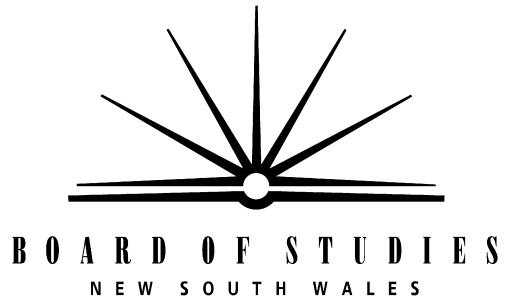

Science and Technology K–6 Syllabus

Symposium Report

York Conference and Function Centre
The Bowlers Club
95–99 York Street, Sydney

Saturday, 11 August 2007

Program

8.30 am	**Registration**	
9.00 am	**Welcome**	Ms Margaret Malone Inspector, Primary Education Office of the Board of Studies
9.10 am	**Introduction**	Professor Gordon Stanley President, Board of Studies NSW
9.20 am	**Keynote Address One** *Science Education for the Future*	Professor Peter Fensham, AM Monash University
10.30 am	**Morning Tea**	
11.00 am	**Keynote Address Two** *Technology Education for the Future*	Dr Doreen Clark, AM Academy of Technological Sciences and Engineering Professor Veena Sahajwalla University of New South Wales Mr Peter Thompson Head Teacher, Technology Bossley Park High School
12.30 pm	**Discussion Groups (Session One)**	Issues raised in Keynote Addresses One and Two
1.00 pm	**Lunch**	
1.45 pm	**Keynote Address Three** *Primary Science and Technology – Lessons from the Classroom in Informing Best Practice*	Professor Marilyn Fleer Monash University
2.45 pm	**Discussion Groups (Session Two)**	Issues raised in Keynote Address Three
3.15 pm	**Feedback**	
4.00 pm	**Reflections**	Professor Peter Fensham, AM Monash University
4.20 pm	**Conclusion**	Ms Margaret Malone Inspector, Primary Education Office of the Board of Studies
4.30 pm	**Close**	

Keynote Addresses

The three Keynote Addresses examined the topics:

- Science Education for the Future
- Technology Education for the Future
- Primary Science and Technology – Lessons from the Classroom in Informing Best Practice.

Their purpose was to stimulate discussion among participants relating to the issues raised and their implications for review of the Science and Technology K–6 Syllabus.

Abstracts for the keynote presentations are included below with more detailed papers and/or slideshows available on request.

The participating organisations are listed in the Appendix.

Keynote Address One

Science Education for the Future **Professor Peter Fensham**

Abstract Science education in most developed countries is now a matter of serious concern as fewer high achieving students are opting for careers in science and technology and a large majority of all students are expressing disinterest in science as they are experiencing it at school. While the conditions that have led to this malaise are no doubt a complex mixture of in-school and out-of-school factors, I will focus in this lecture on the in-school conditions that have been found to be contributing, since these are ones for which we as educators have a responsibility. After identifying a number of these conditions, some of the current moves to change them will be outlined and their practicability considered in the light of the contemporary Australian scene.

Keynote Address Two (Panel)

Technology Education for the Future **Dr Doreen Clark**

Abstract The Academy of Technological Sciences and Engineering contends that Technology Education has a bright future. When taught with Science, as a key learning area (KLA) of the K–6 syllabus, it provides opportunities for creative thinking and practical realisation of ideas which are essential learning for young children. The incorporation of science and technology into play will spark interest and encourage further study of these subjects to the benefit of a technologically literate community and increased numbers of professional scientists, technicians and engineers.

Technology Education for the Future – Educating Students for Environmental Sustainability — **Professor Veena Sahajwalla**

Abstract Australia has made tremendous advances in science and technology over the past decade which has paved the way for greater competitiveness in the global marketplace. However, economic development usually comes with a huge cost to the environment. We need to enhance environmental sustainability to maintain our planet's resources for future generations. Research initiatives are being undertaken worldwide to address this; one example from our research in the area of sustainable materials is the innovative recycling of waste plastics in steel making.

Industries and communities require innovative pathways to develop and implement technological changes and to deal with associated challenges. To meet these objectives, a new wave of science students who are both eager and educated to apply sustainability concepts in industries and research are essential. One of the key responsibilities in developing our students lies with educators who have to enlighten students about the importance of technological literacy, its role in environmental sustainability and the contributions that we can make as we move into the future.

Primary level education can pave the way in increasing interest and passion in students for these technological studies through the implementation of learning activities that help them to understand their relevance for their future.

Technology Education for the Future — **Mr Peter Thompson**

Abstract What is the current status of technology education? Bossley Park High School's 'technology education' program emphasises the use of tools and processes by students to achieve the satisfaction of a need, want or desire. A tool is an extension of a human's ability to create.

Educating for an unknown future, however, requires different thinking and an ability to be adaptive, creative and innovative. Technology education internationally is changing to meet this need. 'Technology for All Americans' was established to promote technological literacy for all students. A technologically literate person is one who understands what technology is, how it is created, how its use shapes society and in turn how society shapes the development of technology. 'Learning through Making' recommended that intelligent making activities should be enhanced and made regularly available to all pupils across the curriculum at least until the end of full-time schooling so that they may develop practical skills and imagination. A technology education mode of delivery leads the classroom teacher to target a broader range of learning styles than a more 'traditional' pedagogy. Certainly, in practice, the use of a problem-solving, hands-on approach to learning provides opportunity for a broader range of students to learn.

Keynote Address Three

Primary Science and Technology – Lessons from the Classroom in Informing Best Practice — **Professor Marilyn Fleer**

Abstract In this presentation a brief overview of research relevant to primary science and technology education will be shared. In particular, the literature on student engagement in science and technology will be considered – that is, valued early experiences, transformative experiences and relationships and connections between schools and children's homes. After this overview, the session will turn to the examination of a theoretical driver which could usefully inform science and technology syllabus re-development. In this presentation,

cultural-historical theory will be discussed because it has provided a dynamic approach to framing research and has drawn scholars' attention to community (rather than individual) activities for building children's capabilities (Vygotsky, 1987; 1998). Funds of knowledge best describes how learning in communities generate social, economic and cognitive capacities within the home and community (see Moll and Greenberg, 1990). In this presentation, curriculum implementation in classrooms is framed as developing an understanding of a collective enterprise through positioning children as researchers of their own technological and scientific knowledge and capability, as located within their home and community practices. This approach will be highlighted through a case study of children from a prep/year one class and a year three/four class acting as researchers. The example shows how children's everyday lived scientific and technological world can be brought into the primary classroom.

Discussion Groups

Discussion Group Focus Questions

Session One:
Considering the presentations in Keynote Addresses One and Two as well as your own knowledge and experience, please discuss the following question:

What are the key elements of science education and technology education that would need to be addressed in developing a K–6 Science and Technology syllabus for students of the 21st century?

Session Two:
Considering the presentation in Keynote Address Three as well as your own knowledge and experience, please discuss the following question:

How should what we know from research about best practice in K–6 science and technology education inform the revision of the current syllabus?

The keynote addresses were followed by opportunities for participants to provide comment and feedback on the areas raised in the presentations and their implications for the revision of the Science and Technology K–6 Syllabus.

The symposium participants were allocated to one of eight discussion groups. Participants were asked to consider the Focus Question in each of the two discussion sessions.

Members of the Board's Science and Technology K–6 Curriculum Committee and Primary Curriculum Committee chaired the groups and recorded the main aspects of each group's discussion.

Each group presented an overview of their findings to the whole group in a feedback session at the end of the day. Recorded feedback was also collected from each discussion group. A summary of the collated feedback is included below.

Summary of Feedback

While there were many suggestions and recommendations from participants, the following represent some of the key matters that were identified by the discussion groups for consideration in the revision of the NSW Science and Technology K–6 syllabus:

Syllabus Organisation

- A Rationale and Aims that describe a clear purpose for the syllabus emphasising Scientific and Technological Literacy as well as engaging and interesting students in Science and Technology
- A clear description of the nature of Science and the nature of Technology and their relationship(s)
- A clear and concise description of the core skills (processes) and knowledge and understandings (conceptual content) essential to primary Science and Technology
- A simpler structural organisation to emphasise the key skills (processes) and to narrow the scope of content

Treatment of Skills (Processes)

- An emphasis on active, student-centred, inquiry-based teaching and learning
- An emphasis on the skills (processes) essential to primary Science and Technology
- Clear separate scaffolds for the key skills (processes) of Science and of Technology as well as guidance for their effective integration
- A clear continuum of learning described for the skills (processes) of Science and Technology

Treatment of Conceptual Content

- A balance between describing a core of knowledge and understanding (conceptual content) and providing flexibility to allow choice of content and contexts
- A clear description of what needs to be taught and when in terms of the foundation in knowledge and understanding (conceptual content),emphasising depth rather than breadth
- Treatment of Technology content that is broader than using ICTs
- Content structured appropriately for the developmental level of K–6 school students
- Clear definition of key language appropriate at specific stages in Science and Technology

Cross-curriculum Content

- Clearly identified opportunities for meaningful integration with other key learning areas, especially with numeracy and literacy
- Meaningful use of ICTs embedded in the syllabus content

Special Education Needs

- Inclusion of outcomes and content which provide for the full range of students

Support Materials

- Background information regarding the foundation in knowledge and understanding (conceptual content), skills, (processes), values and attitudes
- Exemplar activities/ learning sequences that explicitly incorporate authentic assessment
- Guidance regarding the selection of appropriate contexts (for example, real-life scenarios, issues, stories and enterprises beyond the classroom) with which to explore the core skills (processes) and knowledge and understanding (conceptual content) in ways meaningful and relevant to students
- Recommendations of resources and suggestions for their use
- Specific support for students with special education needs

Implementation Issues

- Implementation support at the time of syllabus release and ongoing professional development
- A possible electronic version of the syllabus and support material to ensure sustainability, networking and sharing resources.

Reflections

Professor Peter Fensham (Monash University), Chair of the NSW Science and Technology K–6 Syllabus Reference Group, provided his reflections on the day's proceedings.

The key messages Professor Fensham synthesised from the Symposium were that the revision of the NSW Science and Technology K–6 Syllabus could consider:

- explicitly addressing the weaknesses of the current document and clearly outlining the changes made in the new syllabus
- supporting teachers in understanding the close relationship between science and technology and therefore the rationale for a 'Science and Technology' syllabus at primary level; also explaining why it is appropriate to separate the two disciplines at secondary level to facilitate a higher level of subject treatment
- clearly defining what is meant by 'content'. Process and conceptual knowledge are inextricably linked, but it is useful to describe content in terms of 'knowledge of science' and 'knowledge about science'
- describing a clear progression of learning or 'competencies' from Early Stage 1 to Stage 3 that matches the progression of psychological development in primary students rather than just being disciplinary-driven
- clearly describing a purpose for the syllabus that is appropriate to the developmental stage of primary school children.

Appendix

Participating Organisations

Committee of Chairs of Academic Boards
NSW Department of Education and Training
Catholic Education Commission NSW
Association of Independent Schools
NSW Teachers Federation
NSW Independent Education Union
Professional Teachers Council NSW
Primary Principals Association
Early Childhood Education Council of NSW
Australian Association of Special Education
Science Teachers Association of NSW
Technology In Primary Schools
Federation of Parents and Citizens' Associations of New South Wales
Council of Catholic School Parents
Academy of Technological Sciences and Engineering
Australian Computer Society
Technology Educators Association
Macquarie University
University of Sydney
University of Western Sydney
University of New South Wales
University of Technology, Sydney
Charles Sturt University
Monash University
University of Canberra
Wingara Education