Investigative Projects in Engineering for Secondary School Students 2

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Engineering faculties around the world must always work to ensure that they attract high standard students to their courses. Unfortunately prospective students have a poor appreciation of the engineering profession. They are often unaware of the diversity of challenges and opportunities that await them in an engineering career. A number of strategies exist to raise the profile of engineering within secondary schools. One activity involves targeting the students while still at school, with engineering academics either visiting the schools or playing host to the students on campus. An alternative to this is to present to mathematics teachers real engineering design problems that may be solved by the application of relatively simple mathematical concepts.

This paper describes two activities for use in the senior secondary mathematics class room which have been developed to illustrate how mathematics is used by engineers. The storage of bulk solids such as coal, gravel, iron ore and wood chips provide the background for the first activity. A series of simple experiments have been developed which allow the formation of solid heaps to be studied in the class room. Using everyday solid materials of a range of properties such as sand, rice, milk powder, sugar and confectionary students are able to take a range of measurements relating to the shapes of the heaps. Using simple geometry they can then characterize the shapes of the heaps. Mathematics topics covered include statistics and geometry while engineering topics include the storage of bulk solids, the angle of repose of the heaps and the sphericity of the solid particles.

The second activity relates to the characterization of oil fields. After a brief introduction which includes a description of underground petroleum reservoirs and how oil wells are drilled students are given graphical data relating to the physical properties of an actual petroleum reservoir. This data relates to the thickness of the field as well as the field porosity and oil saturation. Mathematics topics addressed by this topic include graphing and averaging while the context gives the students an introduction to petroleum engineering.

Activities including the above have been used in the secondary school class rooms in Melbourne for up to nine years. They have proved to be a successful way to raise the profile of the engineering profession within the secondary school community.