

Chapter 17

Moodle-Based Validators to Improve Teaching and Learning of Web Development

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ABSTRACT

The challenge to prepare the graduates for working in a constantly changing environment, such as software engineering, requires an effective learning framework. This chapter presents two educational Web (PHP and JavaScript) programming validators integrated into the learning management system Moodle to improve the teaching-learning process. These applications also offer the students an appropriate explanation of the errors found and some information about the language key terms, suggest alternatives to possibly misspelled terms, and gather usage data to provide both student and teacher statistical graphics of the type of error committed. The chapter also describes the result of a qualitative analysis of its use in several telecommunications engineering courses offered at the University of Valladolid.

INTRODUCTION

“Education and Training 2020” (ET 2020) is a new strategic framework for European cooperation in education and training that builds on its predecessor, the “Education and Training 2010” (ET 2010) work programme (European Union, 2009). “Education and Training 2020” empha-

sizes that education and training have a crucial role to play in meeting the many socio-economic, demographic, environmental and technological challenges facing Europe and its citizens today and in the years ahead. Efficient investment in human capital through education and training systems is an essential component of Europe’s strategy to deliver the high levels of sustainable,

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knowledge-based growth and jobs that lie at the heart of the Lisbon strategy, at the same time as promoting personal fulfilment, social cohesion and active citizenship. The “Education and Training 2020” strategic framework states four common strategic objectives for Member States, one of which is “Improving the quality and efficiency of education and training.”

As a whole, the ICT (Information and Communications Technologies) sector represents 4.8% of the EU (European Union) economy. It generates 25% of the total business expenditure in Research and Development, and investments in ICT account for 50% of all European productivity growth. The overall aim of the EU research and innovation information and communication under Horizon 2020 (European Commission, 2013) is to bring the benefits of progress in these technologies to European citizens and business. In particular, Horizon 2020 will support the development of the infrastructures, technologies and services for the future Internet.

Therefore, educating and training tomorrow’s Internet-oriented software engineers represents ongoing challenges. Both professors and students agree in that computer programming learning is one of the most difficult tasks, especially for first graders, who lose their motivation easily. Apart from the inherent difficulty of the subject, the problem may lay on the wrong way of teaching. Over the last decades, many researchers have searched ways of improving the students’ academic performance, especially first graders’ in programming courses (Moons & De Backer, 2013).

Many computer programming students understand the concepts and theoretical base, but they have problems when they have to put them into practice. But many others, unfortunately, the foreknowledge they have is wrong and they are reluctant to change those initial ideas. Along this line, Newstetter and McCracken (2001) performed a study for a better comprehension of the nature of computer programming learning. They tested the first grade students’ skills and their initial

knowledge. The study proved that most of the first grades students have wrong previous ideas when coding. Hence, it is essential to develop resources to research the students’ wrong concepts and so increase the understanding of what is not working both in teaching and learning. Improving the teaching process it may require employing a methodology, that is, deciding an order of introducing the topics to the students, adding new elements, remodeling those already existent, and perhaps replace or even erase some of them. Depending on the scene of learning, it is possible to plan different interventions and, in this sense, the use of e-learning applications can be a step forward.

However, computer programming university courses are concerned with providing the students with not only theoretical knowledge but required skills for achieving a more efficient programming, which is something required for working in software development (Sancho-Thomas et al., 2009). However, contrariwise programming learning requires, today students are playing an increasingly passive role in their own education; the rise of the dropout rate and the lowering in the grades show signs of it. In this sense, e-learning also tries to promote a more active involvement of the students in their own learning process. As Law et al. (2010) suggest, an e-learning environment makes easy and can improve the motivation for learning and the self-efficacy.

Furthermore, in order to strengthen learners’ programming skills, they need to do a lot of practice. Hence, practical activities play an important role in the learning process (Thomas & Paine, 2000). Another reason of trying to combine mainstream education system (face-to-face classes) with new e-learning systems is that sometimes professors has to work with crowded lab classes, where paying due attention to each student is practically impossible. By doing so, the professor can better utilize his/her time as well as take advantage of the learning time outside of school hours, so the effective learning time increases

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