REFLECTIONS ON DESIGNING AND TEACHING PROFESSIONAL DEVELOPMENT COURSES FOR CAVE GUIDES

– Dr. Armstrong Osborne

Designing and teaching professional development courses for cave guides presents a number of challenges in particular with prior knowledge, the nature of the discipline, scaffolding, curriculum, and mode of delivery. Over the past twelve years, I have designed and taught several professional development courses for cave guides at Jenolan and Wellington. These courses have been focussed either half on science and half on interpretation or, as with the recent courses at Jenolan, have focussed largely on cave geology. There are distinct differences in how the guides react to different subject matter. My experience has been that straight science content is often better received than material relating to education, interpretation and the actual practice of guiding.

The aim of this article is to look "under the bonnet" at developing and presenting courses to cave guides from an educator's viewpoint and to provide a model curriculum framework to assist with future course development. The focus is on teaching Earth science to guides, however issues relating to teaching education, interpretation and guiding will also be raised.

Prior Knowledge

The prior knowledge of cave science and education, interpretation and guiding varies between individuals within any group of cave guides. In science (particularly cave Earth science) the amount of content knowledge, degree of understanding and structuring of knowledge tends to vary considerably. While many guides have picked up *significant amounts of specific knowledge*, most lack formal education in Earth sciences, so much foundational knowledge and many fundamental concepts are missing.

As with all areas of science education, persistent misconceptions, and especially in the case of caves enduring myths, are barriers to learning. As with science in general many of these misconceptions and myths involve outdated theories and half-truths (limestone is always a coral reef, stalactites form by evaporation, speleothems are composed of calcium bicarbonate and the volcanic hose theory of speleogenesis at Wellington etc).

Some misconceptions are well known, so they can be planned for in the curriculum. Others have to be drawn out with questions or recognised in questions asked. It is often necessary to deconstruct a question that has been asked and work backwards to uncover and address a fundamental misunderstanding or a lack of knowledge underlying it. Consequently teaching these courses is much more demanding than teaching a cohort of students whose prior learning is known.

In terms of education, interpretation and guiding, most guides have highly developed practical skills and many are highly innovative. Like many working educators, however, some guides are wary of theory, reflection on practice and of sharing their practice with colleagues. Just as teachers like to shut the classroom door, guides can be uncomfortable with colleagues, bosses or "experts" observing their work or tagging along on the end of their tours. The darkness behind the last person on the tour is for them the closed classroom door. Much work needs to be done to build confidence when facilitating reflection, sharing or even tagging along on a tour.

The Nature of the discipline

Some cave guides, many visitors and some cave managers take it for granted that there is a significant body of scientific knowledge about the caves they visit, interpret and manage and a significant group of scientists are researching and teaching in the field. While this is true in some countries in continental Europe, it is certainly not the case in Australia. Cave science and particularly the Earth science of caves (geology, geomorphology, mineralogy, hydrology) is an obscure field in Australia, with few practitioners. This has important implications for cave guides and their professional development:

1. Guides are routinely expected to answer obscure questions about an obscure field of science, quite an ask!

2. Our understanding of even the most researched sites such as Wellington and Jenolan is still very incomplete, there are not reliable answers to many questions and there are not many people out there working on solving them.

3. As there are no regular undergraduate programs in Australia teaching the Earth science of caves, there are few locally relevant texts and existing curricula to use as models.

4. Much of the relevant content does not come from easily accessible texts, but needs to come either directly from the scientific literature (most not held in Australian libraries or easily accessible *via* the internet) or from even more obscure monographs or edited books, some of which are not available for purchase.

Scientific understanding of caves is currently undergoing significant change. This is occurring internationally and in eastern Australia. Two big changes involve 1: a re-assessment of the likely age of caves, helped by ongoing work at Jenolan by local scientists and also by ongoing dating

work by a multinational group in central Europe and 2: the recognition that hypogene caves are far more common than was previously thought, arising from work in Europe, the US and here. Keeping the curriculum up to date and not becoming embroiled in controversies are thus challenges.

Scaffolding

Scaffolding refers to the processes required to support a learner in moving from one level of competency to the next. When erecting scaffolding it helps to know the foundation on which you are building. Unfortunately, when it comes to cave guides and Earth science we often have to build the foundation before the scaffolding.

Scaffolding is a key consideration in the construction of the curriculum. It is often useful to think backwards from the objective to the foundation. An example with several rungs missing from the scaffold is:

Objective Guides explain the difference between calcite and aragonite.

To do this, learners need:

Rung an understanding of polymorphs and the role of structural poisons.

To have this, learners need:

Foundation a definition of *mineral* that has *atomic structure* as a defining characteristic.

This example also illustrates the problem of *significant amounts of specific knowledge* without a structured basis. A guide might learn by heart an explanation of something like calcite/aragonite, but not understand it because they lack key foundational knowledge and understandings. Often visitors can pick this up; off pat speeches that the speaker does not understand have a particular ring to them.

Thinking systematically about scaffolding allows us to identify the key foundational areas of knowledge, understanding and concepts that must be included in the curriculum before moving on to the specifics.

Curriculum

In constructing the curriculum for the recent course *Interpreting Cave Geology 1,* developed for Jenolan, I first considered the question 'What are the big areas of content (knowledge, understanding & concepts) that guides need to know about when they are working in the caves?' The answer was two big blocks:

Block 1	The caves and how they formed (Speleogenesis & cave morphology)
Block 2	The stuff in the caves (Cave deposits and speleothems)

Because most of the work of guides is in the caves, I left karst landforms and surface processes out. This could be added if necessary or if time allowed as a third major block of content.

Three types of content were then placed into these two blocks:

A	Generally applicable content elements (e.g. basic karst hydrology in Bock 1)
B	Phenomena that guides would encounter at Jenolan (e.g. potatoes in Block 2)
C	Items of general interest to widen guides horizons (e.g. spherical niches in Block 1)

Once this was together, it was time to construct the scaffolding. This material would come first in the curriculum and teaching program and would provide the learners with foundational knowledge, understanding and concepts. This material had to start at the very beginning and be sufficiently comprehensive to underpin Blocks 1 and 2. The question here was 'What foundational knowledge is required to underpin teaching and learning of Blocks 1 and 2?' The answer again was two big blocks:

Block 3	Some basic geology (Fundamental Geological Concepts)
Block 4	The geological and geomorphic history of the area (Earth history of the Jenolan Caves Region)

For convenience, and in recognition of the structure of the discipline, Fundamental Geological Concepts was divided into two parts: -

3.1 Earth materials

3.2 Structure, Time and Stratigraphy

The structure of the curriculum thus became:

Component 1	Fundamental Geological Concepts (Block 3)
Component 2	Earth History of the Jenolan Caves Region (Block 4)
Component 3	Speleogenesis & cave morphology (Block 1)
Component 4	Cave deposits and speleothems (Block 2)

When putting together the printed notes, which became the de facto detailed curriculum and teaching plan, it was essential to check that terms and concepts did not appear in Components 3 and 4 that had not been defined or explained in Components 1 and 2. This was quite time-consuming and surprisingly difficult. It was easy to pick up the more unusual material, but common geological terms such as *bed* and *joint* were almost overlooked.
As it is difficult to access detailed information on much of the material presented in the courses; background and extension information was included in the printed notes for future reference by the guides.

A Model Curriculum

From the considerations discussed above a model curriculum for an Earth science course for cave guides would look like this: -

1. Fundamental Geological Concepts

1.1 Earth materials
1.2 Structure, Time and Stratigraphy

2. Local Earth History

2.1 Local geological history

2.2 Local geomorphological history

3. Speleogenesis & cave morphology

3.1 Generally applicable content elements

1.2 Phenomena that guides would encounter at the specific location

1.3 Items of general interest to widen guides horizons

2 Cave deposits and speleothems

4.1 Generally applicable content elements

2.2 Phenomena that guides would encounter at the specific location

2.3 Items of general interest to widen guides horizons

5 Karst landforms and surface processes (optional)

5.1 Generally applicable content elements

5.2 Phenomena that guides would encounter at the specific location

5.3 Items of general interest to widen guides horizons

It is important to note that the actual content within each of these headings needs to be tailored to suit local conditions, individual needs and changes in scientific understandings.

The detailed content will differ even within the same geological and geomorphic zone. For example, the content and emphasis of a course designed for Jenolan would not be the same as one designed for Wombeyan.

Mode of delivery

There are many practical constraints on the delivery mode for professional courses for cave guides. Since most show caves in Australia are not located close to cities or even large towns it is usually necessary for the instructor to go to the cave, rather than have the guides attend at the instructor's institution. Consequently professional development courses for cave guides tend then to be intensive events, held over 2-3 days at the cave location.

The first problem with this situation is what is technically called *cognitive load*. It is much easier to endure 24 hours of teaching and to learn effectively if it is spread out as two, 2-hour sessions over six weeks, rather than as eight-hour sessions over three days. The six week arrangement not only reduces the amount to be learnt per day, it gives the learner time to digest, reflect and ask questions and the teacher the opportunity to reinforce important concepts.

The 2–3 day pattern makes it inevitable that most of the teaching will be teacher-centred presentation, with lots of sitting and listening. I addressed this problem by: -

1 Spending the afternoon of each day in the field: -
Day 1: Looking at local geology & geomorphology
Day 2: In the caves looking at speleogenesis and morphology
Day 3: In the caves looking at sediments, speleothems and minerals

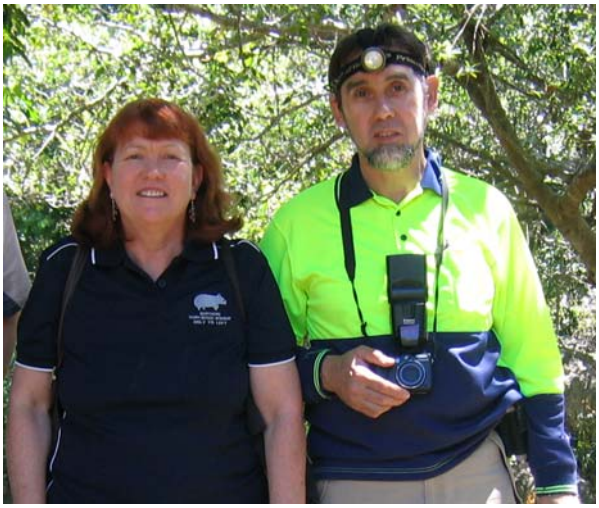
2 Having practical sessions in day 1 looking at mineral and rock specimens.

3 Limiting the use of PowerPoint and not showing images of things that could be seen in the caves.

4 Humour, questioning, a Socratic approach (were possible) and strategic timing of morning tea were used to maintain attention.

The 2-3 day pattern is clearly not ideal; participants tend to leave with their heads spinning while the instructor is significantly drained. Professional development courses for cave guides are not off the shelf items and are not directly transferable from one cave area to another, even within the same region. They require a great deal of initial preparation and thought and are hard work for both the participants and the presenter. I hope that this small article will give both guides and managers some insight into the issues facing those developing and presenting these courses.

I would like to thank my wife Penney, who has assisted on several of the courses and endured the best and worst of cave guiding in many languages and for helping with the text. Thanks are also due to Cave guides and managers, locally and internationally who have given me the privilege of observing their work; the guides who have participated in the courses with such good humour and my colleague Deb Hayes for her helpful comments.



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