

Kolb's Learning Styles and Approaches to Learning: The Case of Chemistry Undergraduates with Better Grades

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ABSTRACT

The purpose of this study is to investigate if the teaching, learning and assessment strategies conceived and implemented in a higher education chemistry course promote the development of conceptual understanding, as intended. In this paper, the authors analyse the learning styles and the approaches to learning of chemistry undergraduates with better grades. The study took place during the 1st semester of the school year 2009/2010. This research was conducted within the context of chemistry classes for 1st year science and engineering courses at the University of Aveiro, Portugal. Data was collected through Kolb's Learning Styles Inventory, Approaches and Study Skills Inventory for Students, through non-participant observation, and analysis of students' participation in online forums and lab books. The results show that the students with better grades possess the assimilator learning style, usually associated to the archetypal chemist. Moreover, the students with the highest grades revealed a conception of learning emphasising understanding. However, these students diverged both in their learning approaches and in their preferences for teaching strategies. The majority of students adopted a deep approach or a combination of a deep and a strategic approach, but half of them revealed their preference for teaching-centred strategies.

Keywords: *Higher Education, Kolb's Learning Styles, Learning Approaches, Science Education, Chemistry Education, Scholarship of Teaching and Learning*

1. INTRODUCTION

This paper is based upon a growing body of work shaped by a research project aiming to promote the advancement of the scholarship of teaching and learning (SoTL), through the

implementation of classroom research, at the University of Aveiro, in Portugal (Albergaria Almeida, 2010; Almeida, Teixeira-Dias, & Medina, 2010). In the last decades, SoTL emerged as a fundamental concept to the development of good teaching practices in higher education (HE) and, consequently, to the enhancement of the quality of student learning. At this point

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we are investigating the learning styles and the approaches to learning of chemistry undergraduates with better grades.

Presently one of the main aims of HE is the development of the critical, reflective and creative thinking. These competencies can be achieved through the stimulation of students' active (Meltzer & Manivannan, 2002), deep (Entwistle, McCune, & Walker, 2001) and integrated learning (Kolb, 1984). In this essay we will refer to the teaching, learning and assessment strategies that were designed and implemented in the chemistry course for 1st year students in order to stimulate divergent thinking. Moreover, we will discuss how the students with better grades perceived these strategies and we will also examine the Kolb's learning styles and learning approaches of 1st year chemistry students with better grades.

Thus, by conducting this study we intend to investigate if the teaching, learning and assessment strategies conceived and implemented promote the development of conceptual understanding. The specific aims of this study are as follows: (i) to identify and characterise Kolb's learning styles and approaches to learning of chemistry undergraduates with better grades; (ii); to characterise the study habits of chemistry undergraduates with better grades; (iii) to identify the conceptions of learning of students with better grades, and (iv) to discuss the influence of learning, teaching and assessment methods on approaches to learning and Kolb's learning styles of chemistry undergraduates with better grades.

The sections that follow present a brief literature review on learning and teaching chemistry in HE, on Kolb's learning styles, and on approaches to learning. Later, the methodology is described in detail. Finally, findings, conclusions and limitations are discussed.

2. OVERVIEW OF THE LITERATURE

2.1 Learning and Teaching Chemistry

Science disciplines operate at distinct levels, some of which are not observable (Johnstone, 1991, 1993). Treagust (2007) suggests that this can be particularly important in the teaching and learning of chemistry, since many concepts are abstract and unfamiliar to students. According to Johnstone (1991), learning of chemistry is a matter of learning about its representation at different levels, which can describe (macro level), represent (symbolic level) and explain (micro level) chemical phenomena, as shown in Figure 1.

The macro level refers to the phenomenological, or what can be perceived by senses without the assistance of instruments. This level usually is concerned with concrete information, such as references to students' everyday experiences. The symbolic level refers to pictorial representations, models, symbols and computational and algebraic forms. The micro level refers to abstract information, that can only be perceived with the aid of instruments or that which is abstracted by inference from chemical processes. For instance, this level comprises the particulate level, which can be used to describe the movement of electrons, molecules, particles or atoms (Johnstone, 1991; Mbajjorgu & Reid, 2006; Treagust, 2007).

Chemistry is important as an independent disciplinary field and also as interdisciplinary since it provides a singularly significant understanding of our material world at the micro level, and it shares important connections with many other disciplinary fields, such as biology, electronics and physics. Chemistry is present in all aspects of our everyday life. In this regard, chemistry is a particularly practical disciplinary field and is continuously experiencing change as significant progresses are achieved.

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