Chapter 8
Virtual Environments in Materials Science and Engineering: The Students' Opinion

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ABSTRACT

The use of virtual resources in university teaching is becoming a key issue, especially in engineering degrees where novel virtual environments are being developed. This chapter described a study on the opinions of engineering students with regard to the use of diverse virtual applications in subjects related to Materials Science and Engineering. From 2011 to 2014, engineering students of several universities and diverse nationalities were surveyed regarding their views on using virtual environments in learning. The results presented in this chapter showed that students gave great importance to the use of virtual resources in university teaching but, at the same time, they also considered the presence of the teacher in the classroom to be very essential. The findings also provided the timetable distribution of topics that, according to the students' opinion, should be considered in the subjects of Materials Science, such as master classes, problem solving classes, practical classes in both real and virtual laboratories.

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INTRODUCTION

The use of virtual resources in university teaching is becoming a key issue (Mumtaz, 2000), especially in engineering degrees (Thornton, Nola, García, Asta, & Olson, 2009; Balamuralithara & Woods, 2009). Hence in the past years, many scientific contributions were published on novel virtual environments which some teachers are applying in subjects linked with Materials Science and Engineering (Bhargava, Antonakakis, Cunningham, & Zehnder, 2006; Dobrzański, Jagiełło, & Honysz, 2008; Dobrzański & Honysz, 2009; 2010; Dimiduk, 2011; Sinnott, 2013; Brophy, Magana, & Strachan, 2013; Vergara, Rubio, & Lorenzo, 2014a; 2014b). The general assessment of these experiences has been always positive for both teachers and students. Even so, it must be taken into account that the use of virtual tools in the classroom must be framed within an appropriate methodological framework so that the educative objectives could be correctly obtained (Vergara & Rubio, 2012). Therefore, what is really important is not the use itself of teaching technologies, but how they are designed and applied by the teacher in the classroom in order to exploit their maximum teaching potential (Dillenbourg, 2000; Thornton et al., 2009).

Regarding subjects linked with Materials Science and Engineering, the development of practical classes in a real laboratory environment entails potential shortcomings. When the groups are excessively crowded, some students may not be able to see how a materials testing machine works while teacher is explaining. Even when the size of the class is appropriate, certain details of the machine performance are not well appreciated due to

1. Quick execution of the action developed by the testing machine or due to
2. The small zone where the test data is shown.

Finally, another shortcoming of performing the practical classes with students is the timetable schedule availability of both the laboratory testing machines and the laboratory itself. However, among the main advantages of the virtual resources, the following can be found:

1. To visualize the performance of the testing machine on a computer screen,
2. To enlarge a certain zone on the computer screen,
3. To show the test at a lower speed, and
4. To offer access to the virtual tools in the students' computer, allowing their use when needed.

In this chapter, an analysis is presented of the engineering students' opinion with regard to the use of diverse virtual resources (VR) in subjects of the Materials Science and Engineering area. Specifically, the resources analysed in this work was recently presented in several teaching innovation forums:

1. *Interactive Virtual Platforms* or IVP (Vergara et al., 2014b),
2. *Interactive Multimedia Applications* or IMA (Rubio, González, Heres, Ruiz, & Pérez, 2006),
3. *Didactic Video* or DV of short length (5-10 minutes) which are edited by some television channels or private companies.

To achieve this goal, surveys were done from 2011 to 2014 with students of several universities and diverse nationalities, who previously underwent a class on the use of these three types of virtual tools (IVP, IMA, DV). The main aim of this study is to improve our understanding of what motivates students when using virtual resources in subjects of Materials Science and Engineering and, consequently, to know how these virtual