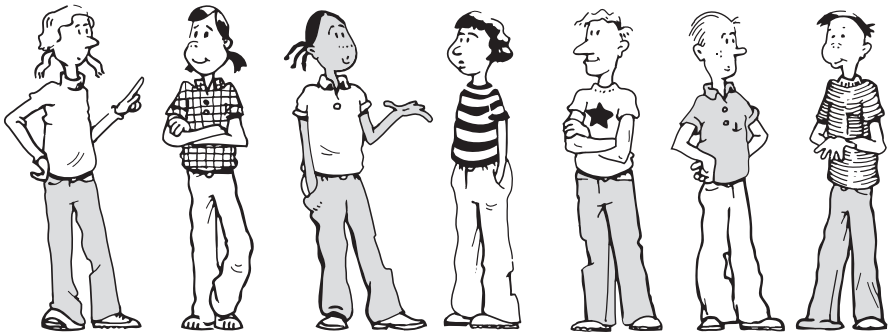
INTRODUCTION

Science circles contains a wide range of classroom activities designed to engage students in extensive discussion while exploring science topics. The ***Science circles*** approach is developed from the concept that understanding is discourse-based. Scientific literacy is built when students can practise using correct terminology to give explanations and construct arguments based on evidence. The activities are intended to be used in conjunction with standard science textbooks and units. Using ***Science circles*** to complement other science activities and units of work will assist in the vital quest to make classroom science meaningful for each student, and develop a greater readiness to value and use science language and ideas in everyday life.

The topics

The topics of ***Science circles*** are those most likely to be included in typical junior science programs, including one from each of the main fields of scientific endeavour.

- The nature of science
- Biology
- Physics
- Chemistry
- Earth science
- Astronomy
- Environmental science



What is a science circle?

At the simplest level, a science circle can be viewed as a group discussion in which students air their own understandings and questions about science topics. Talk in science circles should ideally form a significant part of each stage of science learning, from the introduction of a new topic through to its summation. A science circle discussion may begin with a student recording their own thoughts when asked a question, or two or three students discussing a concept cartoon or creating a mind map at the beginning of a topic. It can also be a whole group session discussing ideas about what is of interest to different people when planning an investigation or concluding a unit of work, including how they felt during the process.

In this series, the activities presented for each topic consist of a four stage process which reflects the ongoing cyclic processes of scientific enquiry and learning.

The activities are self-contained and require no extra resources. Each activity page has an extension task, some of which are research tasks that may require extra reference material to complete.

- **Stage 1 Ideas and knowledge – establish and clarify prior knowledge/world view**
  What do I think I know about …?

  Tasks introduce topics by presenting worked examples or information in formats such as yes/no questions, multiple choice quiz, concept cartoons and other discussion starters including listing 'big ideas' in the topic or compiling a glossary of terms.

- **Stage 2 Raising questions – encourage raising questions and planning investigations**
  What would I like to know about …?

  Activities designed to move beyond current understanding through question raising and discussion in order to record interests and 'wonderings' about a topic to be revisited throughout learning experiences.

- **Stage 3 Investigating – practice in how science investigations are planned and conducted, and data collected and organised**
  What will I do to find out about …?

  Similar to 'standard' science activity sheets, with additional opportunities for discussion to encourage personal understanding and a willingness to take risks with leaps in understanding.

- **Stage 4 Evidence – identify patterns in evidence supporting theories and raise more questions for investigation**
  How I know …

  Activities including analysing evidence, supporting conclusions, providing relevant evidence, using information to respond to concept cartoons and problem solving; all of which highlight links between evidence and theory and also involve value judgements in deciding what to take into account.

The aim

The main aim of the activities in ***Science circles*** is to provide a vehicle to help empower students to say what they think and how they feel towards their science learning, throughout a continuous process of concept and skill development. The activities enhance student talk, to prevent the spiral of silence that can surround teaching as concepts being covered increase in complexity. ***Science circles*** learning goes beyond simply presenting concepts and skills, to encouraging the development of a richer understanding of science as a reliable way of making sense of the world.

The approaches

The approaches used in ***Science circles*** include mind maps, quizzes, problem solving, concept cartoons and directed questionnaires. These all focus attention on what the learner is thinking. They provide an avenue for making the students' inner thoughts, questions, personal experiences and impressions overt.

Each activity sheet provides students with a range of opportunities to discuss and explore their ideas about the worlds of science and scientific investigations, or how these worlds link to their own ideas and world view, in an atmosphere of co-operation. The sheets are self-contained and require no extra preparation except for the occasional provision of reference books, which is indicated with a book icon.

The activities in ***Science circles***:

- stimulate expression of ideas and genuine discussion
- raise interest and confidence in exploring topics by presenting worked examples as starting material
- help students develop their own curiosity and ability to raise questions
- show how science can help each person make sense of their world
- give practice in linking evidence to scientific ideas in a range of situations
- encourage students to constantly monitor their own progress in understanding, asking themselves questions such as "What do I understand by … ?"
- encourage thinking about, clarifying and appropriately using science terminology through self-directed learning
- include assessment and evaluation opportunities as part of the activities.

Current research values student talk

Current science education research indicates that students need to express what they are thinking about a topic and the process of science in order to clarify their ideas and incorporate new understandings into current schema. In order for meaningful learning to occur for each and every student, adequate classroom time must be devoted to student discussion before, during and after new ideas are contacted. Taking time in classrooms for student talk shows the student that each individual's thought processes are a highly valued part of their learning process. Exploring and confirming the necessary language, terms and expert use of terminology makes the science, which can seem like an alien world, meaningful to the learner.

Current research shows that many students quickly become disengaged in science classrooms when they feel they cannot understand the terminology being used or how the activities they are completing fit into a topic or relate to their own real-world experience.

A large body of research shows that existing student 'preconceptions' must be used as the starting point if classroom time is to lead to meaningful, long-term learning. Dealing with 'alternative views' or 'misunderstandings' must be an ongoing process in order for new ideas to be incorporated into existing conceptual frameworks.