

Chapter 2

A Case Study of Curriculum Development in Engineering: Insights Gained over Two Decades

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ABSTRACT

This chapter draws on two decades of curriculum development to advance a series of insights into curriculum development, covering the scope of curriculum development, the processes involved in curriculum development, the people needed for effective curriculum development, the basis on which curriculum development should be built, and warnings to be heeded when undertaking curriculum development. To set the scene for these insights, the chapter starts with an outline of the curriculum development undertaken in the Department of Chemical Engineering at UCT over the past twenty years. This is followed by a discussion of the main motivations for curriculum development in our context, these being student overload, changing student demographics, new insights into student learning, the requirements of accreditation, and the changing chemical engineering workplace and profession. After that, the insights gained are discussed in detail, and then conclusions are drawn.

INTRODUCTION

This chapter is a case study of the curriculum development that has taken place in the Department of Chemical Engineering at UCT over the past two decades. The purpose is to present insights that we have gained into curriculum development in engineering during this period. The chapter first sets out the context in which we operate, and then covers the development of our curriculum over the past twenty years, with special attention

to outcomes-based development. Next we cover the main drivers for curriculum development in our situation. We then move on to deal with each of the insights we have gained, grouped under five major headings, and drawing on particular examples that illustrate them. The chapter ends by summarising the insights gained into curriculum development.

At the outset I need to point out that our graduates are generally well received by traditional industrial employers, and no significant concerns

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have been voiced by the members of our Advisory Board regarding our curriculum. This has been a good space in which to undertake curriculum development: these favourable responses represent a base on which we can build, recognising that there is always room for improvement.

Curriculum involves much more than content and how it is ordered. Rogers and Taylor (1998) describe it as follows: “Curriculum development describes all the ways in which a training or teaching organisation plans and guides learning. This learning can take place in groups or with individual learners. It can take place inside or outside a classroom. It can take place in an institutional setting like a school, college or training centre, or in a village or a field. It is central to the teaching and learning process.”

The World Agroforestry Centre states the following:

It is difficult to give a definition for curriculum development, because it will always be affected very strongly by the context in which it takes place ... We can think of curriculum development as a continuous process, which is relevant to the situation where it takes place, and flexible, so you can adapt it over time (WAC, 2000).

In our context the South African Qualifications Authority defines the scope of curriculum as having to do with:

- Determining the purpose and values of the learning.
- Analysing the needs and nature of the learners.
- Deciding on the outcomes or learning objectives.
- Selecting the content, the subject matter that will support achieving the outcomes.
- Deciding on the activities, the methods and media for teaching/training and learning.

- Planning how assessment will be done.
- Planning how the overall effectiveness of the delivery of the curriculum will be evaluated (SAQA, 2000).

Curriculum development is thus a process that should encompass a range of aspects of curriculum. As I see it, curriculum development involves continuous improvement which can be seen to involve at least four elements that are inextricably linked and should not be treated separately: structure, content, modes of delivery, and assessment. These issues are dealt with more fully in the section on the insights we have gained.

THE DEVELOPMENT OF THE CHEMICAL ENGINEERING CURRICULUM

The UCT Chemical Engineering Programme started in the late 1950s. By the mid 1960s it had two streams – a chemical engineering science stream and a chemical process industry stream. There were no individual subject courses, simply Chemical Engineering I, II and III, and Chemical Engineering Science I and II. These courses were passed or failed as a whole. There was a strong emphasis on Chemistry, with all students doing Chemistry III, without the practicals, and the chemical engineering science stream doing the Physical Chemistry Honours course as well.

In the 1970s the then-Engineering Faculty introduced a modified semester system in which the large courses were broken down into individual subjects. This was not a full semesterisation of all courses as is common in the USA, in which each course is offered every semester, and in which there is a strong emphasis on continuous assessment. Linked to the semesterisation, supplementary examinations in all Engineering courses beyond first year were discontinued.

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