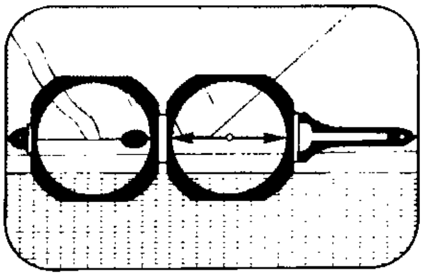
Geological Education



Individual Audio-Visual Instruction for Geology Students

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Designing an introductory geology course at university level can be a frustrating task. On one hand, the course must be interesting enough to keep the students coming to classes, yet it must also give a broad introduction to the subject that will provide the basis for more advanced courses. Because of geology's high factual content, an emphasis on memory work is almost unavoidable, yet if the student is to learn anything, these facts must be presented to him in digestible chunks, with plenty of opportunity for review. Even assuming that university staff can design a course that meets all of these academic goals, they must still cope with the problem of overcrowding in first year courses which makes effective teaching difficult. In addition, in a course where so much ground must be covered, there is the ever-present pressure of time. Unless the student is keen and well-organized right from the start, he may suddenly find himself facing the examination with a mass of material which he has only half-learned.

A great need exists in introductory geology courses (and, indeed, in introductory courses generally) for some kind of instruction that can overcome these problems – instruction that is geared to the individual student, allowing him to learn and review at his own speed, while still covering the required amount of material.

At the Department of Geological Sciences, Queen's University, attempts have been made to meet this need by setting up an individualized audio-visual method of instruction for the lab section of the first year Applied Science geology course. After one year of trial as an experimental project, supplementary to the regular lab teaching, it has proved to be a great success.

The laboratory part of the introductory Applied Science geology course at Queen's, confined to the autumn term, deals with rock and mineral identification, topographic maps, and geological structures. Initially, we concentrated only on four lab units dealing with rock and mineral identification, because these seemed to be the ones which were causing students the most trouble. For each one of the units, we designed a tape-slide package that the student could work through on his own, using cassette tape recorder, earphones, and carousel slide projector.

The material covered in each of these audio-visual units was the same as that regularly given by the lab instructors, i.e., a brief introduction to the topic, an explanation of the procedure for identifying specimens, and finally, various exercises carried out by the students themselves using their trays of rocks and mineral samples. In constructing the audio-visual packages, we tried to avoid simply reading the lab instructor's notes into the tape recorder. Rather, the tape served as a commentary, linking a variety of activities that the student was directed to carry out as, for example, looking at slides, comparing features shown in the slides with the same features in the individual specimens, reading relevant sections of the text or lab notes, and performing various identification exercises. We used slides sparingly, in order to avoid flashy "slide-shows" which might not encourage the student to try and find the features being described in the actual mineral and rock samples themselves. Rather, slides were used to broaden the scope of the basic lab material in three ways: (1) they were used to show alternative examples of the specimens in the students' trays, especially where these specimens could exist in many different colours (e.g., quartz) or shapes (e.g., crystals vs. cleavage fragments of orthoclase); (2) slides showing microscopic thin sections of rock were included to help explain concepts of texture and mineral composition that are often not easily visible to the naked eye in the hand specimens, and (3) we included numerous slides to show how the rocks and minerals being studied appear in the field, or underground.

Each of the four tapes was approximately 20 minutes long, each beginning and ending with a different piece of "rock" music. There were approximately 15 slides for each of the four units; these were supplemented by some excellent commercial sets of rock and mineral photographs posted on a bulletin board in the lab room.

A special grant from the University permitted the purchase of five sets of equipment which were set up at the back of one of the lab rooms. Students could come in any time during the evening or on Saturday morning to use the audio-visual packages, and could spend as much time as they needed. A lab demonstrator was on hand to sign out the material, and to answer any questions.

In its first year of operation, the audio-visual experiment proved highly successful. Over half of the class of 340 students used the facility, some returning several times to work through all four packages. Students reported that they found the packages particularly useful for review, especially if they had missed one of the regular lab periods, or had found some of the concepts confusing. As a result of this initial success the audio-visual facility will be extended this year by preparing three more packages on geological structures.

Several observations can be made concerning this particular method of instruction. Foremost, it appears to have filled pre-eminently a great need among the students to learn and to review individually, at their own speed, and at the times most convenient to them. Such factors are particularly important for first year students whose time is so strictly scheduled. The combination of traditional regular lab periods plus the audio-visual packages permits the students a choice of ways to learn geology, thus allowing for different learning preferences.

A second observation is that the tape-slide packages are easy to prepare, and do not require a great deal of technical know-how. We collected the slides from various professors at the Department, and copied them ourselves. We also recorded the tapes ourselves, using equipment at, and the help of, Queen's radio station, CFRC. The most difficult part of the project is in designing a lab unit; a great deal of careful planning and forethought must go into the preparation of individualized instruction. But, the effort is worth it, because individualized instruction, which tries to duplicate one-to-one teaching, has been found to be highly effective. Its usefulness is not limited to basic introductory courses, but applies equally well at more advanced levels. Beyond the university setting, individualized audio-visual instruction could be most useful for a wide variety of professional training courses, both at managerial and craft level.

The importance of this method of instruction is not that it is new, nor that it is "audio-visual" (since all too often that only means "gimmicky"), but that it allows each student, as an individual, to learn at his own speed, and to review as often as he feels is necessary. By using individualized audio-visual instruction as a supplement to regular classroom instruction at Queen's, we are hoping to give students the best possible chance of learning geology, and of learning it well.

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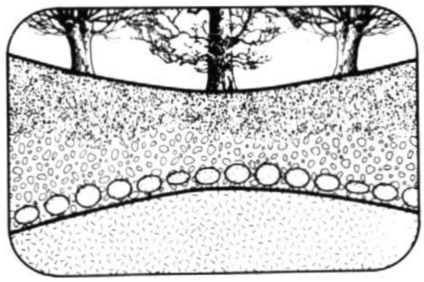
Note. Lucinda Bray, who is the daughter of R. C. E. Bray, is working on her Master's degree in Educational Technology at Sir George Williams University, Montreal. The Queen's project described in this feature will form part of her thesis (John Usher).

The Soil Column



Pipelines, Soils and Farming

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The impact of pipelines on farm productivity is far greater than is generally realized and in many instances the farmer can never be compensated for short and long term damage.

Although this article devotes itself to the effects of disrupting a soil column on a typical farm in southern Ontario (*Fig. 1*) the problem is applicable to any area crossed by pipelines. Some 50,000 miles of pipelines have been installed in Canada, many of them affecting class I land, but there have been no adequate environmental impact studies. The May 1974, National Energy Board hearing of an application to extend a pipeline from Sarnia to Montreal was the first to require environmental studies since the Board itself established environmental guidelines for federally chartered pipelines crossing provincial boundaries.

Soil Composition

A typical soil profile is broken into a series of horizons (A,B,C)

Figure 1
A pipeline excavation illustrating severe side calving.