Chapter 10

Low-Cost Videos for Learning Mathematics by Teaching

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ABSTRACT

Technology plays an important role in everyday life and can be used in education. Video is a source of material that can play an important role in the teaching and learning field. Using videos engages students, aids student retention of knowledge, motivates interest in the subject matter, and illustrates the relevance of many concepts. In this chapter, the authors describe two teaching experiences involving videos, where the students made a video about solving a concrete mathematical problem. In this video, the students should explain the problem resolution to their colleagues (playing the role of teacher). The results of the impact of this kind of project in the students’ motivation are also presented.

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INTRODUCTION

In the Europe 2020 strategy, one of the goals is to have at least 40% of 30-34-year-olds complete higher education. Reducing dropout and increasing completion rates in higher education is one of the key strategies. In Portugal, or even in Europe, too many students drop out before obtaining a higher education diploma or degree. Reducing dropout and increasing completion are regarded prime strategies to achieve higher attainment levels (Vossensteyn et al., 2015).

One of the most important tasks of higher education is to prepare students to work in a changing world and to motivate them to develop skills other than those specific to their fields of study. Abadzi states that “Technological achievements and the globalization of labour require complex skills for the workplace. Companies reportedly demand employees ready to “plug and play”, who are also creative, communicative, and collaborative. Accordingly, international agencies often advise lower-income governments to de-emphasize “traditional” book learning and use innovative pedagogies to teach the needed skills explicitly.” (Abadzi, 2015).

In Europe, the Bologna Process has reconfigured the curricula approach of higher education, placing the students in the centre of the teaching - learning process, giving them greater autonomy. In this context, it was possible to introduce active learning strategies (Christie & de Graaff, 2016), capable of increasing students’ motivation and developing technical and transversal skills.

According to Lima, Anderson and Saalman (2017), Active Learning practices have been included in Engineering Education programs following recommendations from Engineering professional associations like the European Society for Engineering Education (SEFI) and the Active Learning in Engineering Education (ALE) network, political organizations like UNESCO, and national and international accreditation organizations of programs like Accreditation Board for Engineering and Technology (ABET) and European Network for Accreditation of Engineering Education (ENAE). The recommendation of Active Learning from those associations relate to the fact that learning is enhanced in Active Learning environments.

The idea of active learning is the desire to engage students in the learning process so that they are not just the passive recipients of knowledge, but active participants and co-creators of their own learning. Active learning, it typically encompasses learning approaches that focus on students doing things (which could include group discussions, collaborative note taking or recording their own presentations) and reflecting on their own learning process.

In order to improve students motivation the teachers need to understand today’s learners. Most of the students today belong to a generation of Digital Natives (Prensky, 2001). With more than 20 years of experience in teaching in an engineering school, Caldeira et al. (2019) believe that the use of technology is a key element for the academic success of students. Technology shows promise as a tool to make real world connections and help students overcome their lack of confidence. Therefore, for this generation in particular, technology has the potential to motivate the students.

In this chapter, two teaching experiences involving videos are described: two schools, School of Engineering Polytechnic of Porto (ISEP) and University of Minho (UM), and two subjects, Linear Algebra and Analytic Geometry and Mathematical Analyses. These experiences took place in three degrees: one degree of ISEP - Electrical Engineering – Power Systems and two degrees of UM - Polymer Engineering (Integrated Mater’s) and Telecommunications and Informatics (Integrated Mater’s).

The 21st century demands competent human resources in Science, Technology, Engineering and Mathematics, but there is some evidence that mathematics plays a crucial role when dropouts from...
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