How to write 'Real Life' Examples

This is a brief 'how to…' guide that derives from experience in preparing the booklets of lesson plans entitled 'Real Life Examples in Mechanics of Solids' and 'Real Life Examples in Dynamics'[1] as part of the NSF-supported project (#0431756): 'Enhancing Diversity in the Undergraduate Mechanical Engineering Population through Curriculum Change'. Although developed for mechanical engineering it is believed that the principles apply in the teaching of all aspects of technology-related subjects and could be used by individual faculty as well as in the preparation of course materials for large audiences.

The real life examples are presented in the framework of the 5E learning cycle: Engage, Explore, Explain, Elaborate and Evaluate. The learning cycle was developed by the Biological Sciences Curriculum Study[2] in the 1980s from work by Atkin and Karplus[3]. It is useful in this context to consider the dictionary definition of each of these words:

- Engage – **to attract and hold fast** [*the students' attention*]
- Explore – **to look into closely, scrutinize, to pry into** [*the topic of the lesson*]
- Explain – **to unfold, to make plain or intelligible** [*the principle underpinning the topic*]
- Elaborate – **to work out in detail** [*an exemplar employing the principle*]
- Evaluate – **to reckon up, ascertain the amount of** [*knowledge and understanding acquired by the students*]

The definition in bold is from the Oxford English Dictionary[4] while the italics are added to put the definition into the current context. In preparing such lesson plans, real life examples are employed as demonstrations in the classroom to **engage** the students and to act as the focus while students and instructor **explore** the topic of the lesson. The same example or another is used to **explain** the principles by developing the appropriate model which can then be solved in order to **elaborate** the use of the principles in technical analysis or design. Finally, the students' grasp of the topic is **evaluated** by asking them to repeat the modeling and analysis using some further real life examples.

Research has shown that the difficulty of the examples does not influence their value in terms of enhancing student participation or contribution to their learning, providing the examples achieve student engagement by being sufficient relevant to the experiences of the students. This leads to some guidelines on the definition of real life examples, namely that they must relate the everyday experience of a diverse student population. So, in more detail, examples should:

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[1] Available at www.engineeringexamples.org

[2] Engleman, Laura (ed.), *The BSCS Story: A History of the Biological Sciences Curriculum Study*. BSCS, Colorado Springs, 2001.

[3] Atkin, J.M., Karplus, R., Discovery or invention? *Science Teacher*, 29(5):45, 1962.

[4] Little, W., Fowler, H.W., Coulson, J., Onions, C.T., (1983), *The Shorter Oxford English Dictionary*, Guild Publishing, London.

a) be familiar to diverse groups of students;
b) pose questions to which to it is useful or interesting to know the answer; or be transparently relevant to the challenges facing society;
c) contain a low level of abstraction in order to make a clear connection to reality;
d) provide a basis for the straightforward implementation of engineering principles;
e) have some thematic coherence; and
f) together form a wide range of artifacts.

It is clear that there are some conflicts at an increasing level between a) and b); between c) and d); and between e) and f). However this conflict helps to stimulate the creativity needed to generate a good set of real life examples. Most of the examples created in the two booklets mentioned above can be categorized into:

- Domestic (household) activities;
- College sports; and
- Student transport.

These topics certainly seem appropriate for lower level courses however in upper level courses where many students will have co-op or intern experience then it is possible to introduce some examples that relate to this professional familiarity.

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