

INTRODUCTION

Besides being a philosophical, literary and strategic concept, *time* is also a key element in everyday educational institutions, particularly in higher education.

It is possible to introduce the time factor into many areas of education, and it can even become the driving force for discourse and educational planning. When designing a degree programme, for example, how many credits in mathematics should be included in training for future engineers (1 credit corresponds to 25 study hours)? In this case, we quantify and give weight to study hours. More specifically, when planning the outline of a subject for an entire semester we have to allocate a certain amount of time to each task. In addition, when we are preparing an assessment exercise, we need some way of measuring the volume of work and we do this by means of time. If we observe teaching and learning processes, it is interesting to see how, over time, the academic efficacy of a dialogue between students, or between student and teacher, can become definitive. Furthermore, describing and evaluating the use of student time might be crucial in designing teaching activities.

The time dimension is a relevant factor for planning a programme and communicating and managing feedback in e-learning in general, but especially so in subjects such as mathematics and physics. Learning and communicating these types of contents are characterised by a set of elements that require further measures to take account of not only the amount of time, but also the quality and role played by this time. In this regard, there are two features that make it unique: first, the specific nature of mathematics knowledge, and secondly, its language and nomenclature. Indeed, the nature of mathematical discourse justifies and promotes research activities in mathematics education. This leads to modelling and analysis of the role of the mathematical systems of signs, and the structures of meaning and phenomenology that drive the mathematics activity.



From a methodological perspective, *time* can become the independent variable through which we describe and analyse various data. Longitudinal studies are widely used in social sciences, specifically in sociological demography, as well as in medicine and psychology. It also opens up the possibility of designing research in the field of education, by means of methodology based on longitudinal analysis, thereby allowing us to track the same students over time.

The main aim of this issue, No. 4, is to present several aspects of online mathematics with regard to time. The contributions have been grouped into three blocks: Firstly, time for preparing digital resources and communicating mathematics contents; secondly, the use of time in learning and teaching processes; and thirdly, an analysis of online mathematics over time. In the first group, César Córcoles analyses the relationship between the resources invested in creating learning objects and their effect on students; and Cuartero, Hunter and Pérez set out a solution to reduce the time required to write mathematical formulae in a learning activity. In the second group, the study carried out by Christensen, Gras-Martí and Ávila addresses the question of how much time on average students spend on course-related work, and how this time is distributed; and Sgreccia analyses students' time management in a collaborative task in the context of mathematics teacher training. In the third block, Hettiarachchi and Huertas look at some temporal aspects in e-assessment systems for online mathematics; and Rovira and Sancho explore the relationship between cognitive and affective factors in online mathematics.

We hope that these contributions provide a good starting point for future research with respect to online physics and mathematics education by taking account of the time factor from several different perspectives.

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