Spill Preventer!

To design and evaluate the effectiveness of their designed device to prevent water bottles on tables from being knocked or spilled.

Single Lesson Plan

**Task:**
Pose the problem.

**Activity:**
Pose the problem to the class: "The Teacher is tired of water being spilt all over books or picking water bottles up off the floor. Why is this a problem? How do you think we could solve this problem?" Brainstorm possible issues arising from this problem. Brainstorm possible solutions to the problem. "What other things have you seen to prevent things from spilling?"

**Introduce the challenge.**
Use student suggestions as a lead in to introducing the design challenge of designing a device to prevent class water bottles from being knocked over frequently. Discuss as a class things which they, as the designers, will need to consider in their planning process to create a successful end product. "What factors often cause the water bottles to fall over?" (You might need to give them a 5 minute challenge to discover as many causes as possible for the bottle to fall over). "What sizing will it need to be?" "How will I stop the bottle from falling over?" "What method will you use to attach or place it in your work environment?" "How will you make sure you can easily get it out to drink from it?"

**Resources:**
IWB, markers or butchers paper and markers, Powerpoint with possible images of items that prevent spillages, or falls such as swing buckles, seat belts, cup holders, take away cup holders, silicone suction plates for children, sand bags on pavilion posts or water based basketball rings, etc.

**Template to record their answers or considerations**—such as a mind map or drawings.
### Setting design criteria.
As a class, create a set of up to 3 or 4 criteria for a successful design. Explain to students, that real life designers or inventors need to meet the client's criteria/brief or the client will not accept or pay for their design. In this case, they would need to go back and redesign their product. When creating this criteria, it might be helpful to pose the questions: "What would stop it from working?" “What could go wrong?”

### Design the product.
Students to draw/record their design. Students should include labels for each part of the design, joining methods for joined parts, and the material that they plan to use for each part. On completion, students to do a pair’n’share about their design, it’s features and how it will work. Allow enough time for students to take on feedback from their peers to modify or add to their design.

### Making a prototype.
Using different craft/building/recycled materials, students to create a prototype of their design. Students may need reminders to refer to their sketched design. Teachers could choose to have students write or type up the procedure for making their prototype upon completion of this task. Students could use ‘explain everything’/‘show me’ on ipads to create visual procedures incorporating text and imagery (this would mean students or the teacher would need to take photos during their design process).

### Evaluating their design.
Review back to the design criteria. Students to evaluate and reflect upon their designs using this criteria. The following questions could be used: "Did your design work? Was it successful?" “Did it meet the criteria?" “List two things you really liked about your design": “If you could make it again, what would you change?” “Did you use suitable materials or should you review these for next time?"

### Take their design process to 3D Printing.
Using Maker’s Empire students create their sketched design including any modifications they identified during the prototyping and evaluation process. Ipad, laptops, Desktops with Maker’s Empire installed Student log-ins, etc.

### Persuading other’s of their design’s effectiveness.
In your Literacy/English lesson, model using a persuasive argument to persuade someone of your opinion. Students to write or dot point arguments for why their design is the best design (they may even wish to include what modifications they would make to their design prototype), before each child presents their argument to the class. Students to vote on the best design and provide reasoning for their choice.

### Downloadable files
- spill_preventer_persuasive_argument.pdf
- spill_preventer_evaluation_form.pdf
- Spill_Preventer.pdf
- TFEL_design.pdf

### Curriculum
**South Australian TfEL:**

- 4.3 apply and assess learning in authentic contexts
- 4.2 connect learning to students’ lives and aspirations
- 4.1 build on learners’ understandings
- 3.4 promote dialogue as a means of learning
- 3.1 teach students how to learn
- 2.2 build a community of learners
Participating In A Forum On A Specific Topic (ELBT22)

Times, for example adding entries to a class blog, participating in a web conference or online chat with an author, or

The Properties Of Materials To Determine Suitability, For Example The Absorbency Of Different Fabrics Or The Strength Of Different Resistant Materials (ELBT243)

Exploring Ways Of Joining, Connecting And Assembling Components That Ensure Success, And The Impact Digital Technologies Have Had On These Processes (ELBT250)

Using Tools And Equipment Accurately When Measuring, Marking And Cutting; And Explaining The Importance Of Accuracy when designing and making, for example creating a template, measuring ingredients in a recipe, sowing seeds (ELBT67).

Identifying The Properties Of Materials Needed For The Designed Solution (ELBT10)

Visualising And Exploring Innovative Design Ideas By Producing Thumbnail Drawings, Models And Labelled Drawings To Explain Features And Modifications (ELBT21)

Planning, Sharing And Documenting Creative Ideas And Processes Using Digital Tools Such As A Blog Or Collaborative Document (ELBT388)

Using Appropriate Technologies Terms To Confidently Describe And Share With Others Procedures And Techniques For Making, for example cutting and joining materials (ELBT65)

Negotiating Criteria For Success With Class Or Group Members (ELBT411)

Evaluating, Revising And Selecting Design Ideas, Based On Criteria For Success And Including Consideration Of Ethics, Social Values And Sustainability (ELBT342)

Evaluating The Functional And Aesthetic Qualities Of A Designed Solution (ELBT35)

Identifying The Steps In A Mass Production Process (ELBT457)

Seeds (ELBT67)

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Understanding That Objects Can Be Moved But Changing Position Does Not Alter An Object's Size Or Features

Constructing Arrangements Of Objects From A Set Of Directions (ELBM087)

Using Different Types Of Data To Create Information For Sharing Online, For Example Creating A Multimedia Class Profile That Includes A Photo Of Each Student, A Personal Audio Recording And A Written Message (ELBT462)

Planning And Creating Text, Drawings And Sound Files To Share Online, For Example Joitnly Creating A Photo Story To Illustrate A Fable Or Fairy Tale From The Asia Region Or A Local Aboriginal And Torres Strait Islander Community Story (ELBT163)

Making Ethical Decisions When Using Images For Public Viewing And Using The Work Of Others, For Example Asking The Question 'What Is Fair And Just?' To Compare Images Of Events Or Activities And Decide Whether Or Not To Publish (ELBT7)

Participating In Safe Online Environments, For Example Sharing Ideas And Information Through Intranets, Messaging Only To People They Know, Bookmarked Websites And Moderated Online Spaces (ELBT456)

Describe the features of three-dimensional objects (ACMMG043)

Using units of measurement

Creating and describing area or surface area of two-dimensional shapes, with and without digital technologies (ACMMG044)

Using calendars To Locate Specific Information, Such As Finding A Given Date On A Calendar And Saying What Day It Is, And Identifying Personally Or Culturally Specific Days (ELBM081)

Compare and order several shapes and objects based on length, area and capacity using appropriate uniform informal units (ACMMG037)

Compare masses of objects using balance scales (ACMMG038)

Tell time to the quarter-hour: using the language of ‘past’ and ‘to’ (ACMMG039)

Compare and order several shapes and objects based on length, area and capacity using appropriate uniform informal units (ACMMG037)

Compare masses of objects using balance scales (ACMMG038)

Describe and draw	Identifying Geometric Features Such As The Number Of Faces, Corners Or Edges (ELBM085)

Comparing lengths using finger length, hand span or a piece of string (ELBM075)

Comparing areas using the palm of the hand or a stone (ELBM076)

Comparing capacities using a range of containers (ELBM077)

Using scales to determine whether the mass of different objects is more, less or about the same, or to find out how many marbles are needed to balance a tub of margarine or a carton of milk (ELBM078)

Describing the characteristics of quarter past times on an analogue clock, and identifying that the small hand is pointing to the number and the big hand is pointing to the three (ELBM079)

Investigating the seasons used by aboriginal people, comparing them to those used in western society and recognising the connection to weather patterns (ELBM051)

Comparing areas using the palm of the hand or a stone (ELBM076)

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Compare masses of objects using balance scales (ACMMG038)

Tell time to the quarter-hour: using the language of ‘past’ and ‘to’ (ACMMG039)

Name and order months and seasons (ACMMG040)

Use a calendar to identify the date and determine the number of days in each month (ACMMG041)

Understanding That We Use Representations Of Objects And Their Positions, Such As On Maps, To Allow Us To Receive And Give Directions And To Describe Place (ELBM086)

Organising And Creating Different Types Of Information For Sharing And Collaborating Online, For Example Planning The Sequence And Appearance Of An Animation, And Sharing It Online With Students From Another School (ELBT431)

Making A Project That Involves Students Working Together To Publish Online, For Example Identifying How Group Members Can Help Each Other To Avoid Delays In Finishing The Project (ELBT181)

Discussing Digital Citizenship Rules And Behaviours For Participating In An Online Environment, For Example Not Using All Capital Letters When Expressing A Strong Viewpoint About A Controversial Matter And Ensuring That The Audience Is Aware Of Your Identity (ELBT421)

Work with others to organise and describe objects and information using information systems, and share these with known people in safe online environments (ACTDP056)

Using a calendar to identify the date and determine the number of days in each month (ACMMG041)

Tell time to the quarter-hour, using the language of ‘past’ and ‘to’ (ACMMG039)

Compare masses of objects using balance scales (ACMMG038)

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Location and transformation

Understanding That Objects Can Be Moved But Changing Position Does Not Alter An Object's Size Or Features (ELBM088)

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Using Features Of Relevant Technologies To Plan, Sequence, Compose And Edit Multimodal Texts (ELBE886)

Plan, draft and publish imaginative, informative and persuasive texts demonstrating increasing control over text structures and language features and selecting print and multimodal elements appropriate to the audience and purpose (ACELY682)

Using Print And Digital Resources To Gather Information About A Topic (ELBE880)

Plan, draft and publish imaginative, informative and persuasive texts demonstrating increasing control over text structures and language features and selecting print and multimodal elements appropriate to the audience and purpose (ACELY682)

Using Appropriate Simple, Compound And Complex Sentences To Express And Combine Ideas (ELBE881)

Using Appropriate Simple, Compound And Complex Sentences To Express And Combine Ideas (ELBE883)

Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features (ACELY694)

Using Research From Print And Digital Resources To Gather Ideas, Integrating Information From A Range Of Sources; Selecting Text Structure And Planning How To Group Ideas Into Paragraphs To Sequence Content, And Choosing Vocabulary To Suit Topic And Communication Purpose (ELBE016)

Using Appropriate Simple, Compound And Complex Sentences To Express And Combine Ideas (ELBE015)

Using Grammatical Features Including Different Types Of Verb Groups/Phrases, Noun Groups/Phrases, Adverb Groups/Phrases And Prepositional Phrases For Effective Descriptions As Related To Purpose And Context (For Example, Development Of A Character's Actions Or A Description In A Report) (ELBE014)

Use a range of software including word processing programs to construct, edit and publish written text, and select, edit and place visual, print and audio elements (ACELY1697)

Identifying And Selecting Appropriate Software Programs For Constructing Text (ELBE947)

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