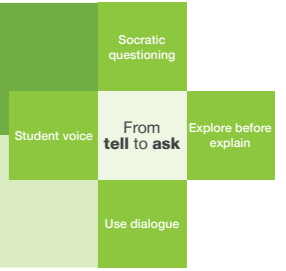


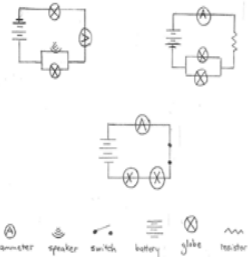
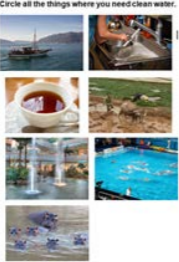




# GOAL – Getting the students doing the thinking in Science

## Transforming tasks strategy: From tell to ask

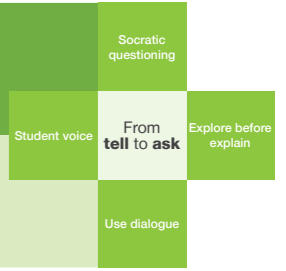


Technique Example	Before	After	Reflection: Why and how?
<p><b>Socratic questioning</b></p> <p>Ask questions that help students dig deeper.</p>	<p>Look for the rings on the wood cutting. How many are there? The number of rings on a tree trunk tells you how old the tree was. How old was this tree? A wide space between the rings tells you that the tree grew quickly. There was probably plenty of rain that year. A narrow space tells you it grew slowly. Use the information from the rings to write the story of the tree.</p>  <p><a href="https://www.flickr.com/photos/robin1966/Micolo J / Tree rings">https://www.flickr.com/photos/robin1966/Micolo J / Tree rings</a></p>	<p>Look at the rings on the wood cutting. What do you notice? What else do you notice? How are the rings similar? How are they different? How do you think they were formed? What do you think they might tell us about the tree? What makes you think that? Do you think the rings would be identical in all trees? Explain your thinking. Do you think the rings would be the same at the top of the tree, at the base, and on the branches? What are you assuming when you say that?</p>  <p><a href="https://www.flickr.com/photos/robin1966/Micolo J / Tree rings">https://www.flickr.com/photos/robin1966/Micolo J / Tree rings</a></p>	<p><b>WHY would you...have students participate in using Socratic questions about the rings in a wood cutting?</b> So students construct their own understanding by digging deeper into the things they have noticed.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to solve problems and ask probing questions for themselves, building on information gained from the things they notice.</p> <p>Examples of Socratic questions can be found online (For example: <a href="http://courses.cs.vt.edu/cs2104/Summer2014/Notes/SocraticQ.pdf">http://courses.cs.vt.edu/cs2104/Summer2014/Notes/SocraticQ.pdf</a>)</p>
<p><b>Explore before explain</b></p> <p>Ask students to try their ideas first.</p>	<p>Read the information you have been given about parallel and series diagrams.</p>  <p>Look at these three electric circuit diagrams. Label which components are connected in series and which devices are connected in parallel.</p>	<p>Connect up the following components with the wires and battery provided. Can you make a circuit so all the globes go on? Can you make a circuit so that only some of the globes go on with a switch? Explain how you did this.</p> <p>Circuits can connect the devices in series or in parallel. Draw the circuits you have made, and label whether you think they are parallel or series circuits. Read the information on parallel and series diagrams. Is it similar/different to how you built the circuits? Do you need to make any changes? Why?</p>	<p><b>WHY would you... have students explore circuits before being given explicit information about how to build them?</b> So students devise and test their own creative ways to solve problems.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to be confident, innovative and independent, and to see the connections between their discoveries and scientific information.</p>
<p><b>Use dialogue</b></p> <p>Ask students to interact and build meaning through learning conversations.</p>	<p>List all the different ways we use water. Name things or places where you find water.</p>  <p>Circle all the things where you need clean water.</p>	<p><b>Think, Pair, Share</b></p> <p>Think about the following: Is it important to purify water before drinking it? Why? Is that always true?</p> <p>Discuss your ideas with a partner. Share your thinking with the class.</p> <p>See South Australian Teaching for effective Learning Framework Tan Panel page 33 for Think, Pair, Share process.</p>	<p><b>WHY would you...have students use dialogue to build their understanding of water quality and use?</b> So students clarify their thinking with others as they explain and justify their responses.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to draw on their experiences, develop collaboration skills and use reasoning as they grapple with challenging questions.</p>
<p><b>Student voice</b></p> <p>Ask students to decide how they might do this best.</p>	<p>Why is Prince William promoting a new Angry Birds game called, "Roll with the Pangolins"?</p> <p><b>Find out</b> What is a pangolin? What important role do Pangolins play in an ecosystem?</p>  <p>Which other animals are becoming extinct in Africa? What can we do to save them?</p>	<p>Why is Prince William promoting a new Angry Birds game called, "Roll with the Pangolins"?</p> <p><b>What do you think?</b> Do you think playing this game is effective in helping you to understand what a pangolin is and its survival needs? Explain.</p> <p><b>Find out more</b> Choose an animal that is now an endangered species. Design an effective way to raise awareness of this species and its survival needs.</p> 	<p><b>WHY would you...have students consider their view of the effectiveness of a strategy for promoting understanding of endangered species, before creating their own design focusing on an endangered animal of their choice?</b> So students reflect on and critique a resource, devise a personal response to it, and use this understanding to create their own design for a similar resource.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students manage their own learning and develop and demonstrate deep understanding.</p>



# GOAL – Getting the students doing the thinking in Science

## Transforming tasks strategy: From tell to ask



Technique Example	Before	After	Reflection: Why and how?
<p><b>Socratic questioning</b></p> <p>Ask questions that help students dig deeper.</p>	<p><b>Look at a rusty nail.</b> Rust is caused when iron reacts with the air and water. Let's see if this is true. Place a nail in a jar of water. Observe what happens. We can prevent rusting by putting a protective coating on the nail. Find out which of the following substances best protect a nail from rusting, by carrying out the following investigation.</p>	<p><b>Look at the nail in the jar of water.</b> What do you notice? What do you think might have happened? What evidence is there to support that view? What might prevent that from happening? What else? What if the nail had to be in water, how might you protect it?</p> <p><small>Examples of Socratic questions can be found online (For example: <a href="http://courses.cs.vt.edu/cs2104/Summer2014/Notes/SocraticQ.pdf">http://courses.cs.vt.edu/cs2104/Summer2014/Notes/SocraticQ.pdf</a>)</small></p>	<p><b>WHY would you...have students participate in using Socratic questions about the rusting of nails?</b> So students construct their own understanding by digging deeper into the things they have noticed.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to use the information from their experiences to make connections and solve problems, and they learn to ask probing questions for themselves.</p>
<p><b>Explore before explain</b></p> <p>Ask students to try their ideas first.</p>	<p>Kyrio wanted to test the effect of diet pills on how tall the tomato plants in his garden would grow. He took two pots, filled them with dirt from the same bag, and planted four tomato plants in each. He watered one plant with tap water, and he watered the other plant with tap water mixed with dissolved diet pills. The plants were in the same location to ensure they got the same amount of sunlight, and the water was measured so that each pot received the same amount of water. He measured their height at the end of each week for eight weeks, and averaged the height of the four plants in each pot. He then graphed the results to show how the diet pills affected the height of the plants. <b>Explain Kyrio's results.</b></p>	<p>Design a way to make your bean plant grow as tall as possible in a 4 week period. What will you do? How will you measure the growth?</p> <p>Compare the growth of the different bean plants. Which ones grew the tallest? What factors may have influenced their rapid growth?</p> <p>Design an investigation to test whether your ideas about factors affecting the growth of a plant are true.</p> <p>Compare the design of your investigation with that designed by Kyrio for tomato plants. What will you expect to see if your prediction is supported?</p>	<p><b>WHY would you...have students conduct an exploratory investigation before designing a scientific investigation?</b> So students design and research an investigation based on their own questions and predictions.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to be confident, innovative and independent, and to see how scientific inquiry helps them to rigorously test their ideas.</p>
<p><b>Use dialogue</b></p> <p>Ask students to interact and build meaning through learning conversations.</p>	<p><b>Research some of the environmental issues facing the Great Barrier Reef and the Daintree Rainforest.</b></p> <p>If we could save only one, which one would you choose? Write an argument that compares the two environments and justifies your view.</p>	<p><b>Research some of the environmental issues facing the Great Barrier Reef and Daintree Rainforest.</b> <b>What would you do?</b> If you could save either the rainforests or the coral reefs, which would you choose? Why?</p> <p><b>Discussion: Which has the higher priority?</b> (Use a dialogue protocol, such as the Community of Inquiry process). Consider different aspects such as: importance of biodiversity, rare species, fuel and food, ecotourism and medicines we get from rainforests or reefs, climate change, soil erosion, pollution, logging, biofuel replacement, overfishing, etc. What do you now understand about how reefs and rainforests must be managed to sustainably balance conservation and human needs. Which would you save? Why?</p> <p><small>Link to Community of Inquiry process: <a href="http://museumvictoria.com.au/education/community-of-inquiry/">http://museumvictoria.com.au/education/community-of-inquiry/</a></small></p>	<p><b>WHY would you...have students use a structured dialogue such as Community of Inquiry to compare the importance of the two environments?</b> So students listen critically, learn from each other, evaluate a range of perspectives and collaborate.</p> <p><b>HOW does this develop powerful/expert learners?</b> Students learn to develop collaboration skills, use reasoning and draw on their experiences as they grapple with challenging questions.</p>
<p><b>Student voice</b></p> <p>Ask students to decide how they might do this best.</p>	<p><b>What are stem cells?</b> What classes of stem cells are there? Where do stem cells come from? Why do scientists want to use stem cell lines? What are the advantages and disadvantages in using stem cells?</p>	<p><b>What do you think?</b> Use the information you have researched about stem cells to consider the following situation:</p> <p><i>National Institutes of Health cannot accept donated umbilical cord stem cells from the general public.</i></p> <ul style="list-style-type: none"> <li>Do you agree, or disagree, with the National Institutes of Health policy?</li> <li>What evidence and information supports your view?</li> <li>What other evidence and information should be considered?</li> <li>Devise a way to convince others of your point of view.</li> </ul>	<p><b>WHY would you...ask students to devise a way to convince others of their point of view about stem cell research.</b> So students make informed decisions and develop valid explanations based on evidence and take shared responsibility for developing and demonstrating their learning</p> <p><b>HOW does this develop powerful/expert learners?</b> Students manage their own learning and develop and demonstrate deep understanding.</p>