ABSTRACT. This paper reports on a project that incorporated mathematical modelling within a pre-university subject at a secondary college. The program emphasised modelling rather than models and extended over two years. A qualitative methodology was used to evaluate the program with information collected in a variety of forms including student written reports, oral interviews, video reports, diaries, questionnaire data, as well as informal observation. The program was evaluated in terms of five criteria derived from the stated aims. From the synthesis and triangulation of the data it was inferred that the program aims were achieved to an encouraging degree. The paper describes and illustrates key aspects of the program and its evaluation.

We know what we mean by modelling as a learning activity at school and undergraduate level - though many “modelling” courses and books are still only about models not modelling in that they demand of the student only that he learn and use, and not create or modify models. Burkhardt (1984)

This paper has emerged from the monitoring and evaluation of a modelling course that is implanted firmly within the category of modelling rather than models in the sense described above. The course is located within one of two senior level mathematics subjects that are taken by students preparing for tertiary studies in science and engineering. Its emphasis is on the development and maturity of modelling skills over a two year period. The venue for the program is a state run college in an outer suburban area that caters for students completing their final two years of secondary education together with students enrolled in trade and technician certificate courses. In the conventional part of their subjects the students study areas such as co-ordinate geometry, trigonometry, calculus, matrices, vectors, particle mechanics and computer mathematics. These topics are taught and tested in a traditional format. The modelling component is assigned an average of 1 hour per week of class time over the two years of the course but much activity occurs out of class time. The allotment is just over 25% of the total time assigned to the subject of which it forms a part so that the modelling strand runs in parallel to the conventional coursework. This means that while only basic skills involving arithmetic and simple algebra are available for the early models later problems can involve the choice and use of content learned and consolidated within the parallel coursework.
Trigonometry, calculus, computing, and mechanics have all been utilized by students in attacking summative problems.

The course began with a firm philosophy which accepted the value and goals of modelling for students as expressed in works such as the Open University Foundation Course (1978), Burkhardt (1983), Berry et al. (1984), and Spode publications, (1981, 1982, 1983). Further it was believed that students should learn to co-operate as team members, should develop confidence and competence in both written and verbal communication, and should therefore learn to prepare reports (both individual and group), and to be articulate in explaining and defending decisions taken, methods used, and conclusions reached.

The aims of the modelling program are summarized below.

To develop the confidence and ability of senior school students in:

(1) applying mathematics to unstructured problems and real-life situations
(2) developing skills of individual and team participation in the solution of problems
(3) communicating and evaluating the results of a project.

It will be recognized that aims (2) and (3) demand a commitment to a methodology that values attributes such as those epitomized within paragraph 243 of the Cockcroft Report (1982):

* discussion between teacher and pupils and between the pupils themselves
* appropriate practical work
* problem solving, including the application of mathematics to everyday situations
* investigational work

1. THE TEACHING FRAMEWORK

It was assumed that successfully applied mathematical modelling would include at various times those aspects that are summarized, in the Open University seven block diagram (Fig. 1).

This diagram provided the basic structure through which students were introduced to the conceptualization and application of modelling via the medium of the case studies.

To meet the other methodological aims a varied teaching program was devised that included the following components.