

## Chapter 4

# Methodology for Knowledge Management and Self-Directed, Science Program Engineering Computing

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### **ABSTRACT**

*The following chapter shows the development of a learning methodology used to validate self-directed learning generic competences and knowledge management in a competence-based model in the engineering computer science program of the Universidad Católica Temuco (UCT). The design of the methodology shows the steps and activities of the learning-by-doing process, as shown gradually in the learning results of the competence. The designed methodological process allows creating working schemes for theory-based teaching and learning, and also for practicing and experimenting. The problematology as controlled scenarios is integrated in order to answer problems in engineering, allowing the process of validation in the self-learning and knowledge management competences. Thus, the achievements in the results have allowed helping the teachers to use their learning instruments.*

### **INTRODUCTION**

Nowadays, implementing the process of teaching practices in the classroom and workplace settings has led the students toward an educational training to review scripts and / or schemes (Yániz and Villardón, 2006) of how teaching and learning takes place in Chilean universities (Levano and Herrera, 2012). In this way, a set of trends in the world have allowed boosting major revisions in the way of delivering education. A common factor in many of these purposes is the orientation towards a competence-based training. Competences are those visible behaviours, skills, and attitudes that people provide in a specific scenery to perform effective and successfully (Tobón, 2007).

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In its constant process of improvement about academic processes, ever since a few years ago, UCT is promoting a new educative model (Sánchez, 2008), which is composed of a significant learning focused on students, academic training based on competences, ICTs on the teaching and learning process, ongoing education, and humanistic and christian education.

The academic training based on competences has allowed for in-depth comprehension of the construct, going from a complex knowing and action to a competent performance in context (Sánchez, 2008), (Lévano and Herrera, 2012; Tobón, 2007) Thus, the competency-based educational model focuses on the student and his/her explanation of the concept in a given situation and context (Yániz and Villardón, 2006).

The new educational model has as pillar the competences training, responding to the needs of the environment and going hand in hand with international educational trends. The emphasis of the model are the generic competences, which give a hallmark to the students of the university.

One of the drawbacks that are exhibited in the validation of skills is the complexity of doing activities of teaching and learning in order to generate scaled schemes scenarios to replicate scenarios as they occur in the real context of a developer of a software product or a specialist in information technology management. Considering the above fact, here is proposed a design of a learning methodology for validation of the following generic competences; independent learning for level 1 and knowledge management for level 1 in a competence based-model in an engineering computer science program at the Universidad Católica Temuco, with the design of activities of learning by doing.

The design is supported by the previous works of Lévano and Oriel (2012), Lévano and Fernandez (2015) and Kolb (1984).

The research question to be resolved is how can you design a methodology to evaluate knowledge management competences and independent learning in undergraduate students for a professional training under a education approach competency-based?.

This paper is structured in the following sections: the UCT educational model, the design of the competences model for the engineering computer science program, the competences of knowledge management and independent learning, the model of experiential learning of Kolb, the model of integration of the metacognition in the curriculum of Lévano and Fernnandez, CDIO in the developement of generic and specific competences of Lévano and Albornoz, the design of the script for learning by doing, the design of the learning guide, learning methodology of learning by doing, results, discussion, limitations and future research, conclusions, acknowledgments and references.

## **UCT EDUCATIONAL MODEL**

The UCT (Universidad Católica de Temuco) defines competence as: “a knowledge act, by mobilizing own and external resources to effectively and ethically responsible solve real problems”, (Sánchez, 2008). The educational model assumes the following types of competencies: generic competences are those shared with other professions; specifics competences are those related to the professional aspect.

In Figure 1, the five main pillars that support the whole educational competence-based model are observed. The UCT educational model is articulated on five main axes according to the study program formative itinerary, as it is explained below:

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