KB)](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/key-learning-areas/stem/media/documents/stem-es1-s1-s2-s3-empathy-map-design-thinking.docx)[Six thinking hats](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/545#.XuG1ZJn0OwU.link) |
| Share and discuss understanding of the terminology within the driving question. | What is the problem I need to solve? Why is there a problem? What is the driving question asking us to do? What do we know? What do we need to know? How can we find out?What do other people think about this? What other questions do you have? | [Wonder walls](https://www.pinterest.com.au/3hokiesncville/wonder-wall/)[affinity diagram](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/576#.Xtneb15BYog.link)[brainstorming](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/542#.Xtneb0qMVBM.link)[5 Whys strategy](https://simonsinek.com/find-your-why/?ref=mainNav)Concept mapping – What if we do nothing?[Rubrics](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/544#.Xt8G0QI4224.link) Allow flexibility in your rubrics to account for multiple learning paths and project variation. |

****Research and plan phase

Table 2 Prompts and learning tools for research and plan phase

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| What we are looking for | Question prompts to guide learning  | Possible learning tools |
| Recognise needs or opportunities when designing solutions. | What decisions can we make? How would you decide...?How can we find out the most important ……?Who can help us …?  | [brainstorming](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/542#.Xtneb0qMVBM.link)[Concept mapping](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.Xt77TJTijDY.link)[plus, minus interesting](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/551#.Xtnd8n2lkn8.link)[hot seat](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/569#.Xtneb2YcUgs.link) |
| Pose purposeful questions about the problem and compare information to their world. | What other questions do you have?Do we need to find more information about…?How do you feel about …?How can we find out …? | [peer discussion and conferencing](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/547#.Xt76bqE31fM.link)[student generated lists](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/563#.Xt76rxfLKqk.link)[mini whiteboards](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/575#.Xt77FouPpyw.link) |
| Explore, identify and organise information from given resources. | How would you describe ……...?What are the parts of …? How is it related to …? Why do you think …? What else is different about...?  | [affinity diagram](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/576#.Xtneb15BYog.link)[Frayer diagram](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/553#.Xt8H40ZV3fo.link) |
| Consider sustainability to meet personal and local community needs. | What if our design solution is not used?How would you show …?How will we understand know what others need?How would you use …? | [Gallery walks](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/555#.Xt77TF56o-M.link)[Brainstorming](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/542#.XuG1y9K_Pjc.link)[Using keywords](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/565#.XuG1y1Nze-U.link) |
| Use information from a previous experience to inform a new idea. | What have we learnt about …?What examples can you find to help your ideas?What if we …? What other way could you...?What can you say about …? | [Simple graphic organiser](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/599#.Xtmqei5RGpE.link)[Concept mapping](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.Xt7ARiLax2Q.link)[mini whiteboards](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/575#.Xt77FouPpyw.link) |
| Apply prior knowledge to create ideas and possibilities in ways that are new. | What is imagination? What if I you could join two good ideas to make a better one?Have you thought of as many ‘out of the box’ ideas as you can? What if you tried...?What could be joined to improve, adjust or change …?Can you think of a new way for the …? | [Concept mapping](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.Xt7ARiLax2Q.link)[Hexagonal thinking](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/579#.Xt7DFbxMTSQ.link) |
| Identify and compare creative ideas to think broadly about a given situation or task. | Can you tell me the reason …? Can you try a different way…? Can you invent …?How can we compare ideas?How would you add on to create a different …?What way would you design …? | [Thinking hats](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/545#.Xt77THeAg3I.link)[Question formulation technique](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/568#.Xt7_L96OQpw.link) |
| Share, discuss and apply feedback to build ideas. | Why have you used this idea?Do you agree with what others say about …...?How are you going to use what your friends say about your ideas?How will you change your ideas now? | [Thinking hats](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/545#.Xt77THeAg3I.link)[digital-learning-selector](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Browser?cache_id=845bd)[Storyboarding](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/559#.Xul7_qrkPB4.link) |
| Investigate options and predict possible outcomes when putting ideas into action. | What do you think will happen?What do you mean by...? What could happen when or if...?How are you going to decide which ideas to use? | [digital-learning-selector](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Browser?cache_id=845bd)[Thinking hats](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/545#.Xt77THeAg3I.link) |

****Produce and implement phase

Table 3 Prompts and learning tools for produce and implement phase

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| ****What we are looking for**** | Question prompts to guide learning  | Possible learning tools |
| Generate, develop and record design ideas through describing, drawing and modelling. | Can you tell me more about your drawing?Why did you use … to make your model?Explain what is happening …?Could you build a model that would change …? How would you tell others about your design? | [Storyboarding](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/559#.Xt7-CNSZlIs.link)[Learning intentions and success criteria](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622#.Xt7_L-KcCy4.link) |
| Identify reasoning used in choices or actions when presented with new information to solve problems. | How could you decide…? What choices helped you decide …?What decision can you make …? How would you explain …? | [Peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549#.Xt8IpCfGyq8.link)[Peer discussion and conferencing](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/547#.Xt8IpA9c4E0.link) |
| Use materials, tools and equipment to develop solutions for a need or opportunity.  | Why is it important to use materials safely? How would you use them to …?How would you use what you learned to make …?What would happen if …? | [Learning intentions and success criteria](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622%22%20%5Cl%20%22.Xt7_L-KcCy4.link) |
| Use planning materials to create a design solution. | What other ways could you plan to …?How can the materials chosen be used to make …?Does the plan help make the ….? | [Rubrics](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/544#.Xt8G0QI4224.link) |

****Test and evaluate phase

Table 4 Prompts and learning tools for test and evaluate phase

|  |  |  |
| --- | --- | --- |
| What we are looking for | Question prompts to guide learning  | Possible learning tools |
| Evaluate the success of design ideas according to a scale of personal preference and predetermined criteria. | How would you group your ideas ….to show …?How would you show what you know about …?How can you decide …?How would you use what you learned to make …? | [Rubrics](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/544#.Xt8G0QI4224.link) |
| Identify the positive and negative impact of a design solution within an environment. | What would happen if ……? How could you decide…? What possible problems can you see if …….? Can our design … or ……? | [Logic modelling](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/581#.XuG1y3YLUgA.link) |
| Communicate creative ideas and products with known and local audiences to gather different forms of feedback for design choices. | Why have you chosen this idea? How does it work?What do you mean by...? Tell me more about ……What are some possible problems with...?What do you know about ……?What did other people think? | [Question formulation technique](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/568#.Xt7_L96OQpw.link)[Mystery feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/573#.Xt8Whx36XYY.link)[Video performance](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/578#.Xt8J1_tc0Mc.link) |
| Identify reasoning used in choices or actions to solve problems. | How did you decide to include...? Why?What information would you choose to show ….?How could you decide …?What is the most important …? | [Digital learning selector](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Browser?cache_id=0ebea) |
| Explain personal accomplishment of the tasks or actions undertaken. | What do you now know and understand?What would have to happen for...?Why have you chosen …?What are you most proud of? Why?What would you change if you did it again?  | [Learning intentions and success criteria](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622#.Xt7_L-KcCy4.link) |
| Identify alternative methods when presenting information. | What changes would you make to explain …? How would you improve …?What else can you tell me about how …?What are other ways we can tell people about our idea? | [Concept mapping](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.Xt77TJTijDY.link)[Storyboarding](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/559#.XtmuCyTXLsI.link)[Peer discussion and conferencing](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/547#.Xt8IpA9c4E0.link) |
| Use appropriate forms to communicate their understandings to an audience. | What is meant by …? Is there any more to do?What can you say about …?Which is the best idea/design …? WhyIs there room for improvement? Where? How? | [student generated lists](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/563#.Xt76rxfLKqk.link)[What did we learn today?](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/558#.Xt8Wh6fZwQo.link)[Rubrics](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/544#.Xt8G0QI4224.link) |
| Describe the thinking strategies used in given situations and tasks. | What would you use to show and tell people about your design solution? How did you make …?What was used to make the presentation? Why?How would you tell or show people the steps you used to..? | [Gallery walks](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/555#.Xt77TF56o-M.link)[Digital learning selector](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Browser?cache_id=0ebea)[Storyboarding](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/559#.XtmuCyTXLsI.link) |
| Upon completion of the design process, identify the use of feedback to connect with new learning opportunities. | How am I going? (What progress can be made towards a new goal?)How will you use what you have learned? (What learning, ways of working will support me best?)Where to next? (What activities need to be undertaken to make better progress?) | [Peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549#.XumUv8-M5vE.link)[What did we learn today](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/558#.XumUv7nO2cM.link)[Parking lot](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/570#.XumUv-qlkcA.link)[KWLH](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/562#.XumUv5C3yHg.link) |

Through STEM project-based learning, students have the opportunity to celebrate their learning through assessment opportunities.

These could be in the form of:

* STEM journals and or digital portfolios
* demonstrations and performances
* documentaries
* writing pieces
* infographics
* debates
* final product reviews, presentations to multiple audiences
* showcases, expos and presentations of design solutions to stakeholders.