This assignment is the main written assignment for the PGCE (Primary) and 3 Year BEd degree at the University of Gloucestershire. It is undertaken during the students’ first three week attachment and designed so that they work with a small group of 4 to 8 pupils.

Assignment - Learning in science

This assignment is designed to help you reflectively analyse and evaluate your teaching of science and enhance your awareness of your practice, so improving your teaching skills. It should identify aspects of the NC programmes of study and draw on children's previous understanding and experience.

The school should provide the opportunity for you to carry out the activities, and it is understood that you will be asked to work within the planned schemes of work of the school.

It is your responsibility to negotiate this work with the school.

The teaching will usually occur within your classroom, but if this is difficult for any reason of school timetabling, you may have to negotiate access to children from another class for the work.

Please inform the College at an early stage if you are having difficulties with this.

Carry out the following teaching sequence with a small group of children (up to eight) during your serial attachment.

1) Elicitation

- **Select** a science concept area in agreement with the class teacher (choose a narrowly defined area, rather than a broad one).
- **Identify** the key scientific ideas (related to the PoS of the NC or the desirable outcomes) and research on this concept area which identifies na¡ve ideas the children are likely to hold and which may inform your choice of elicitation activity.
- **Devise elicitation activities** (eg interview, structured activities using everyday materials, concept maps, drawings etc) making use of your literature search, to find out what children have experienced, know and/or understand about the concept area.
- **Carry out the elicitation** and identify the range of experience, knowledge and understanding of the children.
- **Consider the children's scientific understanding and relevant experiences** in the area, including alternative ideas and compare this to published research in the area (where possible) and relate this to what you know about child development.
- In the case of KS1 children you will emphasise experiences which support scientific development in the area, whilst you will emphasise conceptual understanding within the area in the case of KS2 children. In either case an indication of what is to come (after KS1) or what has already taken place (before KS2) will form a part of this section.

2) Intervention

- **Devise intervention activities** to help children develop a better scientific understanding of, or a wider experience in, the concept area you choose. Your planning should consider:
i) the concepts you wish to develop; ii) the resources needed; and iii) the strategies you will employ, including key questions you may use in the interventions
    - Guide the children to carry out the activities making records of the children's responses and interactions. These activities would normally be carried out over two or three sessions.

3) Reformulation

- **Devise** ways in which the pupils can make sense of what they have experienced. This will normally be through talking activities and will take place alongside the intervention activities.

4) Assessment and evaluation

- **Assess** the children's understanding as a result of the activities (preferably after a few days or a week). Provide evidence of how you have assessed at least three children to NC assessment levels in relation to relevant attainment targets.
- **Evaluate** the effectiveness of your teaching and consider how you may improve or develop your approach further.

Your account should:

- **critically analyse and evaluate** the work in terms of children's learning in the context of your initial aims, your teaching and how the children's ideas developed through the interventions
- **refer** to specific literature relating to your chosen concept reviewing the naïve ideas children might hold in this concept area. Where you find no specifi material, try to look more generally at the big ideas of which your concept area is a part (eg *Teeth* is part of food, *friction* part of forces and *purifying materials* is part of classifying substances).
- **refer to significant theories** of children's learning and any relevant research on children's learning in the topic, where possible, to support your analysis
- **provide supporting evidence** for your analysis, in clearly labelled appendices These should be referred to in the main body of text, eg lesson plans, photographs, descriptive accounts of the work, and/or examples of children's outcomes. (Use photocopies or photographs so pupils' original work can be returned to them.). Remember that your appendices will not be read by the second marker, and even the first marker will only refer to them when you direct from within your text. Make sure they are fully labelled and paginated. Use high lighter to direct attention to extracts what are relevant. Consider bringing some *important* tables, drawings and results into the main text as figures or diagrams (at no extra word dount).

Criteria for assessment - *(Learning in science)*

The five criteria for assessment are as follows:

1) standard University criteria for assignment writing
2) clear identification of the context (including age, ability and previous classroom experiences of the children, reasons for choosing the topic)
3) analysis of your role as a teacher in the activities referred to, identifying, for example, why you chose a particular elicitation or reformulation activity.
4) analysis of the children's learning – what were you expecting them to understand, did they achieve this?
5) use of appropriate literature to support your analysis, including reference to similar research findings, if possible, and ideas on children's development and learning in science (The Nuffield Primary Science Project teachers' guides will be particularly relevant here.)

Length: 2000 words

Feedback from assignment

When your assignment is returned you will find numbered stars in the margin. These numbers refer to the comments that follow. We may simply put the initial number, in which case it is left to you to identify the actual comments from within the list, that refer to your assignment. Reading them now may help you structure your writing.

The following abbreviations will be used:

TPS = Teaching primary Science wp = word processing error s= spelling p= punctuation g= grammar

*1General comments

*1.0 You should be using the Harvard system in full for referencing - no need for ref numbers. Refer to authors in the text, eg (Newton 1666) and the authors listed alphabetically at the end, with full publishing details. *1.1 Spelling, eg one phenomenon, criterion, but several phenomena, criteria; sepArate, prepAration. Take care with apostrophes in possessives, but note *his hers its* but *it's = it is.*

*1.2 Protocol is not to mention schools or pupils by name, eg use pseudonyms and terms such as 'rural school'.

*1.3 We need to know the context, eg class, number, school-type.

*1.4 You should provide a clearly labelled paragraph structure to the account. *1.5 Use photocopies or photographs of children's work - return the originals. *1.6 It is helpful if the appendix is paginated.

*1.7 For quotes - if less than 3 lines flow into the text and use singe quote marks; if three lines or more, indent the quote, italicise and show no quote marks. Show the page number, eg (Newton 1666 p35).

*2Children's ideas

*2.0 The constructivist approach should not be confused with discovery learning. Evidence shows that pupils discover little by doing experiments, unless they have a clear idea of why the experiment has been set up; in this way experiments are used to test out ideas. Discovery learning leads to childish conceptions, hence elicitation needs to be followed by intervention by the teacher. At KS1 most 'experiments' are simply to give pupils new experiences.

*2.1 Questions must be asked in a non-threatening way, where the questioner

'genuinely' doesn't know the answer and where the child is 'in control'. If children want to know 'if they are right' talk in terms of the *old way* and the *new way* of talking, rather than right and wrong (see *2.3 and *5.4).

*2.2 If you put a question to the class, they raise their hands and one child answers, you cannot then say 'They all knew'. Try using the 'tell-each-other' or 'whisper-to-your-partner' technique (TPS, professional issues, page P15 last paragraph).

*2.3 Children's ideas can be useful, but limited. We should build on them, or help them reconstruct them where possible. They should never be classed as *Incorrect* or *Wrong.* For example, a sign in a butcher's shop may say 'No

Animals' - but the shop is full of dead animals, and humans, who are also animals, are welcome. So perhaps we should not **over-ride or replace** children's ideas - they are too well used in everyday life to discard. We need instead to make the pupils **aware** that there is conflict, and to show the limitations of both the scientific and the every-day versions.

*2.4 Elicitation needs time but not too long, otherwise you are in danger of entrenching and validating existing ideas rather than providing time to explore new ideas and experiences.

*2.5 If the first person that puts up their hand gets it 'right' why not ask, 'Does anyone agree?' 'Tell me what you think' (see also *2.2).

*2.6 Asking children to sequence drawings is a very useful procedure - eg manufacturing paper (trees, chippings, paper on a big roll, paper sheets)

*3Intervention

*3.0 Intervention presents new ideas. Children need time to challenge their existing framework, and time to make sense of it. This has to be done orally. The children have to talk about what they have done and learnt (see *3.1 *5.1 and *5.4).

*3.1 Please avoid the word *delivery* - it implies a one way process. Pupils must be given time to make sense of their experiences.

*4Fair testing

*4.0 To keep numbers to single figures use non-standard units of measurement. *4.1 Change or consider only one variable at a time, eg loud/soft sounds arise from different objects at the same distance *or* the same object at different distances. When sorting, compare objects made from the *same* material, or the *same* object made of different materials (TPS Unit 4 page 4.9 and 4.10). *4.2 Experiments test ideas, or lead to pattern finding. You can only ask if it is a fair test after you have set up an experiment. To be fair only one thing should be changed at a time.

*4.3 Give experience first, eg of germination and growth of seeds, then ask specific questions leading to a 'fair test', eg 'How could we test to see if they need light?'.

*4.4 Allow progression in your measurements, eg which absorb, which don't which absorbs the best? Measure the amount of water absorbed by each cloth.

*5Using Ideas and assessment

*5.0 A real measure of the success of your teaching/pupil learning is when they can use ideas or words, spontaneously, a week later. You should create opportunities to allow this to happen every few weeks. Don't let the science ideas die.

*5.1 At KS1, recording is best left verbal (where the pupils are more confident) with you doing the writing or scribing. New language or ideas need to be presented by the teacher and heard by pupils. Only when they understand the need for the new idea/word will pupils begin to use it actively (see *5.3).

*5.2 A few of you attempted to assign National Curriculum levels - well done. *5.3 By all means use science experiences as the source for their creative/emergent writing.

*5.4 Children must first hear new words being used, then begin to understand them. Only then can you expect them to use the words themselves (*see-through* is as good as *transparent*).

*5.5 Giving children an alternative audience, 'Imagine you have to explain this to someone from another planet', is a good way of giving children ownership of their writing/talking (see *1.2).

*6Conceptual issues (These will be specific to your topic and are put here as exemplars of the issues that might arise)

*6.1 'Bigger push makes it go further' - better to say *faster* because the distance will depend on the frictional force from the surface, whereas the speed of the truck, after you finish pushing will always be the same (for the same push).

*6.2 Don't say objects are cold (or hot) unless they *are* (eg left out in the frost, or kept in an oven). Some materials *feel* warm or cold to our touch, even though they are all at room temperature. See TPS chapter 8 pages 8.7,9,16 and 17.

*6.3 Don't confuse heat (amount of heat energy) and temperature (how hot/degree of danger). A red-hot nail is very hot and dangerous, but

'contains' very little heat (plunge it into a cup of cold water, and the heat will hardly heat the water at all) (see TPS p8.7).

*6.4 Try to get children to think about why we (and other animals) have senses

- to avoid danger, to find food etc. Try to get beyond pupils who say, 'Taste is to see what we like to eat'.

*6.5 Growing seeds involves both *germination* (light not needed) and *growth* (light needed).

*6.6 In everyday life, heavy often means dense and light often means not dense - *'Lead is a heavy metal'*.

*6.7 It makes it much simpler if you ask children to hold the objects half way down and see if they rise up (float) or fall down (sink). Floating and sinking then both become an active process, and you avoid the problem of surface tension and boats (see TPS pp7.20-7.22).

*6.8 Only introduce bulb holders after children have experienced 'naked' bulbs, and seen the two connections needed to make the current flow through them. See NCC Electricity loan book and TPS unit 5 pages 2, 5 and 13.

TPS refers to our course handbook, Teaching Primary Science, available from the University of Gloucestershire school of Education, FCH Campus, Cheltenham, GL50 4AZ at a cost of £20 including p&p.