

Ideas for Science and Technology K-6



Primary Connections Unit: *PUSH-PULL*

In my opinion teaching and exploring science with younger children is one of the most exciting, exhilarating and satisfying activities in a teachers' life. I would like to share with you a resource I have been involved with trialling and teaching for three years.

Primary Connections, an initiative of the Australian Academy of Science is not just a set of units but also a professional learning program, aimed at providing teachers with the tools and confidence to teach science with a "minds on" and "hands on" approach. The project links science with literacy, employs an inquiry-oriented approach and uses the Five E's teaching and learning model to support student learning.

The phases of the Primary Connections 5Es teaching and learning model are based on the 5Es instructional model (Bybee, 1997). The relationship between the 5Es phases, investigations, literacy products and assessment are illustrated in Table 1.

Table 1. Primary Connections 5Es teaching and learning model

Phase	Focus
ENGAGE	Engage students and elicit prior knowledge. Diagnostic assessment.
EXPLORE	Provide hands-on experience of the phenomenon. Formative Assessment.
EXPLAIN	Develop scientific explanations for observations and represent developing conceptual understanding. Consider current scientific explanations. Formative assessment.
ELABORATE	Extend understanding to a new context or make connections to additional concepts through a student-planned investigation. Summative assessment of the investigating outcomes.

EVALUATE	Students "re-present" their understanding and reflect on their learning journey and teachers collect evidence about the achievement of outcomes. Summative assessment of the conceptual outcomes.
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The *Push-Pull* unit that features toys is a Stage 1 (second and third year of schooling) unit in the Energy and Change strand. The introduction for the unit states that:

"Forces are at work in everything we do—we push open doors and pull on hats. Air and water exert forces that can be benign or destructive, and gravity pulls on things. Scientists and engineers study forces to design better bridges and faster aeroplanes, and to reduce the forces that impact on people in car accidents.

The push pull unit is an ideal way to link science with literacy in the classroom. The unit provides an opportunity for students to explore pushes and pulls. Through investigation, students observe and gather evidence about how these forces act in air and water, and on the ground. Students identify the effect of the pull of gravity and learn that both air and water "push".

A big plus for busy teachers is the embedded assessment in Primary Connections, which includes diagnostic, formative and summative assessment opportunities with students producing a range of assessment products.

Co-operative learning approaches are used throughout the unit to promote a structured approach to the development of team skills. I found that there were other cooperative learning activities that could also be included.

While the units are easy to follow with step-by-step lesson plans, equipment lists and outcomes identified for the unit and each lesson, I found them flexible and easy to adjust when you have changes to routines and other interruptions to classroom activities. I particularly like the way that *safety precautions* are featured in the lesson steps, with activities carefully selected and particular attention given to potential safety hazards.



Primary Connections Unit: *PUSH-PULL (continued)*

Each lesson contains the aims, the assessment focus, key lesson outcomes for science and literacy, extra teacher background information, equipment for the class and for each team and any preparation needed before the lesson. The curriculum links at the end of lessons are good suggestions but do not necessarily need to be covered. Any necessary resource sheets are provided at the end of each lesson. The lessons are very easy to follow and my confidence in teaching science has improved greatly.

I always find the hardest part of teaching any unit is having enough background information. Primary Connections provides a science background CD with every unit and background information relevant to the unit is included in the introduction and lessons. Other useful unit information is available on the Primary Connections website as well as links to other national initiatives, including the Learning Federation www.thelearningfederation.edu.au and SEAR assessment resources at <http://cms.curriculum.edu.au/sear>.

Another valuable component of the units is the 'Unit at a Glance' which provides a condensed overview of the unit. It is organised in the 5Es and provides a description of lesson activities in each phase. The engage phase 'at a glance' statement is included below in Table 2.

Table 2. *Push-Pull* Unit at a glance

Unit at a glance Push-Pull		
Phase	Lesson	At a glance
ENGAGE	Lesson 1 Moving toys	To capture students' interest and find out what they think about how toys move in air and water and on the ground. To elicit students' questions about how toys move.

A comprehensive unit overview found at the end of the unit lists the science and literacy outcomes, lesson summaries and the assessment opportunities. The outcomes in Primary Connections contribute to students' developing scientific literacy and are linked to the National Scientific Literacy Progress Map. The literacy focuses for the Push Pull unit include: tables, science journals, word walls, force-arrow diagrams, factual texts and scientific drawings.

A selection of helpful 'How to' documents are included in the appendices for units, including:

1. How to organise the co-operative learning teams, along with charts for team skills, team rolls and suggested team badges.

2. How to use a science journal. It is suggested that students use a science journal to record observations, experiences and reflections from the unit. I have found using a sketch book is ideal. It provides room for handouts and if needed when writing, the children can slip a laminated line card under the blank page so that their writing is neater. The blank pages are ideal for scientific drawings. One sketch book is usually enough for the year. Computer generated work can be printed and added to the journal. Another alternative is to have a digital journal with everything, including evaluations kept there and at the end of the year it can be burnt onto a CD to take home. I am, at the moment working with blogs or wikis as an alternative to record the students' work. That is a work in progress.
3. How to use a word wall. This is a systematically organised collection of words related to the unit. For the *Push-Pull* unit I drew a large cut out of a car and we put the unit words inside the car.
4. How to conduct a fair test, this is essential for building students' skills with investigations.
5. The *Push-Pull* overview. I found this very useful for my program; I added the outcomes and the extra activities. I also added an evaluation and reflection column. Using a highlighter is a good way to show how the Quality Teaching dimensions and elements can be used.

I would like to encourage all teachers to try this unit (and other Primary Connections units) as it is easy to use and a complete teaching and learning resources. I found my students were completely involved and so interested in the science that they began their own investigations at home. Their use of scientific language improved and their ability to produce an accurate and labelled scientific drawing developed as the unit progressed.

There are currently eight published Primary Connections units with a further eleven to be published by the end of 2008. The units cover a wide variety of science concepts and have been developed for all stages of Primary schooling.

The *Package it better* unit, due out in February, 2008 has been written in conjunction with NSW Department of Education and Training to incorporate Technology so that will be one to look out for. *Package it better* is a stage 3 Natural and Processed Materials unit suitable for the upper primary school students. Further details of the curriculum units are available on the website www.science.org.au/primaryconnections.

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