

Teacher Notes

For Digital Technologies, TAS,
PDHPE, Science and Maths
Years 7-10



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About Careers with STEM

The *Careers with STEM* series includes four quarterly magazines, along with website articles, teacher resources and videos across four STEM areas: science, technology, engineering and mathematics. The focus is on independent inquiry and constructivist learning.

Each magazine issue provides inspiring stories, statistics and up-to-date information on the careers of the future, and is based on the premise of discovering new areas of innovation through STEM + X – where X is another field of study, a personal passion, or a world changing goal.

To order additional copies for events, clubs or classrooms, or for annual subscriptions and additional resources, career stories and videos go to: CareerswithSTEM.com

Who are these notes for?

The *Careers with STEM* Teacher Notes are for teachers, careers counsellors, parents, STEM-based institutions, or mentors that could use the guides to expose and inspire students towards STEM careers. For teachers, they are ideally suited to the Years 7–10 high school classroom.

These activities are designed specifically for students to gain insight into a variety of STEM careers across a range of topics, as well as meet specific content based curriculum outcomes. In the classroom, most of the activities will allow teachers to link to industry and skills based curriculum outcomes, for example:

Science as a Human Endeavour

- People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE136)
- People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people’s lives, including generating new career opportunities (ACSHE160)





Technology


- Contexts include reflection of ‘national priorities including workforce needs’.

How to use the STEM + X activities grid

The STEM + X activities grid aims to provide a variety of student activities across a wide range of ‘X’ categories, while developing different skill-sets required for flexible career options. This term, the focus is on Engineering.

STEM + X rows – and what they mean

| | | | |
|---|---|--|---|
|  <p>Science, and everything experimental and inquiry-based</p> |  <p>Includes computational thinking and digital technologies</p> |  <p>Maker space and design thinking tasks; building or making something to solve a problem</p> |  <p>Anything related to numeracy that is accessible and/or applied</p> |
|---|---|--|---|



STEM Integrated
– a combination of two or more STEM skills



STEM + X columns – and what they mean

DOING AND USING ENGINEERING

Students are given an actual activity to do.

CREATING AND MAKING WITH ENGINEERING

Students are given an idea for an activity, but they must design and carry it out themselves in a constructivist manner.

| | DOING AND USING ENGINEERING | CREATING AND MAKING WITH ENGINEERING |
|------------------------|---|--|
| S | <p>ENGINEERING + GEOTECHNICAL SKILLS Using two different surfaces (such as sand, concrete, clay and soil), test a model building built on these surfaces for stability. You may want to compare how effective these surfaces are in keeping buildings up under various environmental conditions, such as storms or floods.</p> <p>Read 7 amazing careers in engineering, page 14.</p> | <p>ENGINEERING + BIOMEDICINE Design and create your own biomedical device, such as a robotic arm, heart valve or artificial joint.</p> <p>Read Surgeons armed with tech on page 20 and The bionic body on page 21. Visit bit.ly/BioMachines</p> <p>For heart valves, look at: bit.ly/bionicheart</p> <p>For a closer look at the different parts of a knee joint, go to: bit.ly/bionicknee</p> |
| T | <p>ENGINEERING + CODING Use a block coding (or other) software to create a game that teaches players about structural and/or civil engineering while they construct a building.</p> <p>Taj and Kirsten are using coding to make games, see pages 16 and 17.</p> <p>You can have a go by using Scratch: scratch.mit.edu</p> | <p>ENGINEERING + HACKING Identify and research a recent hacking scam and create an information and prevention package for everyday users to help them avoid being hacked.</p> <p>Turn to Cyber systems, page 10. Visit bit.ly/NOVALab</p> <p>A good place to start is scamwatch.gov.au</p> |
| E | <p>ENGINEERING + DESIGN Use CAD (computer-aided design) software to redesign a building to make it safer. Give yourself a set of safety criteria to work with before you start.</p> <p>Gabe Araujo uses engineering to make sure buildings are structurally sound. Turn to 20/20 vision on page 31.</p> <p>SketchUp is a great place to start CAD projects, visit sketchup.com</p> | <p>ENGINEERING + ENVIRONMENT Reuse or upcycle items that might otherwise be thrown out to create a new piece of technology for a specific purpose.</p> <p>Read Clean it up on page 15. Kathy Thomas reuses waste water for purposes like irrigation. What can you reuse?</p> <p>Find some repurposing inspiration here: bit.ly/reuseupcycle</p> |
| M | <p>ENGINEERING + ENVIRONMENT Build a water harvesting device and calculate how much water can be harvested from it for a month. First, calculate the area of your device, then note the average daily rainfall to calculate the volume of water.</p> <p>For repurposing water, look at: Clean it up on page 15.</p> | <p>ENGINEERING + CRYPTO CURRENCY Create a communication tool to help people understand what cryptocurrency is and what it is used for.</p> <p>Cyber systems, page 10. Visit bit.ly/KeepSecret</p> <p>A good place to start your research is: bit.ly/bitcoinunveiled and bit.ly/CryptoKhan</p> |
| STEM Integrated | <p>ENGINEERING + THE FUTURE Monique Quirk and Nisha Pradhan both work on innovative new technologies or the application of old technologies to new situations. Research a field of engineering that fascinates you and then project it into the future by describing how you would use a current piece of technology in a novel situation. Describe your idea for a new application of a piece of technology.</p> <p>Read New tech transforming careers on page 8.</p> | <p>ENGINEERING + MECHATRONICS One great advantage of robots is that they can work in places that humans cannot or don't want to work, such as sewers, up in the air, deep under water, or at extreme temperatures. Design a robot that completes a specific job in a difficult place and explain why it is easier or safer for the robot rather than humans. If possible, build a model of your robot. Visit bit.ly/RoboPhil</p> <p>Read Getting robots to do our dirty work on page 20 and Making waves on page 19.</p> <p>Snake robots go where humans can't: bit.ly/snakerobots</p> |

Reflection

Choose a job from the STEM + X magazine that interests you and then complete the following table:

| Job title | Job description | STEM knowledge required | STEM skills required | Everyday skills required |
|-----------|-----------------|-------------------------|----------------------|--------------------------|
| | | | | |

S



ENGINEERING + SCIENCE

P8

What science role includes flying drones into inhospitable locations to assess vital infrastructure?

Monique Quirk

T



ENGINEERING + TECHNOLOGY

P11

What engineering career uses code to keep our smartphones, computers and tablets secure?

Oindrila Das

E



ENGINEERING + BUSINESS

P16

How can a head for business and a passion for mentoring make it possible to educate a million students by 2020?

Taj Pabari

M



ENGINEERING + SPORT

P19

How could engineering and a love of surfing be used to make our beaches and coastline safer?

Nathan Adler

For more career profiles, information and quizzes go to CareerswithSTEM.com



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