

# **Annotated Bibliography**

## **Language Development in Secondary Science**

What follows is an annotated bibliography concerning language development in science. A range of resources are presented addressing (1) the social and intellectual sources of difficulty in the student scientific communication, (2) the function of scientific literacy in society, and (3) what is encouraging and impeding direct treatment of these communication issues. The ERIC database was extremely useful in finding relevant resources, as were the internet search engines; Google.com, Yahoo.com and DMOZ.org. Searching and reviewing resources electronically was much more effective than physically locating them through the library. However, a frequent frustration was finding a relevant abstract and being unable to access the full article. Finding websites which directly addressed scientific literacy was difficult.

### **Books**

Wellington, J., & Osborne, J. (2001). *Language and literacy in science education*.  
Buckingham: Open University Press

Argues that science language is a significant barrier to students understanding of science. Then proceeds to describe practical solutions to this barrier. As with the website, *Appropriating Scientific Discourse*, Wellington and Osborne argue that language and content are intertwined and cannot be approached independently of each other. This is a great resource because it includes both theoretical and realistic classroom examples to illustrate their arguments. And does so in a concise manner.

Thier, M., & Daviss, B. (2002) *The New Science Literacy: Using Language Skills to Help Students Learn Science*. Portsmouth, NH: Heinemann.

This book attempts to convince teachers that students ability to learn science increases when they have a better grasp on the language of science. It contains lots of classroom activities and practical ideas to integrate literacy into the content. It would be a valuable planning resource for teachers. However, since it is based on the US curriculum, the activities may need to be modified to use in Australia.

### **Journal Articles**

Hinman, R. L. Scientific Literacy Revisited. *Phi Delta Kappan*, 81(3) , p. 239-41.

Hinman disagrees with the priority that the development of universal scientific literacy has over other education objectives. Based on a cost-benefit analysis of the financial and human cost, and the benefit to the individual and society. He argues that a more immediate goal should be improved science education. As scientific literacy will be a consequence of improved education. Although, Hinman's argument is weak and lacking in consequence, this article is a good overview of the negative side of the literacy debate.

Hassan, G., & Treagust, D. (2003). What is the future of science education in Australia? *Australian Science Teachers Journal*, 49(3), 6.

This is a comprehensive look at science education in Australia. It presents a bleak picture of declining enrolment in science courses at secondary and tertiary level. Hassan and Treagust discuss the sources of this decline, its economic and social impact and possible solutions. The article also looks at science literacy in Australia, compares it to other countries and discusses the relationship between the societies' view of science and the population's scientific literacy. It is an excellent snapshot of science education, understanding and literacy in Australia, but offers little in practical advice.

## Websites

Australian Bureau of Statistics (9 May 2002). *Education - Educational Attainment: Literacy and numeracy among school students*. Retrieved March 9, 2003, from <http://www.abs.gov.au/Ausstats/abs@.nsf/94713ad445ff1425ca25682000192af2/2c40d24cd10ab37fca256bcd008272fd!OpenDocument>

Describes social factors contributing to poor literacy, including scientific literacy, in Australian primary and secondary school students. The implications of poor literacy on future education and employment outcomes is discussed. The information is presented with a solid statistical foundation, and in graphical, tabular and descriptive forms. The usefulness of this resource is in the objective, unbiased way the information is presented. However, it is lacking in commentary and historical background.

Rosebery, A., Warren, B., & Conant, F. R. (1992). *Appropriating Scientific Discourse: Findings From Language Minority Classrooms*, Retrieved March 9, 2003, from <http://www.ncela.gwu.edu/miscpubs/ncrcdssl/rr3/>

Covers the development of scientific literacy among students by using the collaborative inquiry approach. The study involved students with very little previous experience with science. Initially the students reasoning was bounded by

previous experience. After the students used the collaborative inquiry approach for some time, they were reasoning on a more developed level. Not a great resource for language development but it does indicate that good scientific literacy is vitally important to good scientific reasoning. And that the two should be developed concurrently.

## Electronic Journal Articles

Parsons, S., Matson, J. O., & Quintanar-Sarellana, R. (2002). Making Sense of Literacy through Science (LtS): A Model for Professional Development. *Electronic Journal of Literacy through Science*, 1(2). Retrieved March 12, 2003, from [http://sweeneyhall.sjsu.edu/ejlts/archives/scientific\\_literacy/pmq.htm](http://sweeneyhall.sjsu.edu/ejlts/archives/scientific_literacy/pmq.htm)

This report discusses the literacy through science (LtS) framework, a model for language development through science instruction. A previous project found that to improve science literacy teachers should share science and literacy expertise, and use an inquiry-based approach to teaching. The LtS found conditions that need to be satisfied to achieve these; a learning community, emerging teacher leaders, multiple contexts for inquiry, and tangible guidelines. A good resource about addressing literacy issues in a tangible way. Although it is based on US research, which is its weakness, its recommendations appear broad enough to cross cultural differences.

Oliver, J. S., Jackson, D. F., Chun, S., Kemp, A., Tippins, D. J., Leonard, R., et al. (2001). The Concept of Scientific Literacy: A View of the Current Debate as an Outgrowth of the Past Two Centuries. *Electronic Journal of Literacy through Science*, 1(1). Retrieved March 12, 2003, from [http://sweeneyhall.sjsu.edu/ejlts/archives/scientific\\_literacy/oliver.htm](http://sweeneyhall.sjsu.edu/ejlts/archives/scientific_literacy/oliver.htm)

An outstanding article claiming that the current debate over scientific literacy can be enlightened by looking at it from an historical perspective. Makes a convincing argument that the current issues are actually more general debates about “the broader importance of science in society, the purposes of science in education, and the means for achieving understanding of science through schooling” (Oliver 2001). This is a comprehensive overview of scientific literacy, however it offers little practical advice and is not concise.

Science and the language specific to science are strongly coupled. It is clear that a student's ability to learn science is directly related to their grasp of the nuances of the scientific language. The most effective way to improve a student's understanding of the scientific language is to use integrated activities which improve their literacy whilst simultaneously learning the content. There are abundant practical resources available to help develop

science literacy. An inquiry-based, multi-context approach to learning appears to be effective.

The benefits of having a scientifically literate population is a contentious issue which ebbs and flows with characteristics of the society. Science is clearly a good thing for society on many levels. An ability for scientific reasoning is a good thing for the individual. However, an individuals view of science is directly related to their level of scientific literacy. The pressures encouraging and impeding the development of scientific literacy in secondary school appears related to the cultures' view of science. And as such, it is a moving target.

Improving the scientific literacy of school students should be a primary responsibility of science teachers. Students would develop more effectively in the reinforcing environment of a scientifically literate culture. However, it does not appear that Australian society embodies such a culture at present. Therefore, rather than allowing society to maintain the status quo of poor scientific literacy, science teachers must teach the content and language students need to become scientifically literate.