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# Appendix B: Strategies for accessing prior knowledge

## 1. Accessing prior knowledge through interviews

Interviews have been widely used to access students' prior knowledge. The most extensive work in this area has been carried out by Brophy and Alleman<sup>554</sup> with K–3 children in the United States. In their studies, they examined children's understandings of 'cultural universals' – the "domains of human experience that have existed in all cultures, past and present"<sup>555</sup> – investigating children's understandings of, and misconceptions about, food, clothing, shelter, communication, transportation, family living, childhood, money, and government. The researchers used a 'funnel interview' technique, characterised by a sequence of questions that are broad to start with (to encourage extended response statements), then probing (to seek clarification and elaboration), and finally (if necessary) specific (to direct attention to aspects of the subject that the student has not already raised). For example, when researching children's prior knowledge and thinking about government, Brophy and Alleman asked the questions in Figure 34<sup>556</sup>:

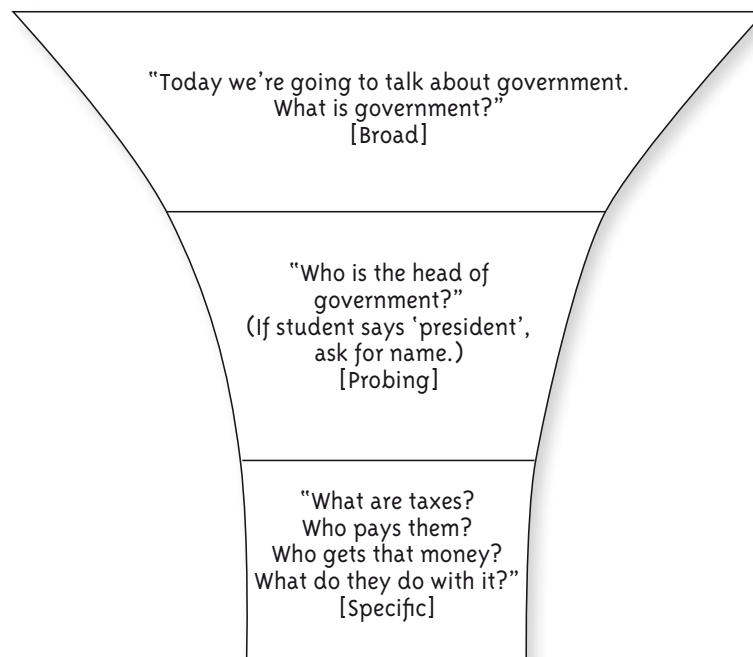


Figure 34: The funnel interview technique

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<sup>554</sup> Brophy, J. & Alleman, J. (2000). Primary-grade students' knowledge and thinking about Native American and pioneer homes. *Theory and Research in Social Education*, 28(1), pp. 96–120.

Brophy, J. & Alleman, J. (2001). What primary grade students say about their ideal future homes. *Journal of Social Studies Research*, 25(2), pp. 23–35.

Brophy, J. & Alleman, J. (2005). Primary-grade students' knowledge and thinking about transportation. *Theory and Research in Social Education*, 33(2), pp. 218–243.

<sup>555</sup> Brophy, J. & Alleman, J. (2006). *Children's thinking about cultural universals*. Mahwah: Lawrence Erlbaum Associates, p. 5.

<sup>556</sup> Brophy, J. & Alleman, J. (2002). *Primary grade students' knowledge and thinking about government as a cultural universal*. Chicago: Spencer Foundation, p. 195.

The funnel interview technique is also characterised by the use of vernacular (rather than precise) terms to describe historical periods. For example, terms such as ‘the cave days’ and ‘the days of the pilgrims’ were used instead of numerical dates or ‘precise periodisation’, to increase the likelihood that students would respond<sup>557</sup>.

Interviews have also been used by other researchers to access students’ prior knowledge in relation to: historical significance<sup>558</sup>; economic concepts such as scarcity, choice, opportunity cost, and monetary value<sup>559</sup>; and the roles and intentions of peers and teachers<sup>560</sup>.

One of the major problems of interviews is that they are time-consuming to conduct. For this reason, researchers – especially in science education – have paid a great deal of attention to how to most efficiently access students’ ideas. In an early review of the research, Sutton<sup>561</sup> identified four possible approaches:

- interviewing individual students;
- using word association or word sorting tasks;
- asking students to write definitions or choose a preferred statement from several correct ones;
- asking students to rate ideas in terms of bipolar dimensions.

Acknowledging the difficulties that teachers face in working with large classes, Sutton suggested that the most practical approaches involved asking students to prepare concept maps or topic overviews or to sort words and objects in ways that revealed the students’ mental processes and their ability to classify. Osborne and Freyborg<sup>562</sup> encouraged the use of classroom observations – where a teacher colleague would focus on what the students were understanding as they engaged in classroom activities – and the use of multichoice questions based on science-related illustrations and ideas. They warned, however, that while these approaches may save teacher time, there is a risk that they will reveal more about the test constructor’s ideas than the children’s ideas. They suggested that this risk could be mitigated by first interviewing a small sample of children and then taking account of the insights gained when designing the questionnaire.

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<sup>557</sup> Brophy & Alleman (2005), op. cit.

<sup>558</sup> Yeager, E., Foster, S. J., & Greer, J. (2002). How eighth graders in England and the United States view historical significance. *The Elementary School Journal*, 103(2).

<sup>559</sup> Schug, M. C. & Jean Birkey, C. (1985). The development of children’s economic reasoning. *Theory and Research in Social Education*, 13(1), pp. 31–42.

<sup>560</sup> Porath, M. (2003). Social understanding in the first years of school. *Early Childhood Research Quarterly*, 18, pp. 468–484.

<sup>561</sup> Sutton, C. R. (1980). The learners’ prior knowledge: A critical review of techniques for probing its organisation. *European Journal of Science Education*, 2(2), pp. 107–120.

<sup>562</sup> Osborne, R. & Freyberg, P. (1985). Children’s science. In R. Osborne & P. Freyberg (Eds.), *Learning in Science: The Implications of Children’s Science* (pp. 5–14). Auckland: Heineman Education.

## 2. Accessing prior knowledge through conversations with learners

A problem with semi-structured interviews, reported by some researchers, is how to draw out reticent students. Keddie<sup>563</sup>, working with 5- and 6-year-old boys, used an affinity group approach, which worked well in terms of encouraging his subjects to speak openly about their ideas. To further encourage the boys, the groups met in ‘natural’ settings such as the playground or small conference rooms.

A methodology designed specifically to privilege youth voice and facilitate greater civic participation grew out of Tuhiwai Smith et al.’s research<sup>564</sup> into what it meant to be a young person in rural New Zealand at the end of the 20th century. These researchers initially accessed the student voice via focus groups operating with mutually agreed codes of conduct to ensure participant safety. A second phase involved the creation of ‘youth tribunals’ where students could hear and witness testimonies. These met in schools, community venues, sporting centres, council buildings, parks, and marae (Māori meeting houses). Influenced by the processes used by the Waitangi Tribunal<sup>565</sup>, these tribunals created spaces in which young people were able to nominate topics of interest and then speak to them. To capture the counter-stories of young people, the researchers present had to listen more than talk.

Mercer et al.<sup>566</sup> report on a teacher who, working with 9- and 10-year-old students in the UK, encouraged them to explore each other’s prior knowledge by consistently asking two questions: ‘What do you think?’ and ‘Why do you think that?’ The teacher formalised the strategy by issuing students with a tally card that had the dual purpose of reminding them to ask the questions and giving them a means of recording the number of times they did so. Mortimer<sup>567</sup> describes how the voices of young children with special educational needs and disabilities can be heard through such means as observation and interpretation, talk-through approaches, and play-based assessment (such as art, role-play, stories, and welcome profiles).

Inman and Turner<sup>568</sup> describe an image-based approach in which students were asked to visualise a place ‘with cultural harmony’ and then describe it to the group as well as write and share definitions. The students responded with visions such as this:

“It’s a hot place, everyone is talking to each other, no-one gets hurt, they come from different countries, races and colours, they are different ages. All are getting along.”

<sup>563</sup> Keddie, A. (2004). Research with young children: The use of an affinity group approach to explore the social dynamics of peer culture. *British Journal of Sociology of Education*, 25(1), p. 35.

<sup>564</sup> Tuhiwai Smith, L., Smith, G. H., Boler, M., Kempton, M., Ormond, A., Chueh, H., & Waetford, R. (2002). “Do you guys hate Aucklanders too?” Youth voicing difference from the rural heartland. *Journal of Rural Studies*, 18, pp. 169–178.

<sup>565</sup> A tribunal established by the New Zealand Government in 1975 to hear claims by Māori against the Crown.

<sup>566</sup> Mercer, N., Wegerif, R., & Dawes, L. (1999). Children’s talk and the development of reasoning in the classroom. *British Educational Research Journal*, 25(1), pp. 95–111.

<sup>567</sup> Mortimer, H. (2004). Hearing children’s voices in the early years. *Support for Learning*, 19(4), pp. 169–174.

<sup>568</sup> Inman, S. & Turner, N. (2007). Researching cultural harmony through the student voice. *Education, Citizenship and Social Justice*, 2(2), pp. 119–133.

The rationale for this approach drew on the work of Barnard<sup>569</sup>:

Children know more than they know they know. They surely know more about what they know than the researcher does. Most of what they know, they know implicitly. Knowledge is not filed away in pupils' heads in answer form waiting for the stimulus of the perfect question to release it. No researcher has ever found out what it means to be a new age traveller's child or a foster child or a teenage mother by asking directly, 'What does it mean to be a ...?'

### **3. Accessing prior knowledge through pre- (and post-) tests**

Pre- and post-tests have been used to detect misconceptions and then to evaluate the extent to which they have been corrected (see for example, Berti & Benesso<sup>570</sup>). Alton-Lee<sup>571</sup> describes a variation on pre- and post-testing – the Haberlee evaluation technique – that makes use of assessment of prior knowledge to develop students' metacognitive awareness. Using this technique:

1. The students sit a pre-test. The teacher collects these papers in and analyses them for what they reveal about prior knowledge.
2. At the end of the unit students re-sit the test, using a clean copy.
3. Following completion of the post-test, students are reissued their pre-test. Together, students and teacher compare the pre- and post-tests and discuss difficulties and shifts in understanding.

This approach, although not empirically tested, is derived from empirical studies of student learning processes. It is characterised by a shared discourse in which teacher and students consider the learning results for the whole class. Shared inquiry of this kind – into where learning did and did not occur, and what it was that students did to learn – involves a radically atypical use of test data. In this approach, ownership of the data is shared and connections are made between teaching, classroom participation, and learning.

A number of studies reported in this synthesis describe the use of pre-tests and post-tests as part of their methodology. See, for example: Berti and Benesso<sup>572</sup>, Berti and Monaci<sup>573</sup>, Ernst

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<sup>569</sup> Barnard, P. (2001). Using image-based techniques in researching pupil perspectives. Conference paper, ESRC Network Project: Consulting Pupils about Teaching and Learning, 2001. Retrieved September, 2005 from [www.consultingpupils.co.uk](http://www.consultingpupils.co.uk)

<sup>570</sup> Berti, A. E. & Benesso, C. (1998). The concept of nation-state in Italian elementary school children: Spontaneous concepts and effects of teaching. *Genetic, Social, and General Psychology Monographs*, 120(2), pp. 121–143.

<sup>571</sup> Alton-Lee, A. (1983). Organising for learning: The results of an ecological study. *SET: Research Information for Teachers*, 2(5). See p. 6.

<sup>572</sup> Berti & Benesso (1998), op. cit.

<sup>573</sup> Berti, A. E. & Monaci, M. (1998). Third graders' acquisition of knowledge of banking: Restructuring or accretion. *British Journal of Educational Psychology*, 68, pp. 357–371.

and Monroe<sup>574</sup>, Hodkinson<sup>575</sup>, Hollingsworth et al.<sup>576</sup>, Laney<sup>577</sup>, Laney et al.<sup>578</sup>, Nuthall<sup>579</sup>, Nuthall and Alton-Lee<sup>580</sup>, Twyman et al.<sup>581</sup>, and van der Shee<sup>582</sup>. Hollingsworth et al.<sup>583</sup>, for instance, used a board game both as a pre-test and a post-test to uncover ideas about power in society.

#### 4. Accessing prior knowledge through questionnaires/surveys

A number of researchers have used questionnaires and surveys as a means of determining students' skills or what they know and think about particular concepts, for example: Davies et al.<sup>584</sup>, Kwan<sup>585</sup>, Tan Geok-Chin et al.<sup>586</sup>, and Taylor et al.<sup>587</sup>. Concepts or skills have related to, for example, environmental knowledge, economic aspects of citizenship, mapping skills, understandings of rights, and rights that are important to young people.

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- <sup>574</sup> Ernst, J. A. & Monroe, M. (2006). The effects of environment-based education on students' critical thinking skills and disposition toward critical thinking. *Environmental Education Research*, 12(3–4), pp. 429–443.
- <sup>575</sup> Hodkinson, A. (2004). Does the English curriculum for history and its schemes of work effectively promote primary-aged children's assimilation of the concepts of historical time? Some observations based on current research. *Educational Research*, 46(2), p. 99.
- <sup>576</sup> Hollingsworth, S., Gallego, M., & Standerford, N. S. (1995). Integrative social studies for urban middle schools: A case for multiple literacies. *Theory and Research in Social Education*, 13(3), pp. 204–233.
- <sup>577</sup> Laney, J. D. (1993). Experiential versus experience-based learning and instruction. *Journal of Educational Research*, 86(4), pp. 228–236.
- <sup>578</sup> Laney, J. D., Frerichs, D. K., Frerichs, L. P., & Pak, L. K. (1995). *The effect of cooperative and mastery learning methods on primary-grade students learning and retention of economic concepts*. Paper presented at the annual meeting of the National Council for the Social Studies, Chicago.
- <sup>579</sup> Nuthall, G. (1999). The way students learn: Acquiring knowledge from an integrated science and social studies unit. *The Elementary School Journal*, 99(4), pp. 303–341.
- <sup>580</sup> Nuthall, G. & Alton-Lee, A. (1993). Predicting learning from student experience of teaching: A theory of student knowledge construction in classrooms. *American Educational Research Journal*, 30(4), pp. 799–840.
- <sup>581</sup> Twyman, T., Ketterlin-Geller, L. R., McCoy, J. D., & Tindal, G. (2003). Effects of concept-based instruction on an English language learner in a rural school: A descriptive case study. *Bilingual Research Journal*, 27(2), pp. 259–274.
- <sup>582</sup> van der Shee, J. A. (1999). The effect of student freedom of choice in learning map skills. *International Journal in Geographical and Environmental Education*, 8(3), pp. 256–267.
- <sup>583</sup> Hollingsworth, S., Gallego, M., & Standerford, N. S. (1995). Integrative social studies for urban middle schools: A case for multiple literacies. *Theory and Research in Social Education*, 13(3), pp. 204–233.
- <sup>584</sup> Davies, P., Howie, H., Mangan, J., & Telhaj, S. (2002). Economic aspects of citizenship education: An investigation of student's understanding. *The Curriculum Journal*, 13(2), pp. 201–223.
- <sup>585</sup> Kwan, T. (1999). Pre-teenage children's vernacular perception and experience of maps in Hong Kong. *International Research in Geographical and Environmental Education*, 8(1), pp. 5–25.
- <sup>586</sup> Tan Geok-Chin, I., Kim-Eng Lee, C., & Kim Chuan, G. (1998). A survey of environmental knowledge, attitudes and behaviour of students in Singapore. *International Research in Geographical and Environmental Education*, 7(3), pp. 181–202.
- <sup>587</sup> Taylor, N., Smith, A. B., & Nairn, K. (2001). Rights important to young people: Secondary student and staff perceptions. *The International Journal of Children's Rights*, 9, pp. 137–156.

## 5. Accessing prior knowledge through visuals

Barton and Levstik<sup>588</sup> have made extensive use of pictures to access students' understanding of historical significance. By this means they have identified the generally uncritical lens that students bring to interpretation. Other educators and researchers have also used visuals as a means of gaining insight into what students know. The methods they have tried include: sorting of photographs, picture recognition, picture drawing, using open questions to invite responses to visuals, and using cartoon strips as catalysts for student response<sup>589</sup>. Approaches that involve drawing have been found effective for accessing the prior knowledge of students who are unfamiliar with the language of instruction<sup>590</sup>.

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<sup>588</sup> Barton, K. & Levstik, L. S. (1996). "Back when God was around and everything": Elementary children's understanding of historical time. *American Educational Research Journal*, 33(2), pp. 419–454.

<sup>589</sup> Foster, S. J., Hoge, J. D., & Rosch, R. (1999). Thinking aloud about history: Student interpretations of historical photographs. *Theory and Research in Social Education*, 27, pp. 179–215.

Harnett, P. (1993). Identifying progression in children's understanding: The use of visual materials to assess primary school children's learning in history. *Cambridge Journal of Education*, 23(2), p. 137.

Harwood, D. & Jackson, P. (1993). 'Why did they build this hill so steep?': Problems of assessing primary children's understanding of physical landscape features in the context of the UK national curriculum. *Geographic and Environmental Education*, 2(2), pp. 64–79.

Lee P., Dickinson A., & Ashby R. (1997). "Just another emperor": Understanding action in the past. *International Journal of Educational Research*, 27(3), pp. 233–244.

Levstik, L. S. (2000). Articulating the silences: Teachers' and adolescents' conceptions of historical significance. In P. N. Stearns, P. Seixas, & S. Wineburg (Eds.), *Knowing teaching and learning history: National and international perspectives* (pp. 284–305). New York: New York University Press.

Porath, M. (2003). Social understanding in the first years of school. *Early Childhood Research Quarterly*, 18, pp. 468–484.

von Karolyi, C. (2006). Grappling with complex global issues – Issue awareness in young, highly gifted children: Do the claims hold up? *Roeper Review*, 28(3). Detroit: Roeper Institute.

<sup>590</sup> Gallas, K. (1991). Arts as epistemology: Enabling children to know what they know. *Harvard Educational Review*, 61(1), pp. 40–50.

Alton-Lee, A., Rietveld, C., Klenner, L., Dalton, N., Diggins, C., & Town, S. (2000). Inclusive practice within the lived cultures of school communities: Research case studies in teaching, learning and inclusion. *International Journal of Educational Inclusion*, 4(3), pp. 179–210.