Chapter 3.2.0

AUTHENTICITY AND GOALS – OVERVIEW

Peter Galbraith
University of Queensland, Australia, Email: p.galbraith@mailbox.uq.edu.au

Abstract: This chapter samples a spectrum of views, informed by selected papers, and by input from a discussion involving participants from nine countries. It hence offers the reader an opportunity to engage with the diversity of thoughts expressed on these topics, and does not purport to attempt a definitive synthesis.

1. INTRODUCTION

Goals and authenticity are in practice inseparable, as the degree to which a task or problem meets the purposes for which it is designed is a measure of its validity from that perspective. Two broad theoretical conceptualisations can be identified in curricular implementation: referred to by Julie (this volume) as modelling as vehicle and modelling as content. In the former, real world problems are used to motivate and provide a basis for the development of particular mathematical content, and the needs of this curricular mathematics dictate the selection of problems to address. In the latter, developing the capacity of students to address problems located in the external world, and to evaluate the quality of their solutions are pre-eminent goals. Of course it is possible for a modelling program to embrace both versions to various degrees. However it appears that individuals, by and large, appear to identify themselves with one or other priority, and it is useful to bear this in mind when reading the contents of this section.

Papers included present alternative emphases, and issues raised are complemented by contributions from a discussion group featuring participants from nine countries. Three major themes emerged within the discussion – modelling at different levels of education; difficulties in the modelling process; and task selection. The following is representative of the range of viewpoints expressed, rather than attempting an impossible consensus.
**Modelling at different levels of education:** At school level mathematical modelling is a way of bridging the gap from reality to mathematics. On the one hand it is possible for children to use daily life experiences to understand mathematics, and on the other developing modelling competencies becomes a way to understand the world of reality, and to place mathematics in culture. At university level development of modelling competencies is more associated with learning to use mathematics as a tool.

Bridging the gap from mathematics to reality is very important, and we need to ask how this is affected by the age range – are younger children involved in mathematical modelling doing the same generic things as older students? Since mathematical modelling is important from the beginning there are implications for teacher education at all levels – asking what mathematics is, developing critical thinking as a basis for citizens to take a stand on issues, and so on.

**Difficulties in the modelling process:** Challenges to authenticity occur when portraying modelling as representative of the real world: for example, what is transferable; what can be discovered through manipulating models; how to avoid stereotypical models. Developing an ability to choose relevant information, and to look for missing data are important, as is a model viewed as an accountable personal construct of a problem situation.

A workable teaching and learning scaffolding process is needed: e.g. how to start the modelling process validly and proceed, and how to develop and maintain a proper balance with the use of technology. Mathematical modelling implies we learn something new in or about mathematics, and to model a new situation can complicate the view of the mathematics behind it. This raises learning and teaching issues concerning approach and purpose, and of course for the setting of valid goals that are also feasible for a given context.

**Task selection:** Here the question of authenticity becomes very significant. There is a need to ask of a potential task: Is it worth it? Does it really help us reach our goals? It is important to introduce real world modelling tasks, and in general realistic problems involve at least two models developed incrementally. Two aspects raised here are: the importance of using models based on experience (influenced by student background); and motivation e.g. looking to the world and to other disciplines for knowledge and problems.

It is central that choice of task should be consistent with avowed purpose. For example, if applications and modelling is included in mathematics education to attain goals such as ‘students will experience school mathematics as useful for solving problems in real life outside the classroom’ then students, to some extent, need to encounter tasks that are close parallels to comparable problem situations encountered outside the mathematics classroom. This issue is taken up in several of the papers that comprise this section.