

Light Comms

Teacher Resource Sheet



science and engineering
challenge

ON THE EVENT DAY

Half-day activity

Students will design efficient codes to send secret messages along fibre optic rods using pulses of coloured light. Teams are scored on the accuracy in transmission of the messages they send.

(Please remember that students cannot bring notes, models or other paperwork on the event day)

ACARA LINKS (Year 5/6)

- Light from a source forms shadows and can be absorbed, reflected and refracted (ACSSU080)
- Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083, ACSHE100)
- Investigate how electrical energy can control movement, sound or light in a designed product or system (ACTDEK020)
- Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014)
- *There are also a number of links to the Digital Technologies (Year 3/4 curriculum)*

[Visit the ACARA website...](http://www.acara.edu.au)

BACKGROUND

An optical fibre is a thin rod of high-quality glass. Light from one end undergoes a process called 'total internal reflection' and emerges at the other end. Cryptography is the discipline of using codes and ciphers to encrypt a message and make it unreadable unless the recipient knows the secret to decrypt it. In Light Comms, students use light to develop their own codes.

REAL-LIFE EXAMPLES

Optical fibres have many uses in modern society including telecommunications, lighting, toys and endoscopes (which allow surgeons to see inside their patients). Codes have been used for thousands of years throughout history when people wanted to keep messages private. The Enigma decoding machine played a huge role in the outcome of World War 2.

RELATED CAREERS

- Software Engineer
- Mathematical Modeller
- Computer Systems Engineer
- Scientific Analyst

RELATED DEGREES (UON)

- Bachelor of Engineering (Software)
- Bachelor of Mathematics
- Bachelor of Science (Photonics)
- Bachelor of Information Technology

[Find out more...](#)



[Watch VIDEO](#) – "What is Engineering"?

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Science and Engineering Challenge



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The Science and Engineering Challenge



THE UNIVERSITY OF
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AUSTRALIA

VOCABULARY

Cipher	A secret way of writing letters or symbols
Code	Set of letters, numbers or symbols used to represent others
Cryptography	The study of writing or solving codes
Data	Facts or pieces of information
Light	Visible radiation that allows you to see things and send information
Optic Fibre	A thin flexible glass (or plastic) fibre that allows light signals to travel
Reflection	The change in direction of a wave (e.g. when light bounces off an object)
Transmission	The act of transferring something from one place to another

RESOURCES/LINKS

-  [Total Internal Reflection](#) – A succinct explanation of total internal reflection.
-  [Centre for Innovation in Mathematics Teaching](#) – A variety of teaching packages developed to teach codes and ciphers.
-  [Message Sticks](#) – An article about Aboriginal long-distance communication
-  [Polybius Square Cipher](#) – An online Polybius Square cipher/decipher to create coded messages (converts letters into numbers).
-  [Ready to Go Lessons](#): PBS explanatory video and discussion of encryption and privacy.
-  [Ready to Go Lessons](#): Cryptography Workshop using a murder mystery role-play scenario
-  [Ready to Go Lessons](#): Mountain Rescue – Transmitting and receiving code.
-  [Ready to Go Lessons](#): Investigate the incredible story of Noor Inayat Khan, WW2 spy.
-  [YouTube Playlist of helpful videos](#)

EXAMPLES OF LEARNING ACTIVITIES

- Have students look up the definitions of the words in the 'Vocabulary' section above.
- Make a special 'Cryptograph Wheel' using two circles of cardboard. Divide each wheel into pieces using a protractor and write one letter of the alphabet in each section. Attach the two wheels together with a split pin so that they rotate independently. Use the wheel to send coded messages.
- Conduct experiments or demonstrate the process of reflection (which can be related to how light travels down optic fibres).
- Get students to send messages across the classroom using Morse code.
- Think of other ways we communicate visually and how much information you can convey to one another, for example, telling a story through facial expressions and gestures, incorporating sign language, using flags signals, or a creating a short film without sound.