The evaluation of a lesson for brickwork students.[1]

It was suggested that lecturers prepare the questions used to support and guide the learning process Some lecturers were sceptical about the advice and Keith Ryan decided to test the advice on the basis of an analysed lesson.

The topic for this lesson was ground-water and domestic drainage. The objectives and lesson content can be summarised as follows.

1. Ground-water objectives

1.1 The students will understand the reasons for the use of ground-water drainage.

1.2 The students will understand what is meant by the term 'ground-water'.

1.3 The students will become familiar with the types of systems used for ground-water drainage.

1.4 The students will become familiar with the materials and methods of jointing pipes used in ground-water drainage systems and will be able to reproduce, when asked, sketches of the various pipes in use.

1.5 The students will understand the methods of backfilling used for ground-water drainage.

1.6 The students will understand the methods of construction for soakways and catchpits.

2. Content is summarised in the form of questions, as this reflects the chosen teaching method:

TQ *What are we referring to when we use the term 'ground-water'?*

TQ *Imagine a building is to be constructed in a low lying field that at times may be subject to flooding due to excessive ground-water. What problems do we expect to encounter when construction commences?*

TQ *Do you think that ground-water is only encountered after long periods of heavy rainfall?*

Explain the term water-table.

[1] Ryan K, The Evaluation of a lesson for CITB brickwork students, **FERN Journal** 1, Spring 1980

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TQ *If we managed to construct the building during a long dry-spell when the water-table is low and no problems are encountered, what would the effects be of ground-water appearing at a later date?*

TQ *If ground-water creates so many problems, how may we dispose of it?*

Explanation of types of system available and illustrated handouts used to support this teaching point.

TQ *What materials would be suitable for the manufacture of ground-water drain pipes?*

Description of material based on samples and student sketches showing various types of pipes available.

TQ *If pipework is used as a means of ground-water disposal, how does the water enter the pipes?*

TQ *Where does the water go to once it has entered the pipework system?*

Explanation of disposal of ground-water, soakways, water courses, public sewers. Sketch of reverse action interceptor trap.

TQ *Before it enters the pipework system, the water has to pass continually through various layers of soil. What problems may be caused inside the pipe system due to this action?*

TQ *Explanation of the term "silting up".*

TQ *What precautions can be taken to reduce the amount of silt entering the pipes?*

Explanation of methods of backfilling and the use of brushwood or straw as a filter.

Although precautions can be taken to reduce the amount of silt entering the system, it is almost impossible to prevent it completely. Consideration leading to an explanation of the use of catchpits.

TQ *It may be necessary for the drains to pass underneath buildings. What problems may be encountered where a drain passes under a building?*

TQ *The drain may need to pass close to existing trees. What problems may be encountered when a drain passes close to a tree?*

TQ *How can we prevent vermin from entering the pipe system?*

Ground-water drainage is a topic that the students have not yet studied and therefore knowledge of the subject is expected to be very limited.

Outlined are questions that are relevant to the main points to be discussed during the lesson. It is hoped that questioning will encourage student participation which should lead to further discussion and questioning.

3. Domestic drainage objectives

3.1 The students will understand the types of waste to be disposed of from domestic buildings.

3.2 The students will understand the terms 'foul water' and 'surface water'.

3.3 The students will understand the characteristics of a standard drainage pipe and the materials from which it is manufactured.

3.4 The students will understand the methods of jointing for the different materials and will be able to sketch, when asked, cross sections through the pipes showing the method of jointing.

3.5 The students will understand the two types of drainage system used and will be able to produce simple line diagrams of the systems.

3.6 The students will understand the positioning and construction of access chambers.

3.7 The students will understand methods of bedding and backfill.

4. Domestic drainage summarised in the form of questions.

TQ *Imagine a normal domestic building such as a house or a bungalow. What types of waste are produced within and around the dwelling?*

TQ *How may these waste products be disposed of?*

TQ *Which of the two liquid wastes creates the greatest health hazard?*

TQ *How may we dispose of the surface water?*

TQ *Can the foul water be disposed of in a similar manner?*

TQ *Where should foul water be taken to?*

TQ *Can the surface water be taken to the same place as the foul water?*

TQ *What problems may be encountered at the sewage works if both foul and surface water are taken there?*

5. We have looked at typical pipes for ground-water drainage, let us now consider the type of pipes used for 'domestic drainage' and a typical pipe.

TQ *What are the basic characteristics of this pipe?*

TQ *Why does it require these basic characteristics?*

TQ *What materials may be used for the manufacture of domestic drain pipes?*

Explanation of methods of jointing using samples.

TQ *What disadvantages would a jointing system have that uses cement?*

TQ *Why is it necessary to use tarred gaskin?*

It is not envisaged that the lesson will develop beyond this point.

The knowledge which students had gained from work experience enabled the lesson topic to be developed more rapidly than had been anticipated. The result was that during the latter part of the lesson a didactic teaching style was adopted due to the fact that questions had not been prepared.

6. The lesson was divided into three parts.

6.1 Surface water drainage based on teacher questions prepared in detail.

6.2 Domestic drainage based on prepared questions.

Total time for sections 1 and 2 was one hour thirty five minutes.

6.3 Aspects of domestic drainage for which questions had not been prepared.

7. The BIAS analysis based on a fifteen minute extract from each part of the lesson clearly reveals significant differences in the teaching performance.

7.1 Surface water drainage

The TL element amounts to less than 50% of the fifteen minute sample analysed from this section of the lesson. The distribution of TL is interesting. A high proportion of TL occurs in the introduction to the topic, and this was followed by a period in which TL was dramatically reduced and TQ was used to extract information from the students. A high proportion of TL was apparent as points established by questioning were reinforced and elaborated. The development of the next stage of the topic followed a similar pattern. The accompanying graph shows the changing proportion of TL occurring in each period of one minute forty five seconds forming the fifteen minute extract selected for analysis. Peaks indicate periods of lecturing as a means of reinforcement, explanation or introduction. Troughs coincide with periods of questioning.

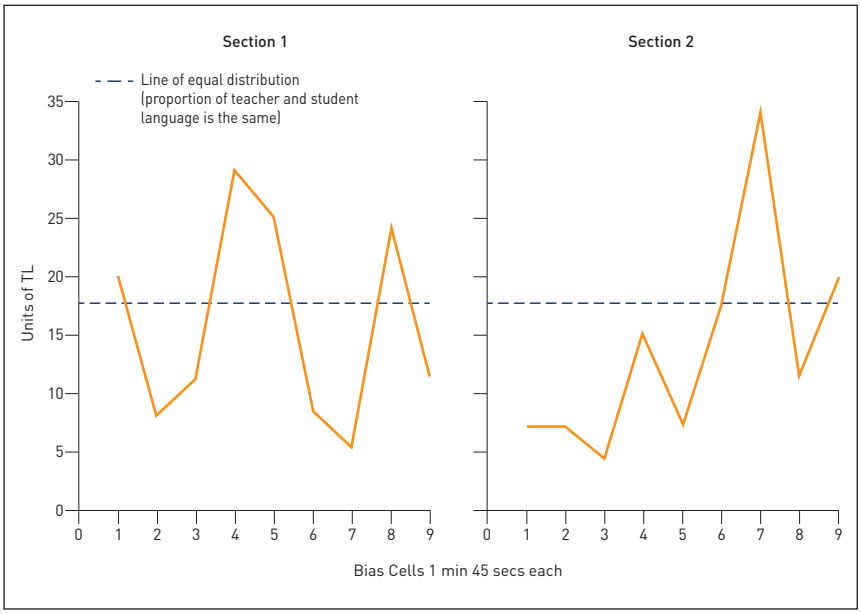
It is interesting to note that TQ, TR and SR collectively form 41% of the sample, only 7% less than TL. This suggests that overall the planned even distribution of lecturing to questioning was achieved.

7.2 Domestic drainage

The questions for this section of the lesson had not been prepared in such detail as the for the first section of the lesson. The following table suggests, however, that the desired teaching style was maintained.

Analysed data	Language categories						
	TL	TQ	TR	SR	SV	S	X
Section 1	48%	16%	13%	12%	0%	7%	2%
Section 2	40%	15%	20%	8%	1%	6%	7%

Figure 1: Distribution of TL and TQ



The following points are of interest:

7.2.1 The increased proportion of TR may reflect a form of lecturing based on student answers and a slowing of the rate at which question sequences were developed.

7.2.2 The increase in the proportion of X reflects the greater use of the chalkboard for the elaboration of teaching points, rather than prompting the development of student observations.

7.2.3 The proportion of TL did increase as the teaching progressed.

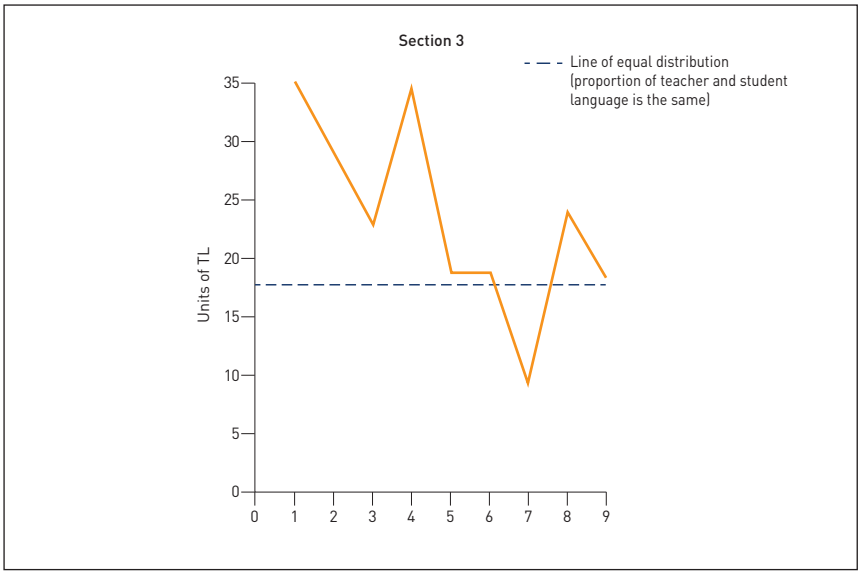
7.3 Domestic drainage

The following table indicates the dramatic change in approach apparent in this part of the lesson.

Analysed data	TL	TQ	TR	SR	SV	S	X
Section 1	70%	9%	9%	4%	0%	1%	7%

It was anticipated that the development of the topic would have been slower than was the case. As a consequence no questions had been planned for the last third of the lesson.

Figure 2: Distribution of TL and TQ



The graph for a fifteen minute extract from this section of the lesson suggests that a more didactic approach was adopted.

7.4 The following table suggests significant differences in the effectiveness of the questions that were used in the three sections of the lesson.[2]

Questioning data	Section 1	Section 2	Section 3
mean length of pause after teacher questions in seconds	3.5	3.42	1.66
mean length of student response in words	3.25	2.42	2.38
number of questions	28	26	21

The comparison of the different sections of the lesson has important implications for teaching preparation particularly when the chosen strategy is based on teacher questions.

[2] In the latest version of the software the timed intervals between language categories can be collected to the nearest hundredth of a second. The timed intervals in seconds in this paper were collected manually.