WORK IN PROGRESS

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A project based learning activity to motivate students towards a higher level of appreciation of materials science in maritime engineering

Denis Lisson[a] and Vikram Garaniya[a].
[a]*Australian Maritime College, University of Tasmania, Locked Bag 1395, Launceston, Tasmania 7250.*
Corresponding Author Email: V.Garaniya@amc.edu.au.

BACKGROUND

Materials science is concerned with three primary inter-connected elements; material structure, properties and processing, and relies heavily on the student's background in chemistry, physics, mathematics and mechanics. Applying the principles of materials science in practice leads to Materials Engineering, which deals with adapting materials and converting them into products required by society (Smith & Hashemi, 2010). This process involves an informed selection of the appropriate material from a large number of possibilities in order to meet the engineering and environmental needs of the community. To develop these skills, students need time, practice and experience, which cannot be adequately achieved outside a practical work environment. This paper proposes that a structured project supported by selected formal laboratory work greatly assisted students in gaining some of the maturity and practical outlook so important in the field of engineering.

PURPOSE

Without careful teaching and assessment methods, it is an unachievable task to bring the two strands of science and engineering together into a single unit of Maritime Engineering Materials. To overcome this challenge, a student focussed project was developed to challenge first year students to integrate materials selection, processing and testing together, in order to meet a specific engineering outcome. Furthermore, this project is expected to improve student motivation, and enhance comprehension of practical problems relating to implementation.

DESIGN/METHOD

The design and introduction of a project had to take into account the key elements of the required outcome, that is to enhance student motivation, and ultimately to lead to an improved understanding of composite materials, in an applied context. With these factors in mind, the following outcomes were defined:

- To achieve a specified goal by sharing ideas and working collaboratively within a group.
- Practical involvement in researching information on a modern engineering material.
- To gain an enhanced understanding of the properties of composite materials, with particular emphasis on the inter-relationship between the structure, properties, mode of manufacture, and the final performance characteristics. A skateboard was selected as the component for investigation, on account of its convenient size, and its contemporary popularity.
- To gain an insight into the importance of laboratory and field testing, and the adjustments that often need to be made to match textbook theory with practice.
- To prepare a technical report in a format that optimizes interpretation and clear presentation of experimental data, leading to logical conclusions and recommendations.

- To investigate the use of composite materials in a wider engineering context, with particular emphasis on marine applications.

This team based project involved design and manufacture of the skate board from polymeric composite materials. Students began their projects by researching the essential flexural and torsional material characteristics, in order to optimise street performance criteria such as stability and manoeuvrability of the skateboard. Students then selected a suitable composite material, to make the board of their choice. These skate boards were lab tested to determine the performance strength criteria. Final group reports outlining the results were provided for assessment.

INTERIM FINDINGS

Results obtained last year demonstrated a good correlation between composite flexural modulus and street performance of the skateboard. The composite materials used in a skate board are similar to those used in high performance yacht construction, and many other sporting applications. Practical knowledge and experience gained in this activity can be translated into larger scale maritime engineering material selection and evaluation.

FURTHER RESEARCH

It is planned this year to collect more results by providing each student with a set of questionnaires particularly about this project and asking them to express their experience. These results will be then analysed in late October 2012 and the resultant statistics will be reported in coming year symposium.

CONCLUSIONS & CHALLENGES

It was found that students, gained motivation from taking responsibility for each stage of their work, developed effective collaborative techniques in working with others, as well as thinking independently, and achieved improved awareness of practical issues relating to implementation. The strong correlation between practical work and enhanced motivation has been borne out by a series of student questionnaires over the last six years, in which consistently high ranking has been afforded to laboratory work.

REFERENCES

Smith, William, & Hashemi, Javad. (2010). *Foundations of Materials Science and Engineering* (5th ed.). Sydney: McGraw-Hill.

KEYWORDS

Project, Maritime Engineering, Material Science.