



Design Challenges

SIMPLE, PRACTICAL DESIGN PROJECTS FOR PRIMARY SCHOOLS

Schools and teachers interested in the Technology Key Learning Area may like to try some of these design activities with their students.

During each activity students should be encouraged to work in design teams to collaborate like 'real designers' to:

- **investigate issues** associated with the design challenge
- develop and document by **drawing a range of ideas** and possible solutions
- **produce their solutions** using a range of materials including recycled and new materials
- **evaluate their solutions** to determine how effectively they work, and whether they are the 'best' solutions for the design challenge.

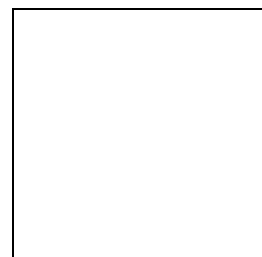
Technology Education — contributing to the Smart State

Technology education seeks to involve students in design activities which provide them with an understanding of the creative processes and practices used to design and develop technological products within society. It provides students with an insight into the issues affecting the appropriate design and development of technological products and how the creation of new technological products can impact both positively and negatively upon people and the environment.

Technology education is inherently a practical learning area that focuses on open ended, hands-on, problem solving activities.

It relates to areas of human endeavour in which people use creativity and ingenuity to design and develop products in an attempt to meet people's changing needs and wants.

More information about the Technology Learning Area can be found at www.qsa.qld.edu.au or by contacting Michael Berry (Senior Education Officer – Technology) 3237 0424.



Design activities for Years 1–2

Designing insect traps

Context: Many students love to study bugs and insects. However, doing this without injuring the insect or allowing the insect to escape prematurely can be a problem. Discuss this challenge with the students, considering the needs of insects (e.g. food sources, oxygen, etc.).

Design Challenge

Design a device in which to successfully store an insect so that it can be studied for a day before being released.

Notes to teachers

Ensure that the insects collected are not potentially dangerous. Students should avoid trapping biting and stinging insects such as spiders and bees.

Possible starting points

Investigation: Students may need some time to examine and discuss a range of potential materials and identify some of the properties which make them either suitable or unsuitable for use in the construction of insect traps.

Consider the needs of the insect — food, cover, etc. How will these needs influence the designs?

Students may also like to consider a range of joining processes — for example, sticky tape and glue, the advantages or disadvantages of certain techniques for particular designs.

Ideation: Students should record lists of materials and tools needed, or draw them. Students may wish to draw their designs prior to, during or after completion.

Production: Students of this age tend to design during the construction process. Often their final design may be quite different from that which they envisaged during the initial design process. Nevertheless, students should be encouraged to refer to their original drawings during the construction process.

Evaluation: The best way for students to evaluate their designs is to use them, either at school within the context of a unit on insects, or at home. Students should be encouraged to reflect upon their designs and consider how they could be further refined or modified.

Cross-curricular links

Science

This design challenge may contribute to students' scientific knowledge and understandings in the area of life and living.

Using this knowledge, the students' design and develop their own devices for capturing and observing insects.

Literacy

Students may use a range of information texts as well as electronic sources of information to:

- investigate design issues associated with the design and development of their traps
- gather research information about the insects they collect.

Design activities for Years 1–2

Designing bridges

Context: The Three Billy Goats Gruff are famous for trip-trapping their way across the Troll's bridge. What would have happened if they decided not to use the Troll's bridge, but build their own bridge instead? What materials might they have used? What would it look like? Where would they start?

Design Challenge

Design and build a model bridge suitable for the Three Billy Goats Gruff.

Design considerations:

- What materials might they use?
- Should the bridge be permanent or temporary?
- What advantages might there be in creating a lightweight structure?

Notes to teacher

A suitable starting point may be telling the traditional story, or asking students to do a recall. Part way through you may like to consider the morality of using the Troll's bridge without asking permission. After all it is the Troll's home. How might students feel to have people (or goats) wandering over or through their home at all hours of the day and night?

Possible starting points

Investigation: Students might like to take a much closer look at the design of bridges within their local community. How and why are they built to that design? Why are they built where they are? Ask students to use a range of sources to investigate various bridge designs and identify their common, and different, design features.

Ideation: Have students consider the design and structure of their bridge and record this on paper for later reference. This can be done individually or in groups. Student may like to gather their materials before drawing their designs. Students could use recycled household items and containers, or natural materials such as sticks collected from the school grounds. Consider how these might be joined (string, thin wire, fast drying glue).

Production: If parents are to assist in the construction process they should be reminded that these are the students' bridges; their role is to support only where necessary. Students should refer to their 'plans' when constructing their designs.

Evaluation: Students might like to test their designs using plastic animals (goats as well as other animals). Will the bridge hold? How many animals can the bridge support safely? Bridges can be presented to parents as a culminating activity.

Cross curricular links

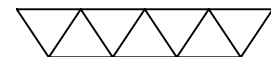
Literacy

Sharing and retelling stories can be used to support students' oral language and sequencing skills. Teachers may like to make a wall chart based on the retelling of the story.

Investigation

Examining different bridge designs provides students with an opportunity to observe and record their key design features.

Many bridges are engineered using triangular truss structures (below) because of their strength and rigidity.



Web resources:

Searching "bridge designs" using a search engine such as google.com.au will provide numerous photographs of different bridge designs.

Design activities for Years 3–4

Designing toys and games

Context: A local toy company has approached your class to assist in the design and development on a new novelty toy. The toy will be used to help promote the sales of healthy fast food at a new chain of restaurants to open soon in Australia.

Design Challenge

Design and create a novelty toy to promote healthy fast foods. Ideas must be clearly drawn and labelled so that 'company representatives' (perhaps the Principal or Deputy Principal) can examine and discuss your design ideas. A prototype of your idea could be made from recycled materials, plasticine or modelling clay.

Notes to Teacher

Most students are familiar with novelty toys from fast food restaurants. Students can draw on these ideas to consider how these might be designed with an emphasis on health.

Design considerations

- How much should each toy cost to produce?
- Is the toy part of a series of toys, or a stand-alone product?
- Is the toy related to other events such as the release of a movie or console game?

Possible starting points

Investigation: Investigate a range of novelty toys by brainstorming and asking students to bring along samples collected from local restaurants. Remind students:

- to look for a range of creative and innovative ideas
- that for intellectual property reasons, the work of others cannot be simply copied.

Ideation: Draw a rough sketch of ideas while working in a small team. Try to decide how the overall layout is going to look. List the key points to include. Be prepared to create several versions and continue to refine these.

Production: Students may wish to create their final products using a range of materials. Remember this is a prototype and doesn't necessarily need to be fully operational.

Evaluation: How will the potential effectiveness of designs be determined? Students might like to share their ideas and seek feedback from the Principal, Deputy Principal or students from other classes.

Cross-curricular links

Real world links

Many small toys are distributed by companies as promotional gimmicks to increase sales and the appeal of their product to their target audience.

Students may wish to bring in a range of promotional products and discuss how these are used for product promotion.

Literacy

Students may like to design a range of promotional and marketing material to support the 'release' of their product. This might include posters, brochures and packaging.

Students' design ideas should be shared, promoting sustained conversations and deep understanding.

Questions

How much is the novelty toy industry worth in Australia each year?

Do they have the same novelty toys in America as they do here?

How many novelty toys are distributed through fast food outlets each year?

Design activities for Years 3–4

Designing a fitness board game

Context: A new fitness and gym company has decided to design and develop a board game to help promote the opening of their new premises and the new range of exercise equipment it contains. It has decided that it will give away this promotional product to the first 1000 people to join any of their three new gyms.

Design Challenge

Design and develop an exciting new board game to help promote the gym. Consider how the gym might be marketed to the public.

Notes to Teacher

Many students will be familiar with board games, but may be less familiar with a fitness gym. Pictures of the inside of a gym or fitness centre could be downloaded from the internet to promote discussion about the purpose of a gym and how it might operate. Students may consider what the new gym equipment might look like and how it might operate. This may lead to the generation of ideas for the design of their board game.

Possible starting points

Investigation: The design of board games can be quite simple or complex depending upon the incorporation of three-dimensional elements such as trap doors, stairs or exercise equipment. Encourage students to investigate a range of innovative ideas from various sources including the internet and home. Ensure that they investigate and have the opportunity to play a range of different board games.

Ideation: Working in small teams, students draw a rough sketch of their ideas and try to decide how the overall layout is going to look. Perhaps they could list the key points to be included. They should be prepared to create several versions of plans and continue to refine these.

Production: Students may wish to create their final products in a range of ways depending upon the materials and resources available. The simplest solutions would involve a piece of cardboard that would fold in half to create a playing board. Alternatively several students may combine their ideas and develop a more complex, three-dimensional design.

Evaluation: How will students determine the effectiveness of their designs? Perhaps they could play the board games with members from other classes and request positive feedback and ideas for improvements.

Extension

Design personalised exercise equipment using, amongst other things, rubber bands and timber, plastic etc.

Cross-curricular links

Health and Physical Education

This design task provides an ideal opportunity to develop and apply understandings associated with health and physical education.

Students should be encouraged to be innovative, extending beyond the traditional notion of a board game.

Numeracy

This task can be used to support students' learning in the area of mathematics and numeracy.

The fitness industry

How many people are employed by the fitness industry in Australia?

How many fitness centres are located in your local area?

Which other businesses could be successfully co-located with a fitness centre? (e.g. doctors, clothing outlets)

Assessment

Ask the students to record their design ideas progressively in a Technology project folio. At the end of the unit students can present their design ideas, products, and folios to parents.

Design activities for Years 5–7

Designing tourist information

Context: The local council has decided that they need to promote the local area more effectively to potential tourists. They want to design a brochure promoting at least one aspect of the local area which can be distributed through local service stations to encourage tourists driving through the area to stay a little longer.

Design Challenge

Design a product (such as a poster or brochure) that will appeal to potential tourists. It should be bright and colourful to attract their attention, and promote some of the attractions of your local area. Remember to include only essential written information.

The brochure will need to be cheap to produce, perhaps a single A4 size sheet of paper folded. However, it can be larger if this can be justified.

Notes to Teacher

Students might like to utilise online clip art to complete their final products online. They may also like to consult sources such as the local phone book to investigate information and contact details about local attractions and accommodation.

Try to foster a classroom environment which focuses on innovation and creativity – students should be encouraged to follow alternative ideas and create a range of diverse solutions.

Possible starting points

Investigation: The design of a range of contemporary brochures and posters could be a starting point. Consider what features in your local area might be attractive to potential tourists. How will these be marketed? How do other brochures market their ideas? What fonts and colour do they use? How do they open and fold?

Ideation: Draw a rough sketch of ideas while working in a small team. Try to decide how the overall layout is going to look? List the key points to include. Be prepared to create several versions and continue to refine these.

Production: Students may wish to create their final products in a range of ways depending upon their confidence with information and communication technologies. Others may wish to draw their design ideas or use a variety of magazines to gather images.

Evaluation: How will the potential effectiveness of designs be determined? They could be shared with a range of audiences to gain feedback and advice – other students, parents, and potential tourists.

Cross-curricular links

Literacy and Numeracy

The literacy and numeracy demands of this task should be considered and addressed contextually within the design challenge.

Examine textual features. Look at persuasive elements of texts.

Aspects of numeracy can be addressed as students consider:

- costs associated with the production of the brochures
- hotel costs
- discounts and special offers.

Information and communication technologies (ICT)

Information and communication technologies can be used to help students research and develop products, as well as enabling them to develop a 'polished' and professional product.

Investigation

Investigation and research form the basis for the development of many new products. It is a key element of learning in Technology. It provides multiple opportunities for students to use and interpret texts in meaningful ways for meaningful purposes.

Students express their ideas visually in Technology as they share ideas and evolve them into a final product.

As students create their designs, their ideas evolve and crystallise into a final product.

By evaluating and reflecting upon their final design, students develop an understanding of the issues associated with the effective design of products to meet people's needs.

Design activities for Years 5–7

Designing shelter

Context: Many people are made homeless throughout the world each year. The United Nations (UN) has identified the need to design and develop cheap temporary housing as an issue of international importance.

Design Challenge

Working in a small design team, design and develop a scaled model prototype/s of temporary housing that could be used to accommodate homeless people. It will need to be able to fold up into a compact form for transportation or shipment to remote areas. It will need to be lightweight and cheap to create. As it may need to accommodate people for a period of time, it should be warm and waterproof if possible.

Notes to Teacher:

Students may use any material, including paper, cardboard, or plastic, to generate their prototype designs. One material which might be particularly useful is corrugated plastic which is used in advertising signs such as real estate signs. This material is light, relatively easy to manipulate, and offer many of the characteristics needed for a 'real' solution. An ice-cream stick 'person' can be used to scale student's models across the class to ensure consistency of size.

Possible starting points

Investigation: Students may begin by discussing the issue of displaced people, relating this to recent world events and issues with which they are familiar. Before commencing any design work, students should understand both the social issue and the design constraints associated with the task. Students may wish to search for images of 'temporary structures' in the library and across the internet. These can be collected and discussed.

Ideation: Students may wish to refer to images found during the investigation process to draw and create a range of potential design ideas. Unusual shapes, including domes and curved roofs should be considered, as well as issues such as fresh water collection from roof run-off.

Production: Production processes for this task may be relatively simple; this allows students to focus on design issues.

Evaluation: Students can evaluate and critique each others' designs providing written feedback on a short proforma and verbal evaluations. Models could be 'tested' outside under the sprinkler to evaluate their water resistance.

Extension

As an extension activity a larger model could be created as a cubby house or reading corner for the classroom.

Cross-curricular links

Literacy

The literacy and numeracy demands of this task should be considered and addressed contextually within the design challenge.

Students may wish to determine a budget or costing for the creation of a full-scale prototype of their solution.

Issues such as storage, package volume and shipping should be examined with students. Minimising each of these factors will improve the feasibility of their product.

Questions

How many people are made homeless each year from different causes?

Could these designs be used to house homeless people in developed countries such as Australia? What would be the implications of such a decision?

Do these type of shelters already exist?