PrimaryConnections®
Linking science with literacy

PrimaryConnections Professional Learning

Facilitation tools and techniques handbook

Australian Academy of Science

Professional learning program

Primary**Connections** comprises a professional learning program supported with exemplary curriculum resources to enhance teaching and learning in science and literacy. Research shows that this combination is more effective than using each in isolation.

Professional Learning Facilitators are available throughout Australia to conduct workshops on the underpinning principles of the program: the Primary**Connections** 5Es teaching and learning model, linking science with literacy, investigating, embedded assessment and collaborative learning.

The Primary**Connections** website has a calendar of workshops available across Australia. Visit the website at: **www.primaryconnections.org.au**

Introduction

Purpose

To introduce the facilitation tools and techniques used in the professional learning workshop modules.

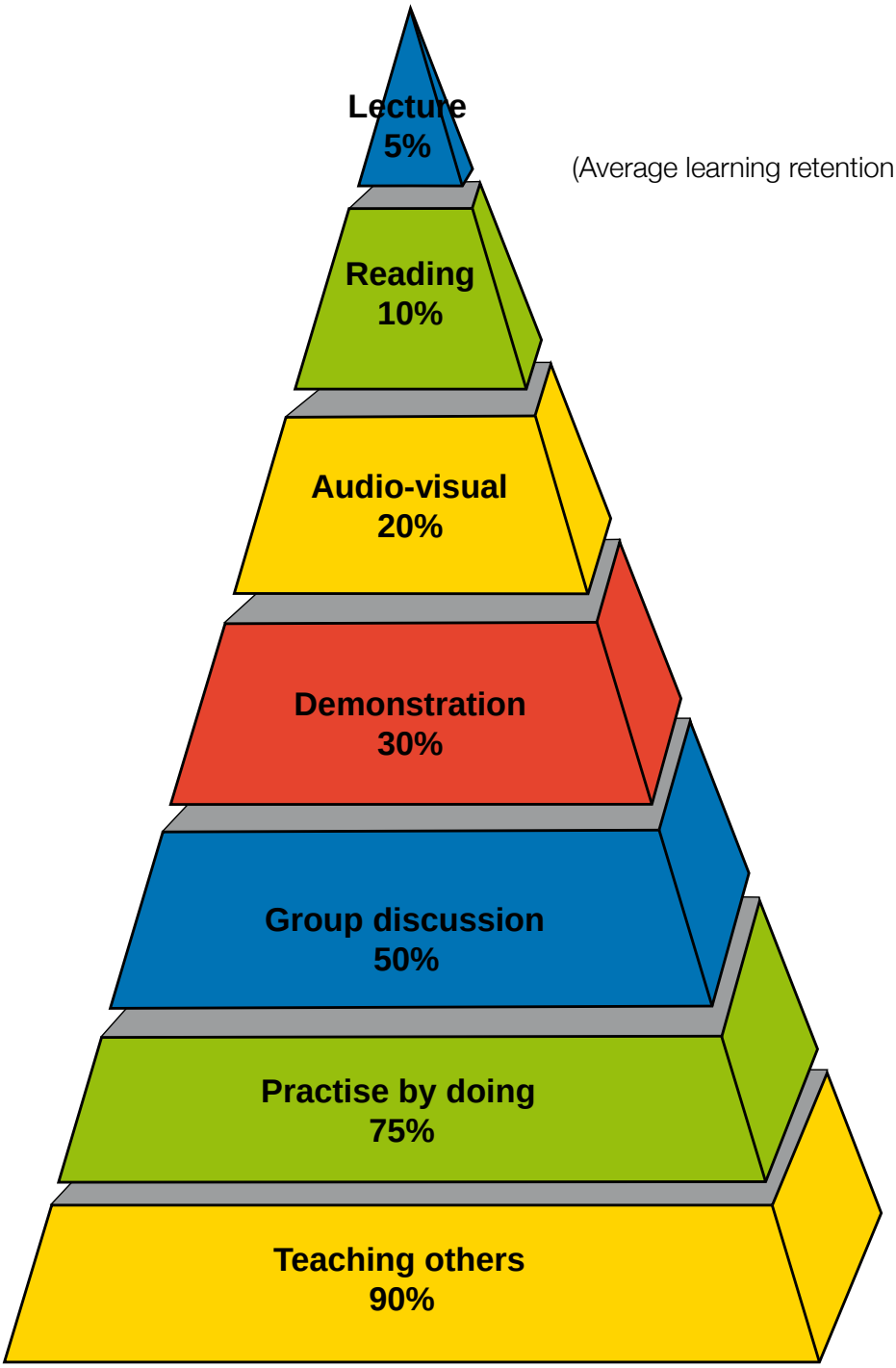
Contents

This chapter provides:

- a glossary
- a description of each facilitation tool and technique including its purpose, the suggested process, the product of using the tool or technique and some Primary**Connections** examples.

Learning pyramid

The learning pyramid visually depicts approximate learning retention rates depending on the learning mode. It reflects learning theory which suggests that people learn best when they are actively involved in the learning process.



(Average learning retention rates)

Reference

NTL Institute for Applied Behavioral Science,
300 N. Lee Street, Suite 300, Alexandria, VA 22314. 1-800-777-5227
http://homepages.gold.ac.uk/polovina/learnpyramid/about.htm

Glossary of facilitation tools and techniques

TITLE	PURPOSE
Affinity diagram	A tool to elicit and organise a large amount of information on a question or an issue from any sized group in a short time.
Analyser	A tool for eliciting the desirable characteristics of a person's role in an organisation.
Before-during-after	A reflection tool for eliciting thoughts and ideas at different stages of a learning experience.
Beliefs continuum	An embodied technique enabling individuals to express the degree to which they agree or disagree with a statement.
Bone diagram	A systems reflection and planning tool that helps clarify the current and desired state of elements of the organisation.
Brainstorming	A technique for generating and collecting ideas from a group in a non-judgemental environment.
Bush dance	A technique that allows teachers to reflect on and discuss their thoughts at any point during a learning session.
Card sort	An evaluation tool which requires participants to categorise concepts or ideas in like groupings.
Concept map	A tool for linking related ideas about a concept in a visual way.
Consensogram	A tool to determine a group's perception of an issue based on individual responses to a focus question.
Correlation chart	A scattergram which evaluates the relationship between two factors.
Cumulative listing	A quick and efficient technique for collating responses from a group.
Dialogue for meaning	An oral technique to promote effective communication between participants to enhance meaning.

Glossary of facilitation tools and techniques (cont)

TITLE	PURPOSE
DIGA	A reflection technique which progresses discussion from description to interpretation, generalisation and, finally, application.
Experience estimator	A tool used to gauge participants' experience prior to a professional learning workshop.
Fishbone diagram	A cause and effect planning tool that helps to clarify the possible causes of an identified effect.
Five whys?	A tool to engage participants in deep thinking about a topic.
Force field analysis	A tool for examining and recording the forces driving or preventing an improvement or change.
Global café	A semi-structured technique which enables participants to engage in several conversations on different but related pre-determined topics.
Hot potato	A technique for participants to write responses to a demonstration, activity or question for sharing with other participants in the group.
If … then	A tool for studying proposed actions and their consequences.
Inquiry walk	A technique that helps teachers handle students' questions for inquiry and analyse the way the questions relate and contribute to the development of the key concept.
Interrelationship digraph	A tool for examining the cause and effect relationship between different factors.
Jigsaw	A cooperative learning technique involving the use of 'home' groups and 'expert' groups to share responsibility for learning.
Learning scale	A tool to enable participants to focus on determining the level to which the issues, suggestions and solutions being discussed contribute to learning.
Loss function	A tool that measures the loss of performance from a target or standard.
Mind map	A visual representation tool which identifies the links between different concepts and topics.

Glossary of facilitation tools and techniques (cont)

TITLE	PURPOSE
Morphing	A tool to map the transformation of an idea, a current situation or an event over time.
P3T	A group technique for producing a succinct statement on an issue.
Parking lot	A tool for group use where participants can 'park' self-adhesive notes to highlight what is going well, what needs to be improved, questions and ideas, for review at a later time.
Plus/delta	A reflection tool used after an event to determine the strengths of a situation or application, and opportunities for change.
Prioritiser	An analytical tool for identifying and prioritising a list of items such as: needs, actions or responsibilities.
Quadrant chart	A tool with four pre-determined and distinct categories for collecting responses to a question or issue.
Quadrant conversations	A group technique where participants adopt a specific role to examine an issue from different viewpoints.
Quality matrix	A tool for assessing a piece of work and seeking improvements towards creating a high quality product.
Question generator	A technique for generating meaningful questions with anonymity.
Radar chart	A tool to enable participants to analyse the relationship between the parts of a system and the whole system.
Stay and stray	A technique for participants to share a variety of conversations on a focus issue in a structured and efficient way.
SWOT analysis	A tool enabling people to analyse the advantages and disadvantages of a solution to a problem or a potential decision.
Systems mapping	A tool that enables people to think about and describe all the necessary elements of an identified system.
Systems modelling	A modelling technique that assists in the analysis of any system.

Glossary of facilitation tools and techniques (cont)

TITLE	PURPOSE
Talking partners	A technique used to ensure effective conversations between pairs of participants.
Thinkers keys	A technique to foster innovative, creative and lateral thinking skills.
Tree approach	An assessment technique for analysing text and making judgements about levels of understanding.
TWLH chart	A tool for tracking an entire sequence of learning from beginning to end using the titles – Think, Want, Learnt, How.
Variables grid	A planning tool for analysing the variables associated with science investigations.
Verb volley	A brainstorming tool that helps people to observe activities and describe them using phrases beginning with verbs.
Visual representation	A visual display of the ideas, information or findings from a group.
Word loop	A tool that helps to clarify the relationship between words and terms, symbols, representations and definitions and how these contribute to a whole topic or concept.
Y chart	A tool for brainstorming responses to a situation or question by focusing on the senses.
5Es sector chart	A visual tool for generating and recording ideas about the focus of each phase of the Primary**Connections** 5Es teaching and learning model.

Glossary of facilitation tools and techniques

The facilitation tools and techniques in the Primary**Connections** professional learning programme have been adopted from a variety of sources and, where possible, reference originators and authors have been appropriately acknowledged.

Reference list

Publications

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Bicheno, John (1994). *The Quality 50: A Guide to Gurus, Tools, Wastes, Techniques & Systems.* Victoria: Nestadt.

Evans, J. (2000). *Leaders in Australia, The Australian Cultural Imprint for Leadership.* Victoria: Cultural Imprint Pty Ltd.

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Osborn, Alex F. (1953). *Applied Imagination: Principles and Procedures of Creative Problem Solving.* USA: Scribner.

Senge, Peter (1990). *The Fifth Discipline: The Art and Practice of the Learning Organisation.* New York: Doubleday.

Tague, Nancy R. (2005). *The Quality Toolbox. 2nd Edition.* Wisconsin: ASQ Quality Press.

Websites

Tony Buzan. See **www.buzanworld.com**

Country Area Program, NSW Department of Education and Training. See **www.cap.nsw.edu.au**

Kurt Lewin. See **www.valuebasedmanagement.net/methods_lewin_force_field_analysis.html**

Quality Learning Australia. See **www.qla.com.au**

Peter Rennie. See **www.leadershipaustralia.com.au**

Tony Ryan's Thinkers Keys. See **www.thinkerskeys.com**

Other

Rostron, Louise: Primary**Connections** Professional Learning Consultant (2006–2016)

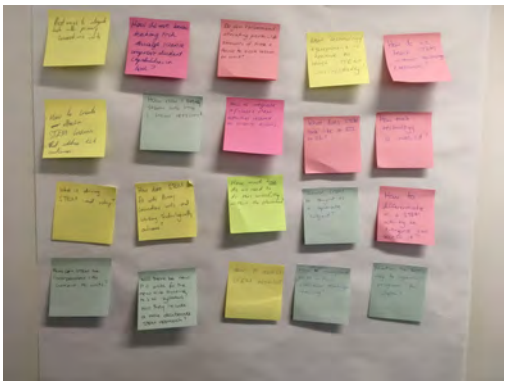
Affinity diagram

Purpose

A tool to elicit and organise a large amount of information on a question or an issue from any sized group in a short time.

Process

- Pre-prepare a large sheet of paper with the focus issue or question as the heading.
- Provide participants with coloured self-adhesive notes and a pen.
- Ask the focus question or describe the issue.
- Participants write one idea or response per self-adhesive note.
- Place all notes on the chart.
- Sort, in silence, all notes on the chart into like categories (the word 'affinity' means closeness or likeness).
- If the group size is small, all participants sort the responses. If the group is large, use a small group of people for this task.
- Discuss and agree on a heading for each category and write it on the chart.



Product

The affinity diagram captures multiple responses in an organised way and provides a visual display of the entire group's response to the question or issue.

PrimaryConnections examples

- Record all the current issues in the media which are science-based.
- By the end of the workshop, what would you like to know?
- By the end of the workshop, what would you like to be able to do?

References

Bicheno, John (1994). *The Quality 50: A Guide to Gurus, Tools, Wastes, Techniques & Systems.* Victoria: Nestadt.
GOAL/QPC (1994). *The Memory Jogger II, A Pocket Guide of Tools For Continuous Improvement and Effective Planning.*
Tague, Nancy R. (2005). *The Quality Toolbox. 2nd Edition.* Wisconsin: ASQ Quality Press.

Analyser

Purpose

A group brainstorming tool, based on both real and fictional people, to analyse the top desirable characteristics of a person's role in an organisation, for example a facilitator/leader. This tool is an adaptation of the repertory grid, a tool for eliciting personal constructs, that is, the "way we think about things."

Process

- Define the role to be analysed, for example, a facilitator/leader role. For the purpose of this description, this example will be used.
- Ask participants to prepare 4 cards or sticky notes with the following titles and display them on the table:

  1. A real person considered to be a **good** facilitator/leader
  2. A real person considered to be a **poor** facilitator/leader
  3. A fictional person considered to be the **ideal** facilitator/leader
  4. A fictional person considered to be the **worst** facilitator/leader

  (The real people should be known to the participant but their identities not divulged. Participants might identify the real people with an initial or symbol on their cards.)
- Ask participants to each prepare a chart on a blank page with two columns titled **Common** and **Different**. Explain that sequential pairs from the cards 1–4 will be compared in order. A question will be asked and participants individually describe a characteristic the pair has in common and a characteristic the pair has that is different.
- Ask participants to compare the cards in the following order:

  1 and 2

  1 and 3

  1 and 4

  2 and 3

  2 and 4

  3 and 4

  Depending on time, participants could sample from this list of comparison pairs.

  In each case the question is:
  "When thinking about the role of a facilitator/leader briefly describe a characteristic the pair has in common and a characteristic that is different."
- Participants add the descriptions to their individual **Common/Different** charts.
- Ask participants to form small groups of 4-6 people and make one compiled list of characteristics under a group **Common/Different** chart. "Like" descriptions may be combined.

Analyser (cont)

- Allow each participant five individual votes to be allocated in any order the individual wishes in answer to the following question:

  "Which of the characteristics on your list are the most important ones in order to be a highly effective practitioner in the role of a facilitator/leader.
- From the whole group compile one list, those with the most votes, of the Top Characteristics of a highly effective practitioner in the role of a facilitator/leader.

Common	Different
Both have the title facilitator/leader	One enables expertise in others, the other does not
Both are excellent presenters	One models what is presented, the other does not
Neither are engaging presenters	One does have knowledge of facilitation techniques, the other does not

Product

The analyser enables a large group to construct the characteristics of a highly effective practitioner in a particular role in an organisation, for example a facilitator/leader, by drawing on knowledge of real and fictional people. Following this, further processes may be used to determine how these characteristics might be mastered and enacted in the actual role.

PrimaryConnections examples

- Collate the Top Desirable Characteristics of a highly effective facilitator/leader.
- Collate the Top Desirable Characteristics of a Science Specialist in primary schools.

References

Rostron, Louise (2013). VIC Science Specialists workshop. *The analyser*

Before-during-after

Purpose

A reflection tool for eliciting thoughts and ideas at different stages of a learning experience.

Process

- Distribute the before-during-after sheets, or, alternatively, ask participants to make their own.
- Participants reflect on the learning experience which is about to take place and write down thoughts, feelings, ideas and initial understanding.
- Choose an appropriate time to revisit this reflection sheet part way through the learning experience.
- Ask participants to again reflect on the learning experience at the end.
- Collate the major ideas by using a technique such as cumulative listing.

Introduction to PrimaryConnections workshop

Before	During	After
• Science is engaging, but I don't know enough about science to teach it confidently. • I need to know more about how science is linked with literacy. • To teach science you need a lot of resources and equipment that we don't have in our school.	• The units include teacher background information and the Science Background CD. • Students use a variety of literacies to represent and re-represent their understanding of science concepts. • The PrimaryConnections units use easy to access, low-cost resources.	• With PrimaryConnections science is fun and do-able for both teachers and students. • I'm excited and feel more confident about teaching science effectively. • The units are a complete teaching and learning resource with a unit overview, lesson plans and student resource sheets.

Product

The before-during-after technique is a cumulative reflection tool which summarises major ideas, thoughts, feelings and understanding about a learning experience.

PrimaryConnections example

- Can be used as part of any PrimaryConnections professional learning module.

Reference

Laverick, C. (2002). *B-D-A Strategy: Reinventing the wheel can be a good thing. Journal of Adolescent & Adult Literacy, 46* (2), 144–47.

Beliefs continuum

Purpose

An embodied technique enabling individuals to express the degree to which they agree or disagree with a statement.

Process

- Display two signs, 'Agree' and 'Disagree', at the extremities of a line created in the room.
- Read a statement to the group and ask the participants to stand in a position along the line which reflects the degree to which they agree or disagree with the statement. They can create depth in the line if a desired position is occupied.
- Ask participants to discuss with the person or small group nearest them the reasons they have chosen their positions. Allow a few minutes for the discussion to take place.
- Ask for volunteers to summarise the discussion at the 'Agree' end, the 'Middle' and the 'Disagree' end of the continuum for the whole group to hear.
- Read a second statement and ask participants to adjust their positions in response to the statement and to discuss with those closest to them the reasons they have chosen their position.
- Ask those who have moved positions to explain the reasons for their movement.

Product

The beliefs continuum creates a human spectrum of opinion along a line from 'Agree' to 'Disagree'. It allows individuals the opportunity to position themselves in a non-threatening way and in a manner which best reflects their beliefs. The discussions enable them to justify their position with like-minded individuals and to hear a wide range of opinions from the entire spectrum.

Primary**Connections examples**

- Students learn best when working collaboratively rather than individually or competitively.
- Students learn best when they are able to explore a concept before explanation is given.
- Students often have fixed ideas about science concepts.
- The main purpose of assessment is to provide accurate reports to parents.

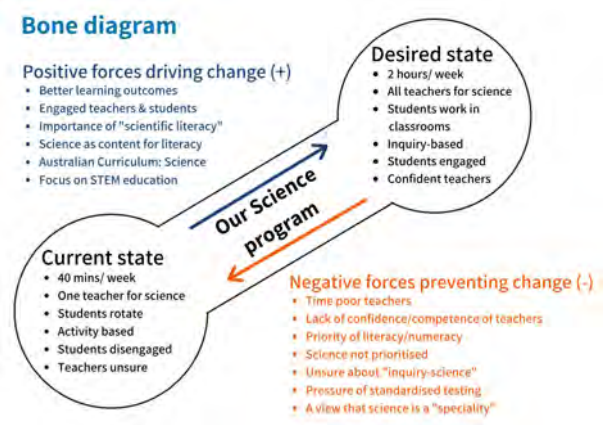
Bone diagram

Purpose

A systems reflection and planning tool that helps to clarify the current and desired situation concerning a major element of the organisation, for example, the way science is taught and learnt at the school. It helps to identify the forces driving and preventing the change to the desired situation.

Process

- Ask participants to consider a current and desired situation in the organisation.
- Draw a large bone diagram on a chart.
- Brainstorm the characteristics of the current situation and describe them in the lower circle of the Bone Diagram.
- Brainstorm the characteristics of the desired situation and describe them in the upper circle of the Bone Diagram.
- Identify the positive forces that create growth and negative forces that prevent growth towards the desired state and place these above and below the Bone Diagram.
- Discuss the ways that the negative forces might be reduced or eliminated so that the positive forces are able to drive change more quickly.



Product

The bone diagram allows a group to analyse the “big picture” of a situation and provides a visual display of the group’s analysis of the current and desired situations and the forces driving and preventing the change to the desired state. It enables people to see that change is difficult, is a system issue and is everyone’s responsibility to enact.

PrimaryConnections examples

- Change the way we teach and learn science in our school.
- Change the priority given to science in our school.
- Change the level of confidence/competence teachers have when teaching science.

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools*. Bone diagram

Brainstorming

Purpose

A technique for generating and collecting ideas from a group in a non-judgemental environment.

Process

- Divide the participants into small groups.
- Appoint a recorder for each small group.
- Ask the group to agree on the objective of the brainstorm. The recorder then writes the objective clearly on a large sheet of paper.
- Allow some thinking time for participants to jot down their ideas.
- Each participant is given the opportunity to respond to the stated objective by giving only one idea at a time.
- All ideas are recorded as presented without judgements, comments or discussion. The recorder may ask for clarification on how to record the idea.
- Participants may pass in a given round.
- Keep the process going until participants have exhausted all ideas or time has run out.

Product

Brainstorming captures multiple individual responses to an objective. Further techniques of prioritisation and action follow the brainstorm.

PrimaryConnections examples

- Identify the benefits of collaborative learning.
- In what ways might science resources be organised?
- How does the teacher behave during the *Engage* phase of a curriculum unit?

Reference

Osborn, Alex F. (1953). *Applied Imagination: Principles and Procedures of Creative Problem Solving.* USA: Scribner.

Bush dance

Purpose

An engaging and active technique that allows teachers to reflect on and discuss their thoughts (for example, what have we learned?) at any point during a learning session. This will work particularly well at the Evaluate phase of a day using the DIGA reflections.

Process

- Ask the entire group to form two concentric circles. If the group is very large then more than one set of circles could be formed.
- Begin by asking pairs to face one another, one from each circle, and have a conversation about a focus question such as:
  Describe one thing that has had impact for you today (something I saw, heard, felt, or touched).
- Ask the circles to rotate in different directions. Use music, a sound or a signal to stop. Participants face the person nearest them and have a conversation about the next question such as:
  Explain something you did today that was personally meaningful to you. Give your reasons.
- Ask the circles to move again for the next questions but use variations in how this happens.

Examples of variations:

- Ask people to swap places in the circles and move
- Ask people to stand back to back and move
- Ask people to zig-zag through the circles taking hands as in a square dance
- Ask people to skip while moving
- Ask people to take one step sideways and walk three places along, circles
- going the opposite way
- Ask every third person to step out of the circle while it is moving, then step back in

There are many other variations only limited by your imagination.

Examples of further questions:

What general principles have you learned about today?

What is something you can apply immediately, in the future?

What will you try with your students as a result of today?

What will you share with a colleague as a result of today?

Bush dance (cont)

Product

The bush dance is an energising way for people to have multiple conversations to share their thoughts based on focus questions. The element of surprise about the person to whom they will talk keeps the process interesting and fun. This technique can be used anywhere at any time during a learning session.

PrimaryConnections examples

This technique can be used at any time during a learning session.

Reference

Angela Gigliotti: Primary**Connections** Presenter (2015)
Rostron, Louise: Primary**Connections** Professional Learning Consultant (2015)

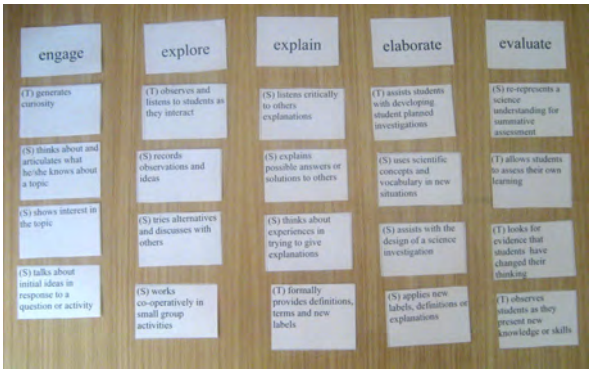
Card sort

Purpose

An evaluation tool which requires participants to categorise concepts or ideas in like groupings.

Process

- Distribute shuffled card sets to participants (individuals or groups).
- Instruct participants on the key cards which act as headers of categories.
- Participants sort the cards by placing them in the most appropriate category.
- Provide a possible answer sheet.
- Allow time for participants to discuss and justify the placement of cards in categories compared with the possible answer sheet.



Product

The card sort categorises like ideas into pre-determined groups or categories. The contents of each category are then discussed to deepen understanding.

PrimaryConnections examples

- Sort the cards describing student and teacher behaviours into the phases of the PrimaryConnections 5Es teaching and learning model.
- Sort the cards describing appropriate questioning techniques into the 5Es phases.
- Sort the cards describing the roles and responsibilities of the director, manager and speaker in collaborative learning groups.

Concept map

Purpose

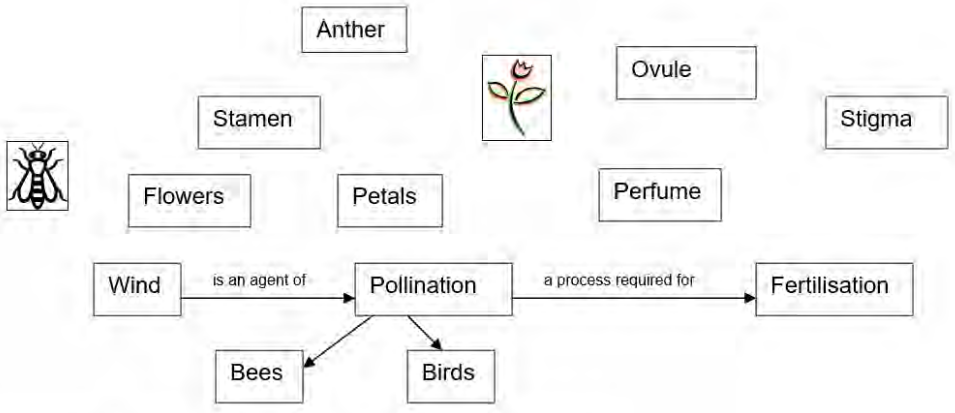
A tool for linking related ideas about a concept in a visual way.

Process

- Distribute a large piece of paper to each participant.
- Assign the broad topic for concept mapping and ask participants to generate related ideas.
- Participants arrange the words or images in a manner which makes sense to them using lines to connect the ideas.
- Ask participants to write words along the lines between linked ideas so that each pathway can be read as an accurate and meaningful sentence.
- Ask participants to share their concept maps so that others can read them.

Product

The concept map captures a visual interpretation of thinking about a particular topic showing the relationship between the concepts. They assist in showing the participants' understanding of concepts.



A concept map in progress: How do flowering plants reproduce?

PrimaryConnections examples

- Draw a concept map of the investigation process.
- Draw a concept map of the way PrimaryConnections links science with literacy.
- Draw a concept map showing the way light energy behaves.

Reference

Novak J. D. (1998). *Learning, Creating, and Using Knowledge: Concept Maps™ as Facilitative Tools in Schools and Corporations.* Mawah, NJ: Lawrence Erlbaum and Associates.

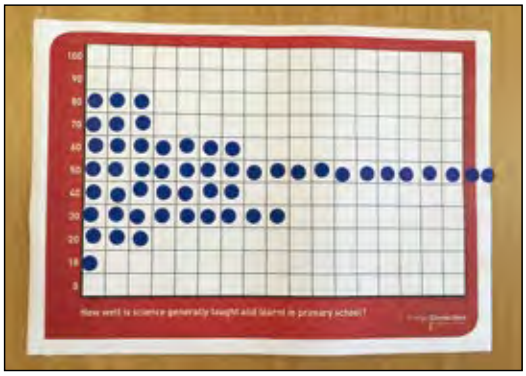
Consensogram

Purpose

A tool to determine a group's perception of an issue based on individual responses to a focus question.

Process

- Pre-prepare a graph on a large sheet of paper with two axes. Scale the vertical axis from 0% to 100% in 10% increments.
- Write the focus question across the top of the paper.
- Provide participants with self-adhesive notes and a pen.
- Ask the focus question beginning with 'To what degree/level...'.
- Ask participants to write their response to the question, as a percentage (preferably in 10% increments), on a self-adhesive note.
- Collect the notes and collate by sticking each one against the appropriate vertical scale mark. The more notes against a particular rating the longer that horizontal bar will become.



Product

The consensogram provides a visual display of the entire group's response to the focus question. It is an effective tool to use before and after a workshop module.

PrimaryConnections examples

- What is the degree of importance of the teaching and learning of science in primary school?
- What is the effectiveness level of the teaching and learning of science in primary schools?

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

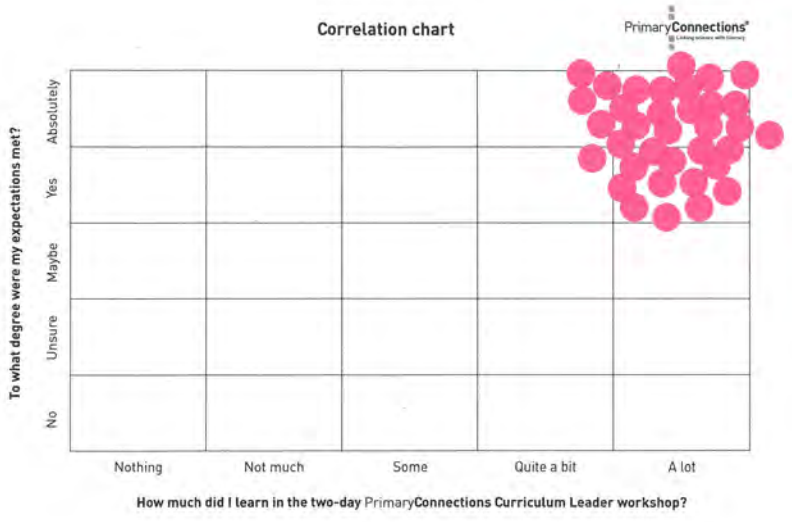
Correlation chart

Purpose

A scattergram tool that evaluates the relationship between two factors.

Process

- Prepare a graph on a large sheet of paper with two axes.
- The horizontal and vertical axes are used to measure any two variables.
- Decide on the increments on the scale and write descriptive labels on each increment.
- Participants place one self-adhesive dot on the correlation chart which measures their judgement of the two related factors.



Product

The correlation chart provides a group visual display of individual judgements of two variables.

PrimaryConnections examples

- Measure the correlation between the level of enjoyment of a module and the level of learning.
- Measure the correlation between understanding the way assessment processes are embedded in PrimaryConnections and understanding the PrimaryConnections 5Es teaching and learning model.
- Measure the degree to which expectations of a professional learning module were achieved and the level of confidence participants have gained in effectively teaching a PrimaryConnections curriculum unit.

References

GOAL/QPC (1988). *The Memory Jogger, A Pocket Guide of Tools For Continuous Improvement.*
GOAL/QPC (1994). *The Memory Jogger II, A Pocket Guide of Tools For Continuous Improvement and Effective Planning.*

Cumulative listing

Purpose

A quick and efficient technique for collating responses from a group.

Process

- Following an activity, ask a participant to share one of their ideas.
- Record the idea and ask others with a similar response or those who agree with the response to raise their hands. Record the number of responses.
- Move to a second participant and repeat the process.
- Continue until all ideas have been exhausted.

Product

Cumulative listing captures broadly similar responses, quickly, with a measure of the frequency of that response. More detailed analysis of common responses might then take place if desired.

PrimaryConnections examples

- List ideas generated from, for example, a hot potato exercise, following observation and discussion of a science phenomenon.
- List the purposes of assessment following brainstorming in small groups.
- Pose a question and list the generated responses to that question, for example, What causes day and night?
- List the participants' explanations after watching a science demonstration, for example, watching a glowing light bulb in an electric circuit.

Reference

Murdoch, Kath (1998). *Classroom Connections: Strategies for Integrated Learning.* Victoria: Eleanor Curtain Publishing.

Dialogue for meaning

Purpose

An oral technique to promote effective communication between participants to enhance meaning.

Process

- Participants sit in small circles facing each another.
- The group identifies the issue which needs dialogue and spends a designated time talking about the meaning of the issue.
- All participants follow the rules of dialogue:
  1. Suspend judgement
  2. Ask questions to clarify meaning
  3. Listen attentively
  4. Avoid jumping to conclusions
  5. Let the conversation take its own course
  6. Avoid getting into a debate or argument
  7. Be open to others' opinions.
- A defined conclusion may not reached. The purpose of the technique is to enhance understanding and meaning which will later contribute to a better outcome or conclusion.

Dialogue for meaning (cont)

Product

There is no published product from this technique but it does produce better informed individuals with heightened understanding about an issue.

Alternative process for large groups

- Divide the group into two.
- The first group sits in the circle as above.
- Each member of the second group is assigned the role of observer of a participant in the circle and makes note of their participation in the dialogue with regard to adherence to the rules of meaning making.
- After a period of dialogue, the observer provides private feedback to the participant.
- Roles are then reversed and the dialogue continues and feedback provided.

PrimaryConnections examples

- What do we understand about the term 'assessment processes' in the primary classroom?
- What do we understand about a particular science phenomenon?
- What do we mean by the term 'literacies of science'?
- What does 'scientific literacy' mean and how might we contribute to developing it in our students?
- What do we understand about the PrimaryConnections program?
- What do we mean by 'collaborative learning strategies'?

Reference

Senge, Peter (1990). *The Fifth Discipline: The Art and Practice of the Learning Organisation.* New York: Doubleday.

DIGA

(Describe, Interpret, Generalise, Apply)

Purpose

A reflection technique which progresses discussion from description to interpretation, generalisation and, finally, application.

Process

- Distribute DIGA sheets to participants (see over).
- Participants complete the sheet solo, or groups discuss each of the stages with one participant as designated recorder.
- Indicate that each of the stages has some prompting questions (see over).

Product

DIGA provides the opportunity to deeply reflect on and record responses to different levels of a learning experience from description, through personal interpretation and generalisation to opportunities for application. The latter could become the basis for action planning.

PrimaryConnections examples

- Reflect on a PrimaryConnections professional learning module.
- Reflect on the essence of a PrimaryConnections curriculum unit.
- Reflect on the results obtained by students when conducting a PrimaryConnections science activity.
- Reflect on the PrimaryConnections 5Es teaching and learning model.
- Reflect on your presentation to an audience.

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

DIGA (cont)

(Describe, Interpret, Generalise, Apply)

Describe

What happened during this experience? Describe your observations without interpretation. Use your senses as prompts, for example – What did you see, hear, feel or touch?

Interpret

Interpret or internalise the experience. What does this mean for me or us? What had the most impact? What did or did not make sense?

Generalise

Generalise the learning. What are the general principles from the experience? What are the main messages I should take from the experience?

Apply

How will I apply the learning from the experience? What actions will result? What are the opportunities for implementing the learning?

DIGA resource sheet

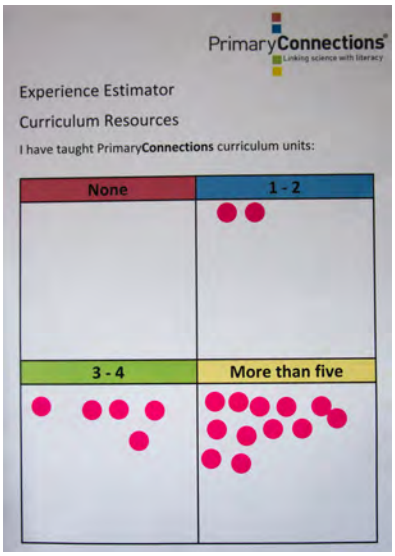
Experience estimator

Purpose

A tool to determine the level of experience individuals within groups have had with regard to the content of a program, presentation or workshop.

Process

- Display the experience estimator chart and self-adhesive dots on a wall near the entrance to the presentation or workshop room.
- Prior to the commencement of the presentation or workshop, ask participants to evaluate their experience by responding to the questions on the chart and placing self-adhesive dots in the most appropriate columns.
- During the introduction to the presentation or workshop, draw participants' attention to the pattern of the dots.
- Make evaluative comments about the pattern of the dots in terms of participants' experience.



Product

The experience estimator provides a group visual display of participants' judgments of their experience. It is valuable to you, as the facilitator, to tailor your presentation to the level of experience displayed on the chart. It is valuable to all participants to see the judgments of other participants and to be aware of the learning needs of others.

PrimaryConnections examples

- Have you attended any PrimaryConnections professional learning sessions before today? None, introduction, more than one, numerous?
- How many PrimaryConnections curriculum units have you taught? None, one, two-three, four-five?

Reference

Rostron, Louise (2008). PLF Recall Days. *Experience estimator*

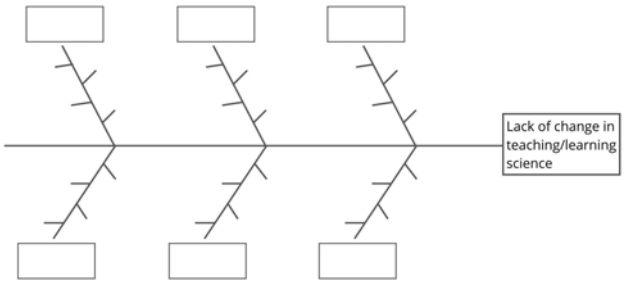
Fishbone diagram

Purpose

A cause and effect planning tool that helps to clarify the possible causes of an effect. This tool is often used when seeking to identify the root causes of a specific problem or issue.

Process

- Ask participants to consider a current problem, issue or effect.
- Draw a large bone fishbone diagram on a chart with a box at one end and a backbone from the box to the other end of the chart.
- Write a succinct description of the problem, issue or effect in the box at one end of the backbone.
- Brainstorm on separate sticky notes all the possible causes of the problem, issue or effect. Group these causes into like categories and give the category a brief description. These categories describe major causes of the effect.
- Draw side bones at an angle connecting them to the backbone. The number of side bones depends on the number of categories you have brainstormed. Draw a box at the end of each side bone and write the major cause description in the box. Six to eight side bones are usual.
- Arrange the sticky notes around each side bone, showing examples of minor causes contributing to the major cause.
- Identify the root causes of the problem, issue or effect. This could be done by collecting data or by the system knowledge of the participants. Multi-voting could be used to identify the root or most important causes.



Product

The fishbone diagram allows a group to analyse the possible causes of an effect, group them into major cause categories and identify the root causes. The chart provides a visual display from which next steps can be decided. Putting effort into improving the root causes of a problem, issue or effect often helps to resolve other issues as well.

PrimaryConnections examples

- Implementing the 5Es model poorly
- Problems associated with teaching and learning “sustainability” in primary school

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools*. Bone diagram

Five whys?

Purpose

A tool to engage participants in deep thinking about a topic.

Process

- Distribute the five whys resource sheet or ask participants to create one (see over).
- Participants write the 'Why?' question at the top of the sheet.
- Participants answer the question by writing their response underneath.
- Participants then ask 'Why?' of their response and write the second response.
- This process is repeated at least five times or until a 'root' understanding of the initial question is reached.
- Individual sheets may be shared, displayed or discussed.

An example of the five whys?

Why do we need to breathe air to stay alive?
Answer: To get oxygen into our lungs.

Why do we have to get oxygen into our lungs?
Answer: So that our lungs can pass the oxygen into our blood stream.

Why do our lungs need to pass oxygen into our blood stream?
Answer: So that all of our cells can be supplied with oxygen.

Why do all our cells need a supply of oxygen?
Answer: So that the oxygen can combine with the food that we eat to give us energy.

Why do we need energy?
Answer: We need energy to keep our bodies moving and living.

Product

The five whys? allows for deep individual reflection with a documented result.

PrimaryConnections examples

- Why is science important in the primary school?
- Why are science investigations important in primary science?
- Why is scientific literacy a high priority for all citizens?

References

Bicheno, John (1994). *The Quality 50: A Guide to Gurus, Tools, Wastes, Techniques & Systems.* Victoria: Nestadt.
Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

Five whys? (cont)

Question 1	**Why**
Answer 1	
Question 2	**Why**
Answer 2	
Question 3	**Why**
Answer 3	
Question 4	**Why**
Answer 4	
Question 5	**Why**
Answer 5	

Five whys? resource sheet

Force field analysis

Purpose

A tool for examining and recording the forces driving or preventing an improvement or change. Its use, as a first step, aims to reduce or remove preventing forces.

Process

- Draw a large chart with two columns headed with the topic to be examined.
- Label the columns with the terms 'driving' and 'preventing'.
- Through a brainstorm process ask participants to elicit all the forces driving the change and those preventing the change.
- When the force field is finished, the first priority is for participants to examine ways to reduce or remove the preventing forces.
- Participants prioritise these for action giving thought to which of the forces are the most powerful and therefore have the most influence.

Implementation of Primary**Connections** in our school	
Driving	**Preventing**

Product

The force field analysis provides a visual summary of the group's ideas of forces driving and preventing an improvement or desired change.

Primary**Connections** examples

- Implementing Primary**Connections** in our school.
- Promoting Primary**Connections** across our sector.
- Organising professional learning for our staff.
- Briefing parents about the Primary**Connections**.

References

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.
Kurt Lewin. See www.valuebasedmanagement.net/methods_lewin_force_field_analysis.html

Global café

Purpose

A semi-structured technique which enables participants to engage in several conversations on different but related pre-determined topics.

Process

- Decide on the number of cafés with each café focusing on one main concept or issue.
- Select participants to be café owners. Each café owner sets up a table with a label for the conversation focus and stays at that café.
- The café owner's role is to listen and record significant parts of conversations which take place among the patrons on the given issue.
- All other participants are free to visit each café and contribute to conversations with other patrons. As groups form and reform, the café owner may summarise previous conversation points to the new group.
- Allow a designated time for each of the conversations.
- Café owners report back to the whole group.

Product

The reports of the café owners provide a rich record of the ideas, questions and issues raised by participants as they pass through their cafés. The points made may be prioritised for further discussion, clarification and/or action.

PrimaryConnections examples

- Cafés focusing on the PrimaryConnections 5Es teaching and learning model.
- Cafés to help distinguish between the terms 'everyday literacies', 'literacies of science' and 'scientific literacy'.
- Cafés focused on the roles of director, manager and speaker in collaborative learning groups.

Reference

Country Area Program, NSW Department of Education and Training. See www.cap.nsw.edu.au

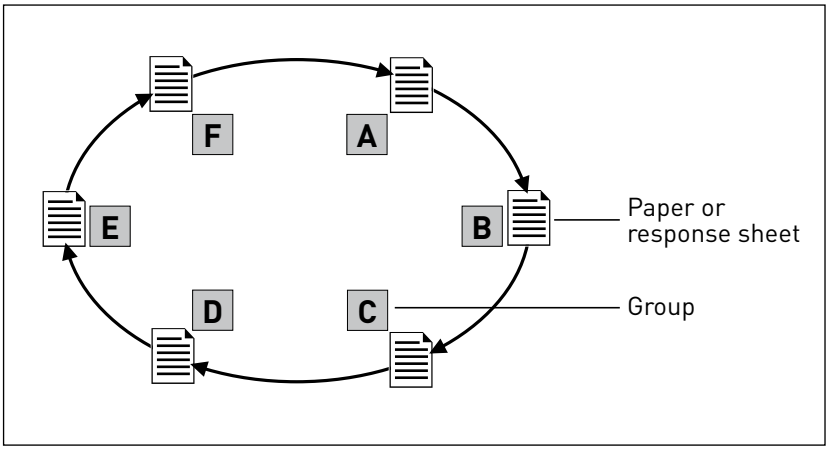
Hot potato

Purpose

A technique for participants to write responses to a demonstration, activity or question for sharing with other participants in the group.

Process

- Divide participants into four groups consisting of individuals, pairs or threes. Provide each group with a large sheet of paper.
- Each group records responses such as words, phrases, questions and diagrams to an observation or an issue.
- After a designated time each group passes the sheet clockwise to the next group.
- Participants read the responses on the sheet and add more ideas. If an idea is already recorded it does not need to be recorded again.
- Repeat this process until each group has the original sheet again.
- As a large group, share and clarify responses to the observations or issues.



Product

The hot potato technique provides records of participants' thinking, responses to an observation, phenomenon or issue and provides ideas for further discussion.

PrimaryConnections examples

- After observing a science phenomenon, record responses, thoughts and observations.
- Explore the purposes of formative assessment in the Primary**Connections** program.
- How might we introduce Primary**Connections** to our school?

Reference

Frangenheim, Eric (1998). *Reflections on Classroom Thinking Strategies.* Queensland: Roden Education Publishing.

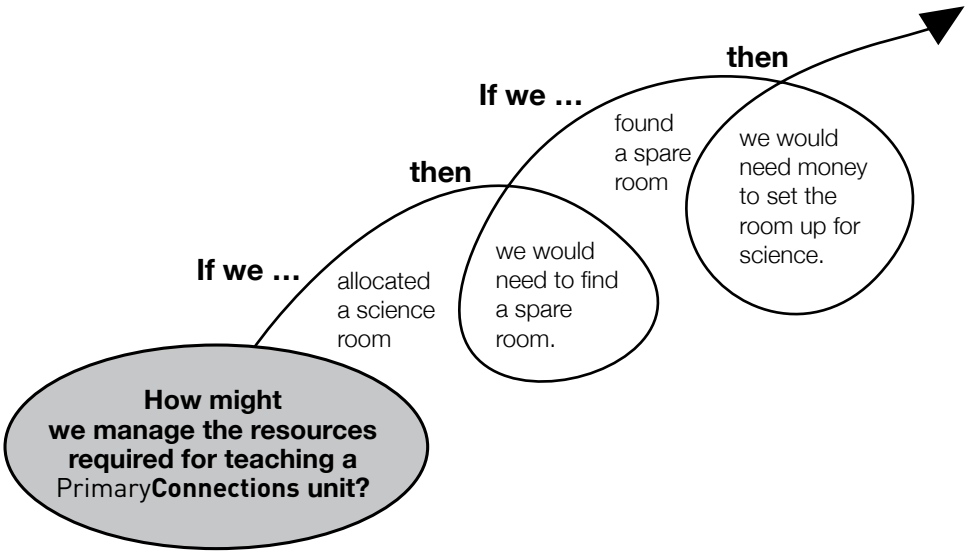
If ... then

Purpose

A tool for studying proposed actions and their consequences.

Process

- Prepare a large sheet of paper with the focus issue or question displayed in the middle.
- Participants brainstorm the first suggested action in response to the question by asking 'If we…'.
- Participants draw spiral arrow images from the centre and in each created circle write the consequence (or 'then') of the 'If we..?'.
- A number of different scenarios may be explored using these spirals.
- Comparisons of each action or consequence spiral may be made to help decide which plan would be the most effective.



Product

The 'If…then' chart captures multiple actions and their subsequent consequences on the same chart.

PrimaryConnections examples

- How might we manage the resources required for teaching a PrimaryConnections unit?
- How might we organise the students in a particular stage group for PrimaryConnections experiences?
- How do we prevent negative reaction to a new way of teaching science?

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools*. USA: Langford International Inc.

Inquiry walk

Purpose

A technique that helps teachers handle students' questions for inquiry and analyse the way the questions relate and contribute to the development of the key conceptual idea being studied. The technique uses the analogy of a bush-walking track heading towards a destination.

Process

- Elicit students' questions for inquiry. This is one of the focuses of the ENGAGE phase of the 5Es. The W column of the TWLH chart is a tool often used for this purpose. Other strategies for eliciting "what we **want** to know" might be used.
- Identify the key conceptual idea being studied and clearly display it on a chart.
- Set up some chairs to create a physical pathway (the bush track) with the destination (the key concept chart) at one end. Ensure there are gaps between the chairs for moving "off track."
- Write the students' questions on sticky notes.
- Ask participants to physically walk the track and place the question on the track or off the track depending on how closely it is related to or contributes to understanding the key conceptual idea. Teachers will have an understanding of the entire unit and will assist students with the placement of their questions on or off the track.

For example, when studying light, the key conceptual idea (ACSSU080) is:

Light from a source forms shadows and can be absorbed, reflected and refracted.

Possible questions might be:

Can we bend light? (ON TRACK)

What happens to light in my eyes? (OFF TRACK A LITTLE)

What does colour-blind mean? (OFF TRACK FURTHER)

Why do zebras have stripes? (FAR OFF TRACK)

- Ask participants to decide which of these questions they will investigate and why. This will depend on time and student interest. Be aware that students' questions can be highly motivating for inquiry.
- Explain that for any question "off track" that is turned into a student inquiry, the following is required:

1. Opportunities to explore and explain including representing understanding
2. Discussion about how the question is related to the key concept and contributes to its understanding
3. A clear pathway back to the main track to continue the journey

Inquiry walk (cont)

Product

The **inquiry walk** is an engaging role-play that helps teachers and students decide which student questions they wish to investigate. They analyse how the questions relate to and contribute to the key conceptual idea and discuss the EXPLORE and EXPLAIN activities required for the inquiry.

PrimaryConnections examples

Any example of students' questions from any curriculum unit can be analysed using the inquiry walk.

Reference

Rostron, Louise: PrimaryConnections Professional Learning Consultant (2015)

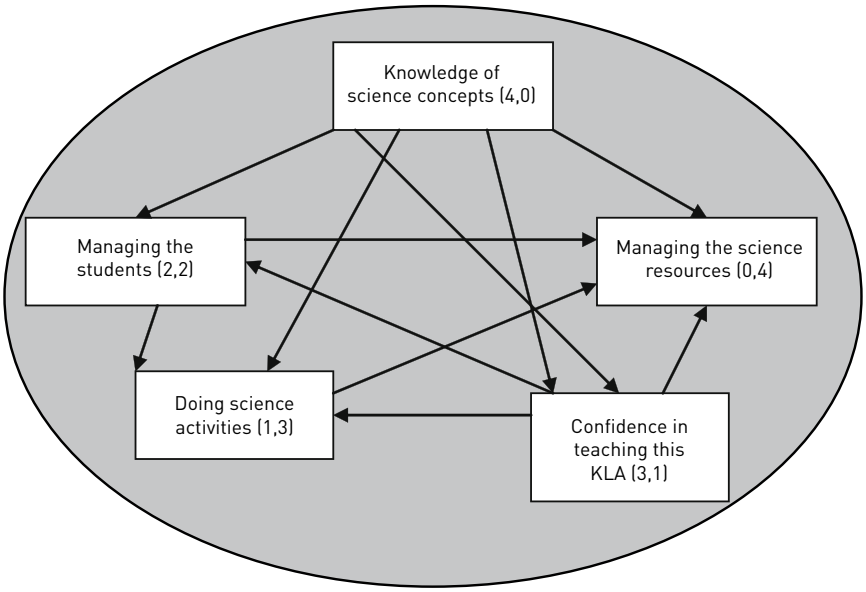
Interrelationship digraph

Purpose

A tool for examining the cause and effect relationship between different factors. It is used to determine which factors have the most impact on other factors. This helps to identify where the effort can be focused to gain greatest benefit. The word digraph means a 'graph between two'.

Process

- Write on a chart or whiteboard the factors you wish to study and arrange them in a large circle.
- Systematically study the relationship between each pair of factors by asking the following questions and receiving responses from participants.
  1. Does a relationship exist? If so, draw a line connecting the two factors.
  2. Which affects the other the most? Put an arrow on the end of the line which points to the affected factor. You cannot use a two-headed arrow. A decision must be made as to which factor affects which the most.
- Continue around the circle until all pairs have been studied.
- For each factor, count the number of arrows out and the number of arrows in and place the numbers in parentheses; for example, (3, 1) indicates 3 arrows out and 1 arrow in.
- Rank the factors in order of the highest number of out arrows. These factors have the most impact on, and influence, over the other factors.



(Continued over)

Interrelationship digraph (cont)

Product

The interrelationship digraph is a visual display of related factors with the highest impact factors being clearly identified. The example illustrated (see previous page) shows some of the typical concerns primary teachers have in teaching and learning science.

The result of this interrelationship digraph shows that 'knowledge of science concepts' is the factor which affects the other factors the most (it has the most out arrows). By addressing this issue there is an automatic flow-on effect to the other issues of concern. It clearly shows where effort needs to be focused.

PrimaryConnections examples

- The main concerns primary teachers have about the teaching and learning of science.
- The factors affecting learning of science in primary classrooms.
- The actions required to improve the effectiveness of the teaching and learning of science at this school.

References

Bicheno, John (1994). *The Quality 50: A Guide to Gurus, Tools, Wastes, Techniques & Systems.* Victoria: Nestadt.
GOAL/QPC (1994). *The Memory Jogger II, A Pocket Guide of Tools For Continuous Improvement and Effective Planning.*
Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

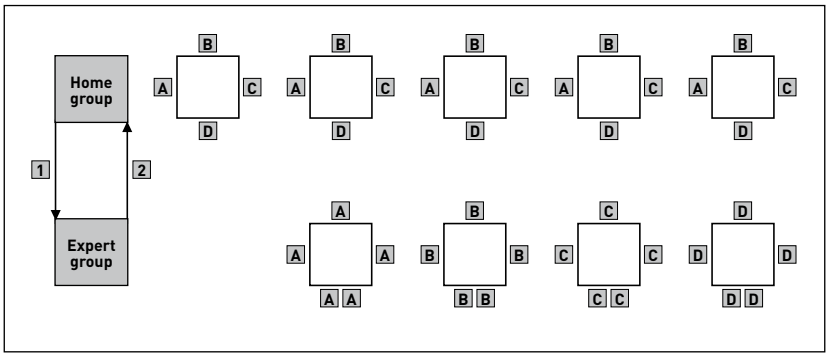
Jigsaw

Purpose

A collaborative learning technique involving the use of 'home' groups and 'expert' groups to share responsibility for learning.

Process

- Decide on the broad topic and the number of smaller aspects to be learnt.
- Set up several home groups, the size of which is equal to the number of aspects to be learnt.
- Assign the numbers 1, 2, 3, 4 and so on to each participant.
- Invite like-numbered participants to form expert groups to learn about one smaller aspect of the whole topic. Experts discuss and record ideas about their aspect of the topic.
- Participants from the expert groups return to their home groups to teach about their aspect.
- Keep a record of the learning during the teaching phase to facilitate the process.



Product

The jigsaw enables a broad topic to be broken down so that participants become expert in a part of the topic. The experts teach others about their aspect of the topic, which contributes to the learning of the home group.

PrimaryConnections examples

- Learn about the literacy focuses, assessment practices or activities in one of the 5Es phases of a curriculum unit.
- Learn about the Science Inquiry Skills (SIS): Questioning and predicting; Planning and conducting; Processing and analysing data and information; Evaluating; Communicating
- Examine various aspects of the teacher background information in a curriculum unit.

Reference

Aronson, E. (1978). *The Jigsaw Classroom.* Beverly Hills: Sage Publications.

Learning scale

Purpose

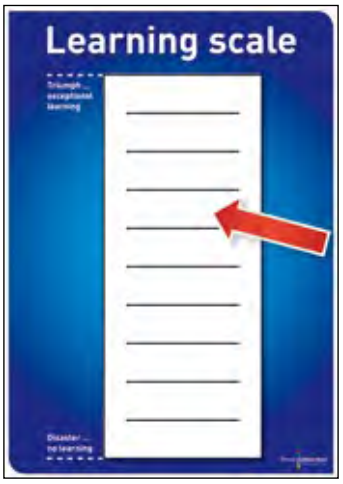
A tool to enable participants to focus on determining the level to which the issues, suggestions or solutions being discussed contribute to learning.

Process

- Pre-prepare a scale on a large sheet of paper with titles at the two extremes. Make sure the scale is displayed with even increments.

  Title 1: Triumph ... exceptional learning
  Title 2: Disaster ... no learning

- Make an arrow from contrasting cardboard with blu-tack on the back to enable easy movement and placement on the scale.
- Display the learning scale on a convenient wall or board within view of all participants.
- When appropriate, ask participants to evaluate and estimate where the current suggestion or solution should be placed on the learning scale.



Product

The learning scale provides a simple but powerful way of focusing attention on the issues, suggestions and solutions of the current discussion in terms of their contribution to learning. It assists the facilitator to keep participants "on track" if they have strayed from the purpose of the session or to periodically evaluate the content of the learning session.

PrimaryConnections examples

Use the scale when discussing issues, suggestions or solutions to:

- using PrimaryConnections with multi-age classes
- planning the scope and sequence of using PrimaryConnections across a year level
- implementing the PrimaryConnections 5Es teaching and learning model
- using the Science Background resource.

Reference

Rostron, Louise (2012). Workshop: *PrimaryConnections, the Australian Curricum: Science and student achievement*

Loss function

Purpose

A tool that measures the loss of performance from a target or standard. It helps groups to create a visual representation when setting targets or standards for factors associated with quality of services or products. In Primary**Connections**, it is very useful when examining time targets or standards.

Process

- Explain to the group that they will participate in a process to determine an agreed time to successfully complete something - such as a series of lessons over the period of a school term in order for students to learn the Australian Curriculum: Science Science Understandings (ACSSU) using an inquiry process. For example, the time to complete a Primary**Connections** curriculum unit.
- Each participant collects three sticky notes of different colours, for example, green, orange and yellow. The notes will be used in the following way:
  - Yellow: optimal time
  - Orange: not enough time (too low)
  - Green: too much time (too high)
- Ask participants, without discussion, to record the number of hours per term (within ½ hour increments) that they consider to be the optimum or most likely time required to complete a typical unit of work; the number of hours that would be too low; the number of hours that would be too high.
- Create a column graph of all the yellow stickers (optimal time) on a large chart or wall. Add the orange notes (too low) to the graph, overlapping with yellow notes but allowing some colour of both notes to show. Add the green notes (too high) in the same manner until all notes are placed on the graph.
- Create a horizontal table at the bottom of the graph with three rows to record the losses from the optimum.
- Begin with the orange stickers and locate the column from the centre where the first overlapping yellow and orange stickers occur. This is the point at which there is general agreement from the audience that below this amount is “too low”. The column with the first overlapping yellow and green is the “too high” point.
- Move to the far right column of the graph, and cumulatively count the number of orange stickers in all columns moving to the left. Record the number under each column. These numbers will increase from right to left.
- Repeat this whole counting procedure but this time starting from the far left column, and cumulatively count the green stickers in all columns moving to the right. Record the number under each column. These numbers will increase from left to right.
- Finally add the two numbers in each row for each column and write this number at the bottom of each column of the graph.

Loss function (cont)

- Look along the final row of numbers and locate the lowest number. If there are two numbers the same use the number on the right to break the tie.
- Locate the number of hours on the scale of the graph corresponding to the lowest number from the counting analysis in the rows below the graph. This is the number of hours that is the best consensus from the group. It is the number of hours that the least number of participants would be unhappy with and the number that most participants can accept as being the target time.

Product

The loss function allows a group to analyse the optimum target or standard for something.

In this case it is the agreed time required to complete a unit of work such that students have the time necessary to learn, through an inquiry process, the required Science Understanding for the term.

It allows every person's viewpoint to be taken into account and provides a compelling visual display of the group's analysis. The result of the loss function can then be used to make informed decisions about the number of hours required for science across the period of a typical school term.

PrimaryConnections examples

- The time required to complete a typical PrimaryConnections curriculum unit of work across a school term.
- The time required as a block for a science lesson.
- Challenging assumptions about the time (or lack of time) required for science in the primary curriculum

Reference

Langford, David (2003). Tool Time: Choosing and Implementing Quality Improvement Tools. *Loss function* Taguchi. http://en.wikipedia.org/wiki/Taguchi_loss_function

Mind map

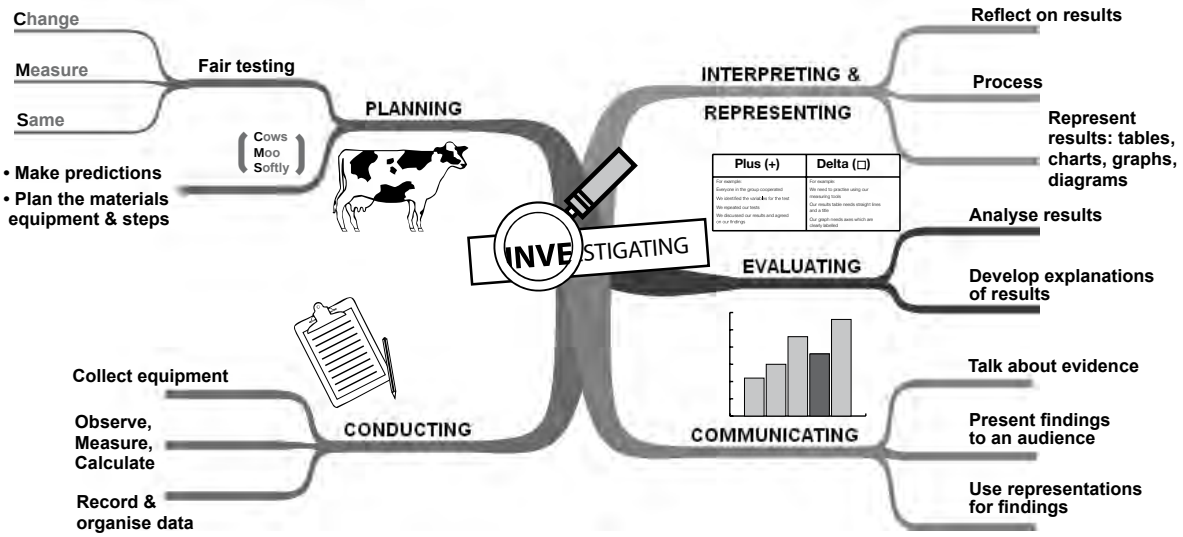
Purpose

A visual representation tool which identifies the links between different concepts and topics.

Process

- Distribute a large piece of paper to each participant.
- Assign the broad topic for mind mapping and ask participants to record this as a large image in the centre of the page.
- Ask participants to generate ideas about the topic and record these in words or images in a manner which makes sense to them using lines to connect ideas. The thickest lines stem from the main image and become thinner as the mind map expands. Branches are created and connected as thinking progresses.
- Ask participants to share their mind maps so that others can read them.

Mind map of investigating in Primary**Connections**



Product

The mind map captures a visual interpretation of thinking about a particular topic. There is no correct way to make a mind map; only maps which make sense to the author. They help to generate questions and reveal misconceptions about a topic as well as deepening accurate understanding.

Primary**Connections** example

- Draw mind maps of Primary**Connections**, the investigation process, literacies of science and the Primary**Connections** 5Es teaching and learning model.

Reference

Tony Buzan. See www.buzanworld.com

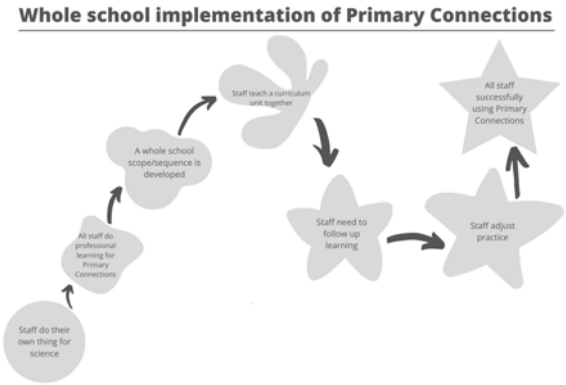
Morphing

Purpose

A tool to map the transformation of an idea, a project, a current situation or an event over time. The tool reinforces that change is a process rather than an event.

Process

- Ask participants to consider a topic or scenario and two situations:
  - The current situation
  - The desired situation
- Briefly describe the current situation and place the description in a morphing symbol, a shape to begin the process, at the bottom of a large chart.
- Briefly describe the desired situation and place the description in a morphing symbol, a completely different shape to end the process, at the top of a large chart.
- Discuss the intermediate steps required to reach the desired situation and briefly describe each step. Fewer steps mean a more abrupt change and more steps mean a more incremental change.
- Create the morphing symbols for the intermediate steps, each symbol being a modification of the previous step. Place the intermediate descriptions in these morphing symbols as they gradually morph into the new shape.
- Decide when to begin the first morphing step and acknowledge that additional steps may be added at any stage through the morphing process.



Product

The morphing tool provides a group visual display of participants' judgments of the steps required to change from a current situation to a desired situation.

PrimaryConnections examples

- Whole school implementation of PrimaryConnections
- Writing a scope and sequence for science across the school
- Teachers' understanding of the PrimaryConnections program

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools. Morphing*

P3T
(Paper, Passing, Purpose Tool)

Purpose

A group technique for producing a succinct statement on an issue.

Process

- Divide the participants into small groups.
- Distribute a sheet of paper to each participant.
- Allow each participant 5–10 minutes to write a statement about the issue under consideration. No names are required on the sheets.
- Ask participants to pass their statements anticlockwise. Each participant then reads the statement and underlines significant words or phrases. This is done without discussion.
- This process is repeated until each participant has read every statement and underlined key words and phrases. Some words and phrases may be underlined several times.
- A recorder then writes all underlined words and phrases on a flip chart, whiteboard or large sheet of paper, prioritising the words and phrases as shown by the number of underlines.
- The small group then creates a statement that all participants agree on.
- A consensogram could be used to confirm the level of agreement.

Product

The product of this process is a clear, agreed statement created through a shared process.

PrimaryConnections examples

- Create a purpose statement for the implementation of PrimaryConnections in your school.
- What is the purpose of an Indigenous perspective in science education?

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

Parking lot

Purpose

A tool for group use where participants can 'park' self-adhesive notes to highlight what is going well, what needs to be improved, questions and ideas, for review at a later time.

Process

- Prepare a large sheet of paper or chart and divide it into quadrants.
- Label each quadrant with a heading such as:
  - What is going well?
  - What are the questions?
  - What can be improved?
  - What are the ideas or issues?
- Provide the participants with self-adhesive notes for 'parking' suggestions, issues, ideas and questions at any time during the session.
- Set aside an appropriate amount of time to review and address the issues on the notes.

Product

The parking lot captures participants' issues, ideas, reflections and questions when they arise. It provides the facilitator a visual display of issues to be dealt with at some stage during the workshop.

PrimaryConnections examples

- Set up a parking lot at every session to capture participant responses.
- Set up a parking lot in your classroom. Teach and encourage students to use it.

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

Plus/delta

Purpose

A reflection tool used after an event to determine the strengths of a situation or application, and opportunities for change.

Process

- Distribute a plus/delta chart to individuals or small groups.
- Invite participants to analyse an activity or process in which they have been involved and record what went well (plus/+) and what needs to be changed or improved (delta/Δ).
- Ask participants to vote on the most important factors that need to be changed to improve the activity or process.

Product

The plus/delta chart is a visual analysis of opinions about the quality of an activity or process and focuses attention on what needs to be improved.

Plus (+) **What went well?**	**Delta (Δ)** **What could be changed or improved?**
• Everyone in the group cooperated. • We identified the variables for the test. • We repeated our tests. • We discussed our results and agreed on our findings.	• We need to practise using our measuring tools. • Our results table needs straight lines and a title. • Our graph needs axes which are clearly labelled.

PrimaryConnections examples

- After conducting a science investigation invite students to complete a plus/delta chart to identify improvements that might be made to the design of the investigation.
- Ask participants in a professional learning workshop to complete a plus/delta chart to provide feedback to the workshop facilitator.

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

Prioritiser

Purpose

An analytical tool for identifying and prioritising a list of items such as: needs, actions or responsibilities.

Process

Participants work in small groups to:

- Identify a process for analysis.
- Determine the requirements for the process to be effectively carried out.
- Rate the importance of each requirement on a scale of 1–10 (1 being low importance).
- Rate the current level of performance of each requirement on a scale of 1–10 (1 being low performance).
- Compare the two ratings and identify the opportunities for improvement by examining the gaps between importance and performance.
- Decide which requirements need priority action (those with high importance and low performance ratings are a good place to start).

Example: Conducting a one-day professional learning module

Requirements	Importance (1–10)	Current performance (1–10)	Gap (+/–)	Opportunity for improvement
Principal support	10	7	–	Require full principal support
All staff present	10	4	–	Identify reasons for staff absence
Identification of suitable date	8	10	+	No problem with finding a date
Commitment from staff to participate in the workshop	10	6	–	Identify reasons
Identification of facilitator	9	10	+	Suitable facilitator is available
Resources for workshop	9	9	Neutral	We have the resources
Staff member to coordinate the day	8	7	–	Usually have someone to coordinate
Space for workshop	6	10	+	No problem

Prioritiser (cont)

Product

The prioritiser results in a chart with an analysis of process effectiveness and enables participants to identify opportunities for improving the process.

Primary**Connections examples**

- Conducting a one-day professional learning module.
- Developing and managing the resources for a Primary**Connections** curriculum unit.
- Implementing Primary**Connections** across a year level.
- Preparing for teaching a Primary**Connections** curriculum unit.

References

GOAL/QPC (1994). *The Memory Jogger II, A Pocket Guide of Tools For Continuous Improvement and Effective Planning.*
Tague, Nancy R. (2005). *The Quality Toolbox. 2nd Edition.* Wisconsin: ASQ Quality Press.

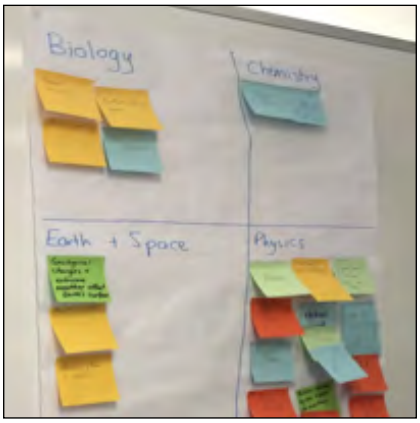
Quadrant chart

Purpose

A tool that assists individuals to analyse their preferences when there are four separate choices available to them.

Process

- Prepare a chart with four distinct quadrants and place appropriate headings at the top of each quadrant.
- Distribute sticky notes and pens.
- Explain the four headings. Pose a question or suggest an issue to which participants can respond.
- Collect the responses and place them in the appropriate quadrants.
- Discuss the spread, detail and pattern of the responses.



Product

The **quadrant chart** provides the group with a visual display of their individual responses to a question or issue. It provides a sound basis for discussing the responses openly and accurately according to the spread of responses.

PrimaryConnections examples

- **Quadrant headings:** Biological sciences; Chemical sciences; Earth and space sciences; Physical sciences.
  Question: When analysing the primary (F–6) Science Understandings across the Australian Curriculum:Science, which concepts are you least confident in teaching?
- **Quadrant headings:** Volunteer; Whinger; Survivor; Prisoner
  Question: When thinking about the teaching of science and literacy in the primary school, in which reaction mode are you most likely to be situated?

References

Rostron, Louise (2015). Workshop: PrimaryConnections Teaching inquiry science: The next steps

Quadrant conversations

Purpose

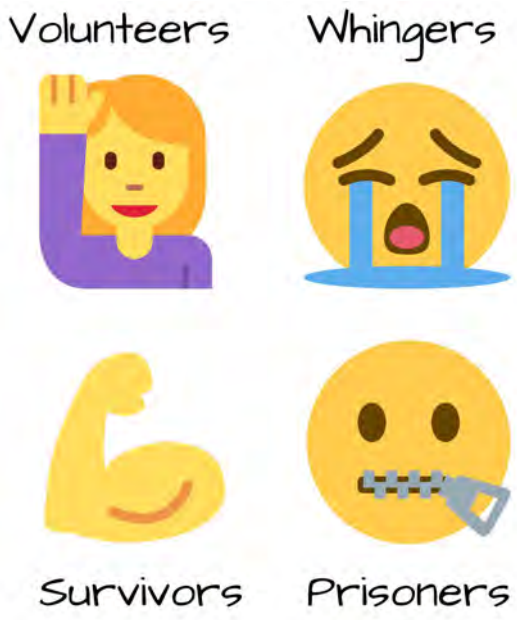
A group technique where participants adopt a specific role to examine an issue from different viewpoints.

Process

- Divide the group into pairs and assign each pair a particular role for the quadrant.
- Allow some time for groups to prepare questions, statements and comments for their role in response to a focus question or statement.
- Ask participants to stand at the corners of an imaginary square.
- Invite participants to hold conversations across the quadrant remaining in their allocated roles as they do so.

Product

There is no written record for this technique but rather an embodied experience in exploring an issue by assuming a designated role.



PrimaryConnections examples of focus questions

- How do you feel about implementing PrimaryConnections at our school?
- How can we organise PrimaryConnections professional learning for our staff?
- What are the cost/benefit implications for using PrimaryConnections?

Reference

Evans, J. (2000). *Leaders in Australia, The Australian Cultural Imprint for Leadership.* Victoria: Cultural Imprint Pty Ltd.

Quality matrix

Purpose

A tool for self-assessing a piece of work and seeking improvements towards creating a high quality product.

Process

- Ask participants to create an example of a "literacy of science", for example, a labelled diagram.
- Think about the features of a high-quality product by examining a high quality example.
- Using the quality matrix, list the features in the left hand column and the characteristics of a high quality product in the middle column.
- Elicit opportunities for improving the quality of the original "literacy of science" and record them in the final column.
- Adjust the "literacy of science".

Representation: *Bar graph*

Features	Characteristics of a high-quality bar graph	Opportunity for improvement
Title	Clear and accurate	*Write in a straight line* *Check spelling*
Horizontal axis	Straight line Clear label Regular increments Units of measurement	*Write label clearly* *Measure the increment spaces*
Vertical axis	Straight line Clear label Regular increments Units of measurement	
Bars	All the same width Same space apart from each other	

Product

The **quality matrix** provides individuals with a tool for self-assessing a "literacy of science" and improving its quality.

Primary**Connections** examples

- Improve the quality of any "literacy of science" developed in Primary**Connections**

References

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools*. USA: Langford International Inc.

Rostron, Louise (2008). Workshop: Primary**Connections** Introductory workshop

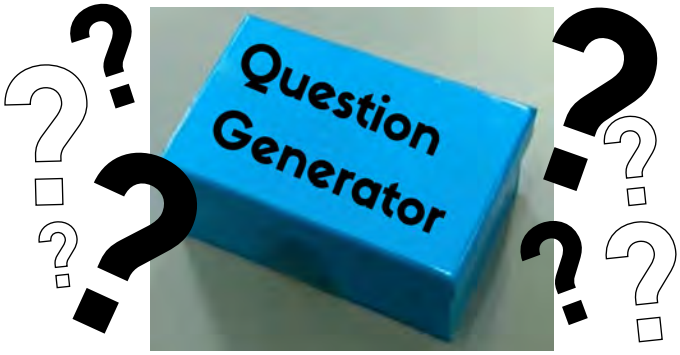
Question generator

Purpose

A technique for generating meaningful questions with anonymity.

Process

- Explain the question generator's process and purpose.
- Participants form pairs and discuss questions they would like answered.
- Each participant writes a question(s) generated by their partner on a sheet of paper and place it in the question box.
- The whole group reforms and the question sheets are distributed randomly around the room.
- Allocate time for asking and answering the questions. Anonymity is assured as the person asking the question is not the generator.
- Explain that any questions not addressed publicly will be answered by the facilitator in writing and the answers distributed to all participants after the workshop session.



Product

The question generator technique provides a written record of all questions from the group. It avoids the usual silence when a facilitator asks for questions at the end of a workshop and enables participants to fully participate in the learning process.

PrimaryConnections example

- This technique can be used at any learning session. If time is limited, the generation phase can be completed with follow-up by the facilitator in writing.

Reference

The Question Generator process is a product of Leadership Australia.

Radar chart

Purpose

A radar chart is a tool to enable participants to analyse parts of a system, by plotting data points on a circular chart and to see the relationship of those parts to the whole system. This Time radar chart is specifically designed to enable participants to analyse the ways time is used during a typical school week in a primary school. It helps participants to evaluate the degree of "prescription" and/or "flexibility" of each time sector.

Process

1. Pre-prepare a chart on a large sheet of paper:
2. Begin with a circle with a dot at the centre.
3. Label the centre of the circle "P" for "Prescriptive". Label the edge of the circle "F' for "Flexible".
4. Estimate the number of hours available in a week in your school. Typically it will be between 22-25 hours.
5. Calculate the number of degrees in the circle to which one hour corresponds.
   For example, for a 22 hour week:

   360 degrees in 1 circle
   22 hours = 360 degrees
   1 hour = 360/22
   1 hour = 16.4 degrees

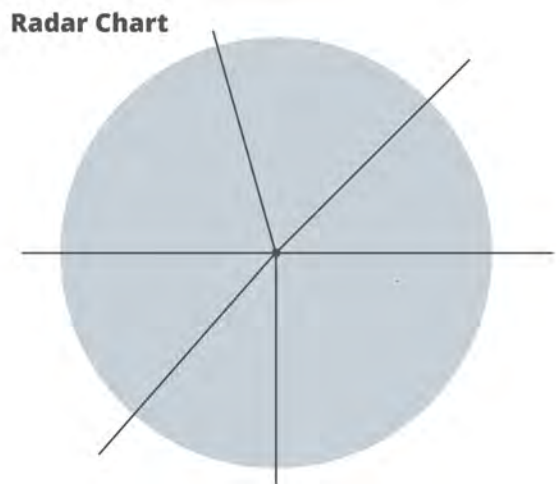
   For 25 hours:
   360 degrees in 1 circle
   25 hours = 360 degrees
   1 hour = 360/25
   1 hour = 14.4 degrees
6. Determine the major ways time is used in one week, calculate the degrees and create a sector, using a protractor, in the chart. Label one of the lines with a title.

   For example, for a 22 hour week:
   5 hours per week spent on Literacy = 5 X 16.4
   The sector would be 82 degrees

   For example, for a 25 hour week:
   5 hours per week spent on Literacy = 5 X 14.4
   The sector would be 72 degrees

Radar chart (cont)

7. Continue dividing the circle into sectors until all the hours in the week are allocated and labelled.
8. If you have a number of short time segments, they can be united into a category called "Other".
9. Evaluate the degree of prescription of flexibility of each time segment and mark the labelled line from the centre of the circle accordingly.
10. Join the marks to form a visual representation of prescription/flexibility.



Product

The PF Radar chart provides a comprehensive visual display of participants' analysis of the ways time is allocated in a typical school week, including the degree of prescription and/or flexibility of the time segments.

PrimaryConnections examples

- Use the PF Radar chart to analyse time spent in a typical school week.
- Use the PF Radar chart to analyse time spent in a typical school term.
- Use the PF Radar chart to analyse time spent in a typical school day.
- **Alternative:** The radar chart can be used to examine sections of a school curriculum or syllabus where the elements of the curriculum are divided up, read and analysed for the amount of prescription or flexibility.

Reference

Rostron, Louise (2015). Workshop: *VIC PMSS Program*

Stay and stray

Purpose

A technique for participants to share a variety of conversations on a focus issue in a structured and efficient way. The purpose is to enhance understanding of a topic or an issue through talking with others who have had a shared experience.

Process

- Pre-determine the focus of the conversations and the number required.
- Assign the letters A (anticlockwise), B (be still), C (clockwise) to each group participant.
- Form a large circle with the groups in small circles.
- Invite each group to discuss the given topic for a designated time. Once the time has elapsed two participants from each group move on to another group.
- After a designated time new groups are formed by person A moving anticlockwise, person B staying in the same place and person C moving clockwise.

  (Alternatively, for smaller numbers of participants, the groups can be pairs. One person stays put and the other person moves in a clockwise direction.)
- The newly formed groups discuss the given topic.
- Repeat the process a number of times.

Product

The product from the various conversations is a much deeper understanding from shared ideas than any one group or individual could generate alone.

Stay and stray (cont)

PrimaryConnections example

Process example: Application of the 5Es to a science concept After viewing a particular science phenomenon (on the Science Background Resource), for example, the Moon revolving around the Earth, the participants form sub-groups of three and hold conversations about the following:	
Conversation 1:	How might you *Explore* this phenomenon with students? What hands-on activities could you employ?
Conversation 2:	What science *Explanations* and vocabulary need to be developed? What might you need to find out to support students with accurate science explanations? How might students represent their understanding?
Conversation 3:	What science investigation/s could be conducted at the *Elaborate* phase? How could this knowledge be applied and represented in a new context?
Conversation 4:	What evidence do you require to *Evaluate* the learning? How might students represent their understanding? What sorts of evaluation activities could be used?

Reference

Country Area Program, NSW Department of Education and Training.
See www.cap.nsw.edu.au/QI/TOOLS/stuv/stayandstray.htm

SWOT analysis

Purpose

A tool enabling people to think about and analyse the advantages and disadvantages of a solution to a problem or a potential decision. It is an excellent tool for comparing a number of different scenarios. Strengths and Weaknesses are often examined from an internal perspective; Opportunities and Threats are often examined from an external perspective.

Process

- Ask participants to describe the solution or potential decision to be analysed.
- Brainstorm the elements of the SWOT chart:

SWOT Chart

Strengths	**Weaknesses**
Opportunities	**Threats**

Product

A SWOT Analysis enables people to make better decisions about an action, a solution to a problem or a decision to be taken.

PrimaryConnections examples

- Conduct a SWOT analysis on the solutions for delivering science to multi-age classes.
- Conduct a SWOT analysis on the ways science resources are managed.
- Conduct a SWOT analysis on the professional learning solutions for effectively teaching science and literacy.

Reference

Attribution for this tool is obscure.

Systems mapping

Purpose

A tool that enables people to think about and describe all the necessary elements of a an identified system. System mapping is an effective tool to analyse the current state of a system and is an essential step prior to examining ways to improve the system.

Process

- Ask participants to think of the system to be analysed.
- Invite them to complete notes to describe all of the elements of the system using the system map template.
- As they complete the template explain that the thinking that contributes to the description assists in identifying parts of the system that might not be working well.
- Participants create “a map” of their system and explain it to others not familiar with their system to make meaning of it.
- The following system map outlines the questions to be considered and analysed in order to describe the system of “Delivering the science program in a primary school”.

Product

System mapping results in a complete, recorded description of an identified system. The creation of the system map follows thinking about the ways the parts of the system connect and work together to achieve a result.

PrimaryConnections examples

- Describe the system of delivering the science curriculum in your school.
- Describe the system of managing science resources.
- Describe the system of allocating time for delivering the science curriculum.

Reference

Langford, David (2003). Tool Time: Choosing and Implementing Quality Improvement Tools Quality Learning Australia

Systems mapping (cont)

Delivering the science program in my school

	*What is the **PURPOSE** (aim or mission) of the science program in my school?*	
	*What is the **VISION** (image of the desired future state) for the science program in my school?*	
	*What are the **VALUES** (qualities to which we aspire in behaviour and relationships) when delivering the science program in my school?*	
*Who are the **SUPPLIERS** (individuals and organisations who provide inputs) to the science program in my school?*	*What are the **CRITICAL SUCCESS FACTORS** (things the school must get right for survival and success of the science program)?*	*Who are the **CLIENTS** (recipients and beneficiaries of the products and services) of the science program in my school?*
	*What are the **RESULT MEASURES** (indicators of success) for the science program in my school?*	
*What are the **INPUTS** (external resources) required by the school for the science program*		*What are the **OUTPUTS** (tangible deliverables) and OUTCOMES (benefits to clients and stakeholders) from the activities of the science program in my school?*
	*What are the **PROCESSES** (sequences of actions) that enable the school science program to achieve its purpose*	
*Who are the **OTHER STAKEHOLDERS** (those not already listed with a vested interest in the success) of the science program in my school?*		
	*How is **FEEDBACK** (information about the system of delivering the science program in my school) used to improve processes and performance?*	

Systems modelling

Purpose

A visualisation and modelling technique that assists in the analysis of any system by examining and evaluating the parts that make up the system, the way they are connected and work together to achieve an outcome.

Process

- Ask participants to think of the system to be analysed.
- Invite them to choose multiple lids of different size, shape and colour to create a visual display of the system.
- Explain that the lids can be used to represent any parts of the system from places, to processes, to people, to organisational structure.
- Participants create “a picture” of their system and explain it to others not familiar with their system to make meaning of it. A labelled diagram of the display is optional.

Product

System modelling results in a visual display of an identified system using everyday objects such as lids. The creating of the model follows thinking about and visualizing the ways the parts of the system connect and work together to achieve a result.

PrimaryConnections examples

- Visualise the system of delivering the science curriculum in your school.
- Create a model to represent the way science resources are managed.
- Create a model to represent the system of setting up collaborative learning teams.

Reference

Dr Peter Rennie, Leadership Australia

Talking partners

Purpose

A technique used to ensure effective conversations between pairs of participants.

Process

- Participants identify a talking partner with whom they will share a number of conversations throughout the learning session.
- When advised, participants talk about the meaning of a specified issue with their partner.
- Participants are to follow the rules of meaning making:
  1. Suspend judgement.
  2. Ask questions to clarify meaning.
  3. Listen attentively.
  4. Avoid jumping to conclusions.
  5. Let the conversation take its own course.
  6. Avoid getting into a debate or argument.
  7. Be open to others' opinions.

Product

There is no published product from this technique but it does produce better informed participants with heightened understanding about an issue.

Primary**Connections** examples

- What are the purposes of assessment in the primary classroom?
- Why is scientific literacy a high priority for all citizens?
- How is science linked with literacy in Primary**Connections**?

Reference

Senge, Peter (1990). *The Fifth Discipline: The Art and Practice of the Learning Organisation.* New York: Doubleday.

Thinkers keys

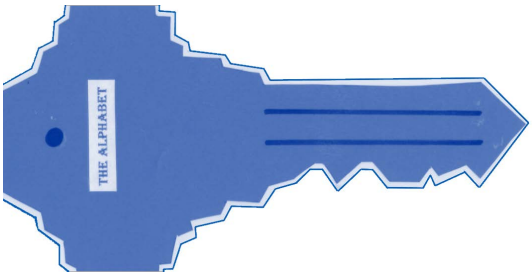
Purpose

A technique to foster innovative, creative and lateral thinking skills.

Process

- Study the table listing the 20 Thinkers keys tasks (see over).
- Apply appropriate Thinkers keys strategies to a particular unit, concept or theme.
- Participants choose, or are allocated, a key and may work individually or in teams to complete the thinking task.

Optional: Make large, laminated cardboard keys with the key title displayed on each (see template on page 42).



Product

The Thinkers keys provide a set of 20 different strategies, which can be applied to a concept, theme or topic, to assist learners to generate ideas and thinking.

For example, the alphabet key can be used as an *Evaluate* activity where students create a list of words or ideas from A to Z about a particular concept or topic to show what they have learnt.

References

Tony Ryan's Thinkers Keys. See **www.thinkerskeys.com/cms/files/PDF's/Thinkers_Keys_all.pdf**
Country Area Program, NSW Department of Education and Training.
See **www.cap.nsw.edu.au/QI/TOOLS/stuv/thinkerskeys.htm**

(Continued over)

Thinkers keys (cont)

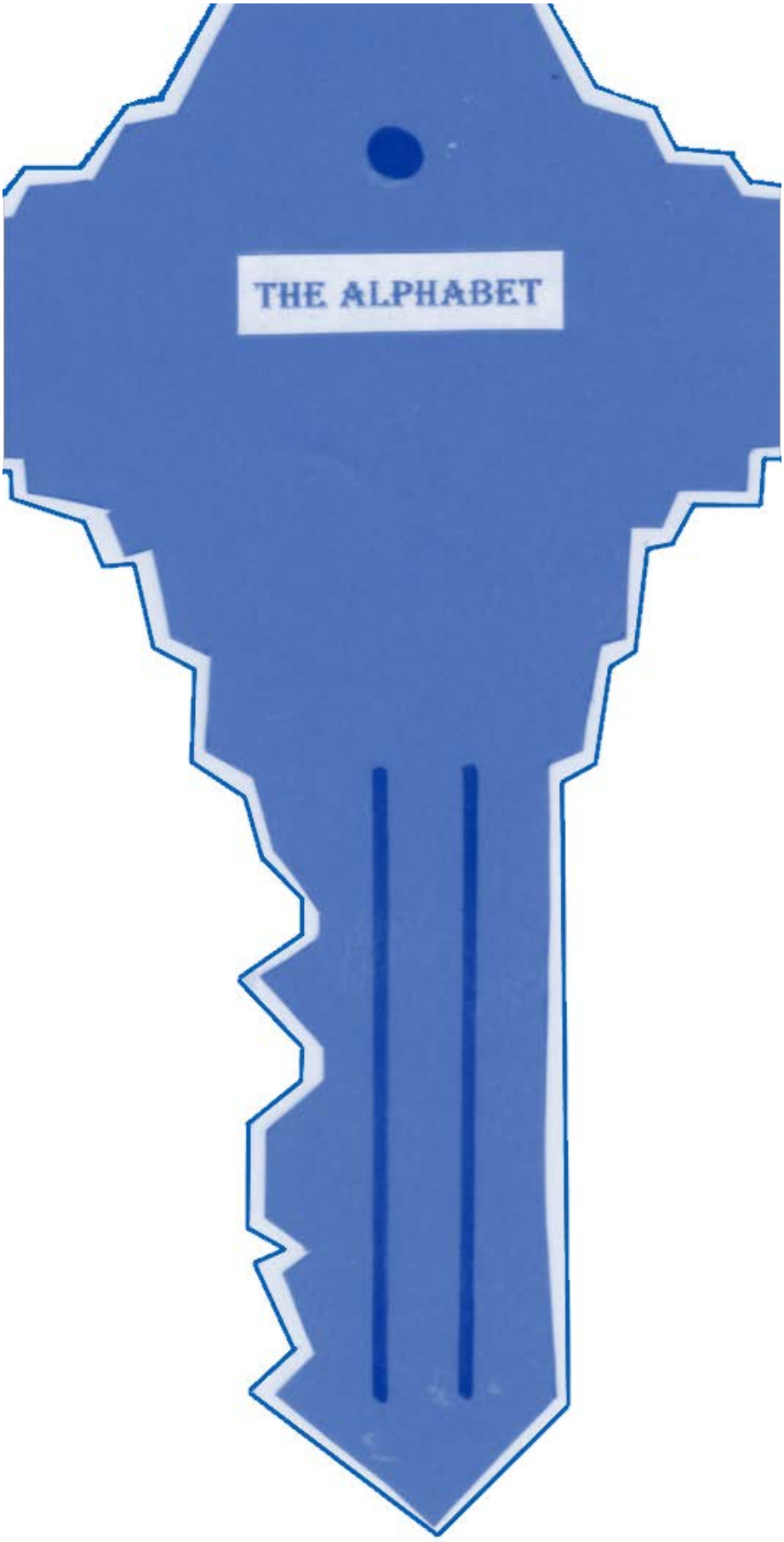
The Reverse Place words such as **cannot, never** and **not** in sentences which are commonly displayed in a listing format. For example, name 10 things which do **not** make a noise.	**The Disadvantages** Choose an object or a practice and list a number of its disadvantages. Then list some ways of correcting, or eliminating, these disadvantages.	**The Combination** List the attributes of two dissimilar objects, then combine the attributes into a single object.	**The What If** Ask virtually any **what if** question. They might be either serious or frivolous. One excellent means of displaying ideas from this key is to draw up an ideas wheel.
The Alphabet Choose an object, or general category of objects, and compile a list of words from A to Z which have some relevance to the object(s). Then try to expand on some ideas which link each of the words.	**The Variation** This key uses a special group of words. Start each question with 'How many ways can you …'.	**The Bar** **BAR** is an acronym for **Bigger, Add, Replace**. This key can be applied to an existing object for the purpose of redesign.	**The Picture** Draw a simple diagram which has no relevance to the area of study. The participants then try to work out ways in which it might be linked with that area. Compile a list of things that the diagram might represent.
The Different Uses List some widely different uses for a chosen object from your area of study.	**The Prediction** Ask for a series of predictions regarding a particular situation, product or set of circumstances.	**The Ridiculous** Make a ridiculous statement that would be virtually impossible to implement and then attempt to substantiate it.	**The Commonality** Decide on two objects which would generally have nothing in common and outline some points of commonality between them.
The Question Start with the answer, and try to list five questions which can be linked to that answer only.	**The Alternative** List ways to complete a task without using normal tools or implements.	**The Invention** Develop an invention which could be constructed in an unusual manner. First outline the product on paper then move onto its possible construction.	**The Brick Wall** Make a statement which could not generally be questioned or disputed. Then try to break down the wall by outlining other ways of dealing with the situation.
The Construction Set up a wide variety of construction problem-solving tasks and use lots of readily available materials.	**The Forced Relationship** Develop a solution to a problem by employing a number of dissimilar objects. For Years 1/2 – one object For Years 3/4 – two objects For Years 5/6/7 – three objects For Years 8-12 – four objects	**The Brainstorming** State a problem which needs to be solved and brainstorm a list of solutions. Start the brainstorm statement with the words 'How to ...'.	**The Interpretation** Describe an unusual situation and then think of some different explanations for the existence of that situation.

Thinkers keys (cont)

PrimaryConnections examples

The Question:	The 5Es is the answer, list five questions which might be linked to this answer.
The Prediction:	How well do you think you will facilitate professional learning on the Primary**Connections** 5Es teaching and learning model?
The Ridiculous:	Everyone in our school will teach a Primary**Connections** curriculum unit perfectly the first time.
The Variation:	How many ways can we think of to implement Primary**Connections** in our school?
The What If:	What if we use literacy time to continue teaching Primary**Connections**?
The Alternative:	How could we view things closely without a microscope?
The Interpretation:	Unusual situation: No-one in our school wants to teach Primary**Connections**.
The Brainstorm:	How to manage the resources required for Primary**Connections**.

Thinkers keys



Thinkers keys resource sheet

Tree approach

Purpose

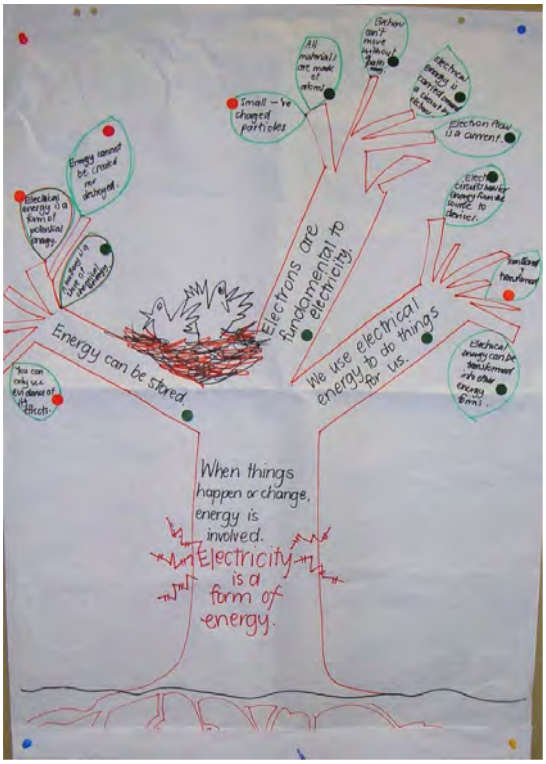
An assessment technique for analysing text and making judgements about levels of understanding.

Process

- Read through the text once and determine the major theme.
- Write this as a phrase or sentence as the main trunk of the tree.
- Determine how many sub-themes are contained in the text related to the main theme. Try to limit these to a maximum of five. Reduce these sub-themes to phrases or sentences containing key words. These are the branches.
- Examine each sub-theme and extract and summarise the detail related to that sub-theme. These are the leaves.
- Assemble the diagram showing the main theme (trunk), the sub-themes (branches) and the detail of each sub-theme (leaves).
- Use a traffic light technique (coloured, self-adhesive dots), and self-assessment to determine the level of understanding of each sub-theme and its associated detail. Green dots for 'fully understood', orange dots for 'partially understood' and red dots for 'not understood'.
- Focus on red and orange themes and study other references to strengthen understanding of the concepts. These are the roots.

Product

The product of this process is a clearly articulated analysis of extended text which identifies the concepts which need to be further studied.



PrimaryConnections examples

- Use the tree approach to analyse the teacher background information from a PrimaryConnections curriculum unit.
- Analyse the information about a chosen science concept from the Science Background Resource to assess understanding.

Reference

Malouf, Doug (1988). *How to Create and Deliver a Dynamic Presentation.* Australia: Simon and Schuster.

TWLH chart

Purpose

A tool for eliciting, tracking, managing and reflecting on participants' learning as they progress through a Primary**Connections** professional learning session.

Process

- Prepare four large charts with the titles:

  What do we **think** we know?

  What do we **want** to learn?

  What have we **learnt**?

  How do we know we have learnt this? What is the evidence for our learning?

  Each first letter of the bolded words in the titles provides the name of the TWLH chart.

- Explain that the TWLH chart is one of the tools used by teachers and students when progressing through a Primary**Connections** curriculum unit.
- Use the chart as a repository for participants' ideas as you progress through the professional learning session.
- Elicit ideas about a concept for the T and W sections of the chart.
- After exploration and explanation of concepts, ask participants to contribute to the L and H sections of the chart.
- The chart can be re-visited as often as required for elicitation, addition, reflection, clarification and summation of learning.

T	W	L	H
What do we **think** we know?	What do we **want** to know?	What have we **learned**?	**How** do we know?

Product

The TWLH Chart provides a visual display of the thinking processes leading to learning from elicitation of ideas to what has been learned and the evidence that resulted in the learning.

Primary**Connections** examples

- What do we think we know about the Australian Curriculum:Science?
- What do we want to know about the Primary**Connections** 5Es teaching and learning model?
- What have we learned about using Primary**Connections** with multi-age classes?
- What evidence do we have that has led us to this conclusion?

Reference

Primary**Connections** curriculum units: *How to use a TWLH Chart*

Variables grid

Purpose

A planning tool for analysing the variables associated with science investigations.

Process

To illustrate the process, the specific example of plant growth as the measurable variable has been used. The process can be applied to any investigation analysis.

- Elicit variables from participants in response to the question, for example,
  What things might affect plant growth?
- Draw a large 3 x 3 grid on a whiteboard or chart and write the variable to be **measured** in the centre, for example, plant growth. Place an **M** for **measure** in this box. Label the diagram 'Variables grid 1'.
- Brainstorm the variables which might have an affect on the measurable variable in the centre and write these in the surrounding spaces. There is room for up to eight variables. Not all boxes need to be filled.
- Choose one variable to be **changed**, for example soil type, in the investigation. Put a **C** for **change** in this box.
- Explain to participants that all other variables must **stay the same** to keep the test fair. Place an **S** in every other box.
- Once the variable to be changed is identified, a second grid can be drawn with the change variable now in the centre. The ways it will be changed are identified in the surrounding spaces. Label the diagram 'Variables grid 2'.
- From Variables grid 1, up to eight more grids can be created to demonstrate the wide range of variables which might impact the variable being measured.

Variables grid 1

amount of light **(S)**	amount of water **(S)**	type of soil **(C)**
size of container **(S)**	**plant growth (M)**	amount of fertiliser **(S)**
type of seed **(S)**	shape of container **(S)**	number of seeds per container **(S)**

Variables grid (cont)

Variables grid 2

sand	no soil	clay
potting mix	**type of soil (C)**	vermiculite
pebbles		

Product

The variables grid provides a means of visually demonstrating all the variables which might affect the outcome of a science investigation and thus assists in the planning stage of an investigation. Numerous investigation questions can be derived from this activity.

PrimaryConnections examples

Examples of investigation questions from the variables grid analysis for measuring plant growth:

- What happens to plant growth when you change the amount of light?
- What happens to plant growth when you change the amount of water?
- What happens to plant growth when you change the type of soil?
- What happens to plant growth when you change the size of the container?
- What happens to plant growth when you change the amount of fertiliser?
- What happens to plant growth when you change the type of seed?
- What happens to plant growth when you change the shape of the container?
- What happens to plant growth when you change the number of seeds per container?

Reference

Langford, David (2003). *Tool Time, Choosing and Implementing Quality Improvement Tools.* USA: Langford International Inc.

Verb volley

Purpose

A brainstorming tool that helps people to closely observe activities carried out by others and describe and share them using phrases beginning with verbs.

Process

- Ask participants to each collect a pad of sticky notes.
- Ask individual participants to closely observe the activities carried out by others usually in small groups.
- Whilst observing, write down a phrase for each observed activity using a verb (doing word) to begin the phrase, one activity per sticky note. For example, “asks questions”, “draws a diagram”.
- Write as many activities as possible until all activities have been described.
- Form a team of people to share the descriptions.
- Arrange the team in a shape, for example, a circle, a rectangle or two lines facing one another.
- Participants share their descriptions one at a time in order or randomly, volleying the “verb” phrases around the group. An alternative is to use a ball and throw it around the group. Each time it is caught, a person shares a description.
- As the phrases on sticky notes are shared, an affinity diagram could be created to show the range of activities described.

Product

The **verb volley** allows individuals to closely observe and describe another group’s activities and share the descriptions with others in an active way. Collectively, the full range of activities will be observed and described. If an affinity diagram (“like” categories) is produced, the group will be able to identify the frequency of the observed activities.

PrimaryConnections examples

- View the *Explore* phase of the *5Es* DVD and observe and describe student activities.
- Observe and describe the activities associated with a group’s discussion about “what they think they know” about a concept.

Reference

Rostron, Louise (2014). Primary**Connections** Intro, 2014

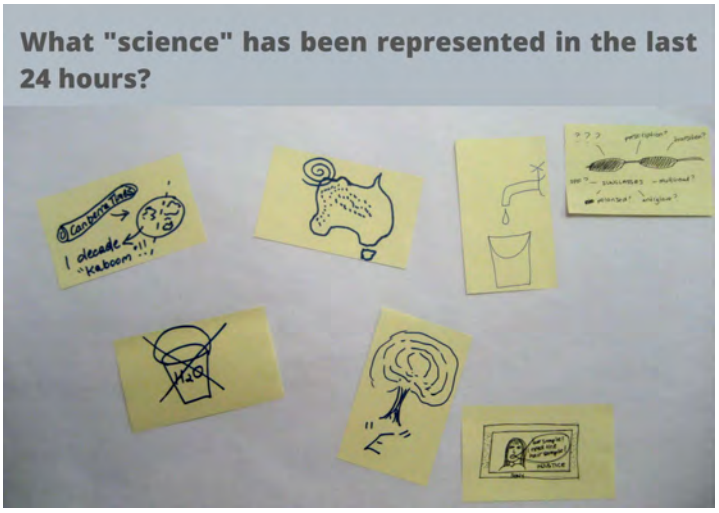
Visual representation

Purpose

A visual display of the ideas, information or findings from a group.

Process

- Prepare a large sheet of paper with the focus issue or question displayed at the top.
- Provide participants with large self-adhesive notes and a pen.
- Ask participants to draw an image which depicts their response to the focus question.
- Collect all the notes and display them as a collage or in a more structured way such as a pictogram.



Product

The visual representation chart captures multiple images and provides a display of the group's response to a question or idea.

PrimaryConnections examples

- What 'science' has been represented to you in the last 24 hours?
- How is water used in the home?
- What are your students' responses to PrimaryConnections?

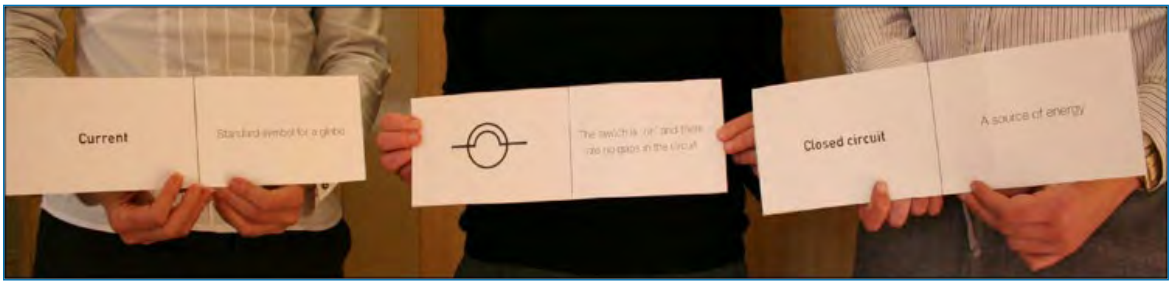
Word loop

Purpose

A tool that helps to clarify the relationship between words and terms, symbols, representations and definitions and how these contribute to a whole topic or concept. Word loops can be completed by individuals, pairs, small groups or large groups.

Process

- Choose a topic or concept on which your word loop is based.
- Prepare cards with two halves.
- Brainstorm up to 30 words, terms, symbols or representations with matching definitions.
- Place a word, term, symbol or representation on one side of each card.
- Place a **non-matching** definition on the other side of each card.
- Distribute the word loop cards to your participants.
- Ask participants to link each word, term, symbol or representation with a matching definition and place them side by side in a circle. People might choose to hold them facing outwards or place them on a table or the floor, gradually building a circle.
- Explain that if each card is matched correctly, all cards will eventually form a closed circle.
- Explain that if a mistake is made, the group needs to find the unmatched pair and adjust the cards until all the cards match and create a closed circle.



Product

The word loop is an engaging, active tool to revise words, terms, symbols, representations and definitions about a topic or concept. It enables participants to check their understanding of the language of the topic.

Primary**Connections** examples

- Word loop in the unit “Light shows”.
- Word loop in the unit “It’s electrifying”.
- Word loop for “Primary**Connections** curriculum resources.”

Reference

Primary**Connections**: linking science with literacy program

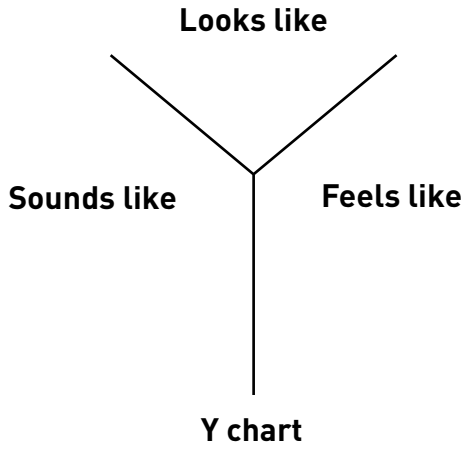
Y chart

Purpose

A tool for brainstorming responses to a situation or question by focusing on the senses.

Process

- Prepare a Y chart on a large piece of paper.
- Label each of the spaces formed with the terms: 'Looks like', 'Sounds like', 'Feels like'.
- Divide the groups so that each group is focusing on one of the terms.
- Ask participants to brainstorm ideas about the question by focusing on their term and recording specific responses on a separate piece of paper.
- Transfer each of the brainstorm sheets to the large chart.
- Discuss the responses.



Product

The Y chart provides a group visual display of responses to a question focusing on the senses.

PrimaryConnections examples

- Describe assessment from teacher and student perspectives.
- Describe effective and ineffective collaborative learning teams.
- Describe student behaviour during the *Engage* phase of a PrimaryConnections curriculum unit.

Reference

Frangenheim, Eric (1998). *Reflections on Classroom Thinking Strategies.* Queensland: Roden Education Publishing.

5Es sector chart

Purpose

A visual tool for generating and recording ideas about the focus of each phase of the Primary**Connections** 5Es teaching and learning model.

Process

- Collect a large piece of paper.
- Draw a circle and divide it into five equal sectors (angle 72 degrees).
- Label each sector with the titles of the 5Es phases: *Engage*, *Explore*, *Explain*, *Elaborate*, *Evaluate*.
- Allow some thinking time for participants to jot down their ideas about the focus of each phase of the 5Es and how they sequentially link with one another. The following stimulus questions might help:
  - What is the focus of the *Engage* phase when asking ideas about a science phenomenon?
  - What is the focus of the *Explore* phase when asking to explore ideas generated in the Engage phase?
  - What is the focus of the *Explain* phase with regard to the science phenomenon?
  - What is the focus of the *Elaborate* phase with regard to the science phenomenon?
  - What is the focus of the *Evaluate* phase and how does it link to the other phases?
- Record words and phrases indicating the focus of each phase in the appropriate sector.

Product

The 5Es sector chart captures responses to questions about the focus of the 5Es phases.

Primary**Connections** examples

- Identify the focus of each phase of the 5Es before viewing the 5Es chapter of the *Questioning Minds* DVD.
- Review your understanding of the phases of the 5Es before teaching a Primary**Connections** curriculum unit.
- Add to your 5Es sector chart after viewing chapters of the *5Es* DVD.
- Examine the Primary**Connections** 5Es model and re-represent your understanding using the 5Es sector chart.

Reference

Rostron, Louise (2013). Primary**Connections** PLF Recall workshop

Notes

Notes

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