

# POST GRADUATIONS IN TECHNOLOGIES AND COMPUTING APPLIED TO EDUCATION: FROM F2F CLASSES TO MULTIMEDIA ONLINE OPEN COURSES

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## ABSTRACT

Promoted by the significant increase of large scale internet access, many audiences have turned to the web and to its resources for learning and inspiration, with diverse sets of skills and intents. In this context, Multimedia Online Open Courses (MOOC) consist in learning models supported on user-friendly web tools that allow anyone with minimum computer literacy to get involved. Although this model is popular abroad, it is not commonly used in the Portuguese Higher Education scenario. Therefore, this paper presents a proposal for structuring in a MOOC an already validated set of post-graduation courses in the field of Information and Communication Technologies applied to education in Portuguese. This paper also aims to establish a threshold for perfect MOOC framing in higher education contexts. The Quantitative Evaluation Framework (QEF) approach was selected for this evaluation to highlight the strengths and limitations of the Post-graduations in Technologies and Computing Applied to Education. With this project we intend to contribute for promoting education professionals' personal training at distance, in a stimulating, interactive and flexible environment, giving access to knowledge to innumerable amount of professionals who might not have access to these courses with adjustable schedules, and real life validation (and accreditation).

## KEYWORDS

Education, MOOC, Online Courses, Post-Graduation

## 1. INTRODUCTION

When looking for specialized training, educators and other professionals in the area do not look only for face to face (F2F) opportunities. Online offers have been increasing in variety and quality, and some of the most recognized universities are following the trend (Harvard, n.d.). Although the Portuguese have also been participating in this model for quite some time, providing technical, specific courses in diverse training areas, only recently has higher education in Portugal began to bet on this teaching model (Aberta, 2013), including the MOOC. Autonomy is definitely the master word behind this trend (Henriques, 2014).

Within online learning, MOOCs promote autonomy, and learning at one's own rhythm. This is also one of the characteristics that have been distinguishing the face-to-face, blended model of the Post-graduations in Technologies and Computing Applied to Education (PGTIAE) at ISEP. These PGTIAE adopt a distinct and more flexible approach to course units' structure when compared to the regular post-graduations in Portugal as they do not follow the line of a traditional school year, and enable attendees to enrol in diverse course units or in a single one any time throughout the year (Marques and Escudeiro, 2016) (ESTAE, 2012). Taking this already innovative feature into account, next step is to apply this flexible and integrating post-graduation degree model to online learning and teaching using MOOCs. The Open University of Lisbon (Aberta, 2017) as well as the University of Porto (Porto, 2017) offer MOOC courses but as complementary training, not as complete accredited degrees such as this paper is presenting. The pedagogical insight of the courses and the transversal features of the considered subjects were decisive to carry out this proposal of having the PGTIAE course units massively available worldwide, targeting at being an additional contribution to widen post-graduation training certification prospects for education professionals in Portuguese Speaking countries all over the world.

Having that in mind, this paper presents the pedagogical model chosen for developing the PGTIAE MOOC, believing that this is an effective way to qualify and train those interested and active in education related subjects in Portuguese.

To cover the essential contents implied in this still in progress project, the paper is structured as follows: First, a general overview of the MOOC history and main features are introduced, followed by a brief reference to the most relevant technology related to MOOC development, and to some crucial aspects involved in their setting and preparation. Afterwards, the considered structure for the PGTIAE MOOC model is detailed, and then the evaluation framework QEF, which is being used to assess the MOOC, is described. Finally, few conclusions concerning the proposal are drawn.

## **2. STATE OF THE ART**

In this section, a brief overview of the MOOC first steps and implications is included, followed by a short explanation concerning the most common technologies and platforms that make MOOCs useful and appealing learning online options.

### **2.1 Brief Overview of the History of MOOC**

MOOC is a learning model based on the learning process (vs accreditation) that bets on interactive participation in large scale, using Web tools to allow anyone even with very limited computer skills to broaden and/or improve their knowledge on a topic, or to learn something new (Escudeiro, 2016). This can be defined as a model for teaching an online course that integrates knowledge and skills of professionals in various fields, social networks connections, and a diverse collection of online educational resources (Matta, 2013).

Based on the connectivity provided by the internet, where the number of possible participants is unlimited, it allows people from anywhere in the world, at any time of the day, to learn by the principles of the so-called "distance education" and "open education" (EADTU, 2015) (Openuped, 2015) (Sanchez-Gordon and Luján-Mora, 2014).

Since its emergence in 2008 in Canada, the MOOC concept has widespread, especially after 2012, the recognized "Year of the MOOC" (Estadão, 2013). Although the first experiment had already been conducted in 2007, by David Wilder at the Utah State University in 2007, only in 2008, during the development of an innovation process in the training field, was the first official MOOC course launched. It was titled "Connectivism and Connectivist knowledge". The credits for this first MOOC belong to George Siemens, Stephen Downes, and the technologist David Cormier. Twenty five hundred students enrolled in this course, including 2.300 graduates. The idea of connectivity to construct knowledge was there to stay, and in 2011 it had acquired even wider impact with the opening of a course on Artificial Intelligence, which was considered an educational revolution. The following year, the emphasis on dissemination among the major North American universities like Harvard, MIT, Yale and Stanford, led MOOC to be at the top of the discussion and analysis lists, regarding education (Estadão, 2013).

The leading aspect that has prompted Siemens to draw this kind of model courses, in which knowledge is acquired through the participation of all, was undoubtedly the leverage of internet potential (Henriques, 2014). It is worth mentioning that MOOCs may have various formats: they can be "free", requiring no payment, provided at "large scale", bearing a high number of participants, and "simple", requiring only a teacher to organize the information that will be available (Aberta, 2013).

In the following section, an overview of the fundamental technology that has been supporting this worldwide learning tool is provided for a better understanding of the implications of structuring a MOOC proposal.

## 2.2 Relevant Technology

Considering the rapid development of technology, more and more companies invest in innovation aiming to create solutions, and especially to meet the present society's needs and challenges in diverse areas, like culture, education, sciences, and economy. The development of the project proposed in this paper targets all those who wish to improve their professional skills, and knowledge. Distance learning overcomes, among other aspects, the incompatibility of timetables, travelling infrastructures, or health conditions. The integration of online content can thus promote quality learning and accessibility.

Looking back at the first developed MOOCs, any educational institution can be a MOOC supplier if they choose to develop a platform or use an existing open source solution. At present there are diverse kinds of MOOC providers. There are those aiming at making a profit, and others that do not intend to have any kind of financial return (Gonçalves, 2015). Coursera, Udacity and Udemy, the currently best known and recognized providers, are some examples of platforms with profit at sight, while edX is a non-profit MOOC supplier. Providing open source software, it is available for any education institution that wishes to develop or offer their own MOOCs. Besides these, there are other suppliers and platforms that enable creating and distributing MOOCs, such as Canvas Network, the Blackboard, P2PU (Peer-to-Peer University) CourseSites, and OpenClass. Furthermore, the Google Coursebuilder tool is to be mentioned as a platform specifically designed for the development of MOOC courses (Costa et al., 2015).

Udemy has been selected to be PGTIAE MOOC provider due to its versatility – it enables both paid and free courses to be offered to any registered user -, and to the fact of embracing an already large Portuguese from Brazil spoken audience (Adriano-Stoyke, 2016).

## 2.3 Pedagogical MOOCs: Brief Comparison

To understand the potential of the MOOC approach proposed in this paper a brief comparative analysis between the PGTIAE MOOC and other MOOC courses was performed, including one available at Udemy, the platform chosen to host the PGTIAE. This analysis has also considered two examples authored by the University of Porto, in Portugal (UP), one by the Open University in Lisbon (UA), and another by an independent author (Alexsandro Sunaga). As presented in Table 1, the PGTIAE MOOC is the only one enabling participants to get a certification corresponding to an academic degree, simultaneously granting them the possibility of getting independently certified training courses.

Table 1. Comparison analysis between four pedagogical MOOCs and the PGTIAE's proposal

Author	Platform	MOOC Title	Certificate of Participation/ Conclusion	Academic degree certification	Independently Certified course units
ISEP	Udemy	PGTIAE	✓	✓	✓
UP	Open edX MiriadaX	As alterações climáticas dos Média Escolares 1ª Edição	✓	x	x
	Open edX MiriadaX	Laboratório de Aprendizagem: Cenários e Histórias da Aprendizagem 2ª Edição	✓	x	x
UA	Eco	Necessidades Educativas Especiais	✓	x	x
Alexsandro Sunaga	Udemy	Tecnologias na Educação	✓	x	x

### **3. PROPOSED COURSE STRUCTURE**

Within the scope of both PGTIAE (Supporting Technologies to Education; Computing in Education), each curricular unit (UC) is understood as a single training course (ESTAE, 2012). To guarantee the homogenization of all these courses, the model outlined in this paper considers a set of recommendations based on a pedagogical structure adapted to the online format. In this format, the production of any content must consider determining aspects, such as structure, effort, length, pedagogical design, content production, supporting material, and validation.

The course structure, and the structure of each class, as well as the pedagogical model chosen, and its background are described in the section that follows.

#### **3.1 Proposed Structure of a Training Course within the PGTIAE MOOC**

Each course consists of eight lessons that will be open in the same week. These lessons include prerequisites, and their respective recipients, learning objectives, the definition of the type of content supporting the course, ensuring the quality of all available materials, the description of the evaluation strategy (assessment methods, type of tasks and activities to be carried out), aligning that with the intended learning outcomes, the description of the interaction model to be adopted (it should be clear to the trainee if the course is entirely autonomous, with no tutoring, or if the trainer is present throughout the process and, if this is the case, a balance between the presence of the trainer, the interaction between the participants, and the individual cognitive process are clarified). Besides that, each lesson includes an introductory video at the beginning of each lesson, introducing the trainee.

A video introducing the course, providing a short overview of maximum 2 minutes, is included at the very beginning contextualizing and explaining the complete course structure. The elements that are part of a course are as follows: Topic; Learning objectives; Lesson description; Promotional video; Complementary material; Video lessons; Lesson Summary; Lesson title; Subtitle; Course promotional image (common to all lessons); Trainer's biography.

#### **3.2 Structure of Each Lesson**

At the beginning of each lesson, an introductory welcome video presenting the trainer(s) needs to be included (this should be the same for all PGTIAE lessons). Besides that, the following has to be considered to sustain the structure of each lesson:

- Definition of prerequisites and respective recipients;
- Definition of lesson structure;
- Definition of learning objectives (summary);
- Definition of the type of contents supporting the lesson;
- Title and subtitle;
- Lesson conclusions and next lesson theme;
- Last lesson presents the evaluation strategy (evaluation methods, type of tasks and activities to be carried out), aligning it with the defined learning outcomes;
- Continuous and active learning have to be enabled (bibliography to be used has to be included, contents have to be appealing, well distributed, and at least 2 questions need to be launched in each lesson so that the trainee may effectively apply and demonstrate the skills and knowledge acquired);
- The model of interaction to be adopted has to be defined (as pointed out at the beginning of section 3.1.);
- Bibliography to be used has to be included.

##### **3.2.1 Effort**

Trainers should consider that the materials used in face-to-face or face-to-face and online teaching must be redesigned to incorporate a MOOC.

### 3.2.2 Length

Each course will have from 35 to 50 minutes, which will correspond to 5 (4+1) lessons taking from 7 to 10 minutes each, so that the trainees do not consider the contents as excessively lengthy, and thus leading to a possible demotivation and early abandonment. The 5 (4+1) lessons must take place on the same week. The image of the trainer should be present about 60% of lesson time.

### 3.3 Pedagogical Design

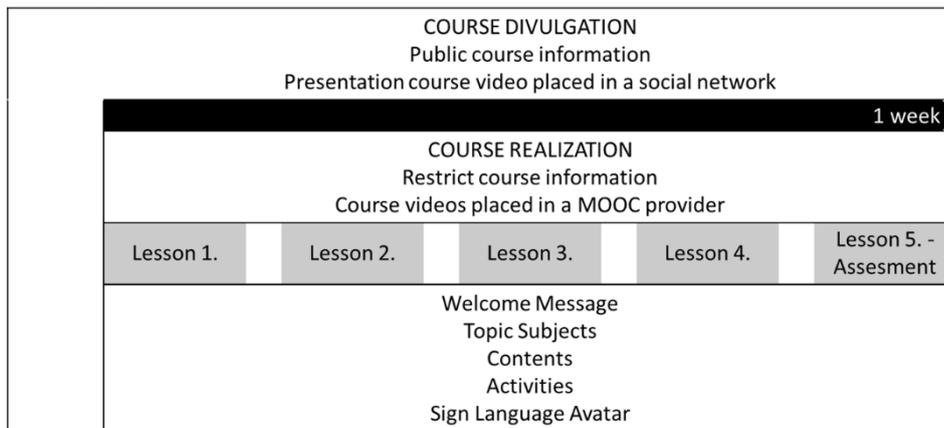
From a methodological point of view, the course is organized asynchronously, based on a flexible combination of moments of independent learning and collaborative learning, the various stages being previously defined at the time of the course presentation. The course should be clear about what is expected from the participants, therefore it is essential to include: The course programme; The skills to be acquired/developed; The calendar of the activities, and the typology of the activities; The specifications of the activity(s) to be developed and their evaluation criteria; The objectives of each communication/interaction session; The bibliography.

Participants who conclude the course will have a certificate from the service provider confirming the domain of the competences acquired. To ensure pedagogical consistency of all the lessons in the MOOC, both PGs have a baseline structure designed as presented in Table 2.

The MOOC structure is based on making content available weekly, and each week the eight lessons should follow sequential topics. For each of the topics it is important to clarify the learning objectives, which can be presented in the form of text or small videos, explaining to the learner not only the expected learning outcomes, but also the type of activities that will take place to evaluate the acquired skills. The expository videos for each lesson, as mentioned before, should be short and objective, taking no more than 7 to 10 minutes each. It is not recommended to produce and make available videos in which the content exposure exceeds 10 minutes.

The type of learning content to be used in each of the topics, like content matter videos (simple video, voice-over video, video with PPT, video whiteboard, etc.) can be complemented with other material, such as, text, images, links, among others.

Table 2. A Typical MOOC Structure



### 3.4 Background of the Training Course

Recordings are performed at ISEP facilities. It is necessary to make a plan of all the contents that are included in the course (texts, images, videos, among others). Knowing that most MOOCs rely on video production, it is essential to create a script so that the content producer understands the idea and resources that will be needed to affect that production.

Double validation: The Organization Committee of both PGTIAE ensures that the published courses comply with the rules of the MOOCs. The MOOC provider ensures that the courses meet the quality criteria. All courses published within these two post-graduations are the property of ISEP.

#### 4. QEF APPROACH

The approach has been adapted so that the essential criteria are assessed in a pre-evaluation phase, covering the general usage requirements. This section presents the application of the Quantitative Evaluation Framework (QEF) approach to assess the PGTIAE MOOC, which has been applied in an operating teaching environment for the last 30 years.

The QEF approach has been developed to highlight the strengths and limitations of the pedagogical models. A set of requirements were chosen and validated by the teachers in order to evaluate the educational courses developed by a group of teachers from the Polytechnic Institute of Oporto, from different fields of knowledge, having in common the support on technology. Tables 3, 4 and 5 represent the Educational Requirements established by the group of teachers from educational technology. The dimensions from our quality space are: Pedagogical, Ergonomic, and Technician. Each dimension has a set of factors, and for each factor we have a group of requirements. The QEF framework is not restricted to measure the final quality, instead it allows for the evaluation of systems quality at any moment during their lifecycle.

Table 3. Pedagogical Dimension

<b>Pedagogical</b>	<u>Learning</u>	PL01 - The learning context is suited to the concept of post-graduate degrees
		PL02 - MOOC model can be integrated in different pedagogical methodologies
		PL03 - The learning context effectively addresses the learning objectives
		PL04 - MOOC model promotes the forming is self-taught
	<u>Evaluation</u>	PA05 - There are steps that promote the assessment of learning acquired
		PA06 - Throughout the course the forming is evaluated with minor issues related to the topic dictated
		PA07 - Each form has access to your progress and status in relation to the content made to date

Table 4. Ergonomic Dimension

<b>Ergonomic</b>	<u>Usability</u>	EU08 - The conditions and the field of MOOC model are clear, precise and concise
		EU09 - The form whenever you want you can easily start and leave school
		EU10 - Interaction with MOOC model is intuitive
		EU11 - The communication between trainee is suitable
		EU12 - The content written/spoken is free of grammatical and syntactic errors
		EU13 - The trainee receives feedback whenever he ask questions on the forum
	<u>Content Quality</u>	EQC14 - MOOC model is inclusive
		EQC15 - The use of audio is critical to MOOC model
		EQC16 - The use of video is fundamental to the lessons of the template created
		EQC17 - Graphics and images make the lessons more appealing
		EQC18 - The overall objective of the curricular units are at the beginning of the course
		EQC19 - The trainee feels he is an asset to attend the course
	<u>Socio-Cultural</u>	EQC20 - MOOC model features a format that surpasses the expectations of forming
		ESC21 - MOOC model is exclusively produced in Portuguese
		ESC22 - MOOC model is suitable for the target audience
		ESC23 - MOOC model does not contain discriminatory aspects

Table 5. Technical dimension

<b>Technical</b>	<u>Learning Objects</u>	TOA24 - MOOC model has supported educational material
		TOA25 - MOOC model supports exercise throughout the course
		TOA26 - In the process of learning the trainees go through various stages (acquire new knowledge, new concepts, think where to apply what they're learning in practice, etc.)
	<u>Content Management</u>	TGC27 - The MOOC model offers a wide variety of contents
		TGC28 - MOOC model presents the organization in all content
		TGC29 - Is presented in a linear manner all content
		TGC30 - All are adapted to each course unit
		TGC31 - Use of short titles and topics
		TGC32 - All contents are developed by an expert team in the area that are tasked
	<u>Video/Audio</u>	TVA31 - Video capture in formal format
		TVA32 - Videos lasting 8 to 10 minutes for each lesson
		TVA33 - Each curricular unit has a brief introduction in video format
		TVA34 - Video capture in formal format
		TVA35 - Quality videos and audios
		TVA36 - All videos and audios are written in Portuguese Language
	<u>Text</u>	TT36 - The text is presented in a linear way and of course
		TT37 - The text presents only one language (Portuguese Language)
		TT38 - All text taught in class is drawn up with the new orthographic agreement

## 5. CONCLUSION

Trainers, instructors, teachers are expected to be effective in establishing a connection with their trainees/course participants, so that the learning objectives are accomplished. It is therefore crucial to set appropriate means targeting at motivating and engaging learners in the content matter. This is what professionals also look for when searching for new and challenging ways of improving their skills, and developing their knowledge. In the digital age they look mainly for online offers for their continuous training, and it is here that well-structured, appealing, and quality controlled content MOOCs still have a role to play.

This paper has presented a proposal for structuring in a MOOC two face-to-face, and blended, Portuguese post-graduation courses that have already been validated in the field of Information and Communication Technologies applied to Education: "Supporting Technologies to Education," and "Computing in Education" post-graduations. The course contents and structure, each lesson requirements and specifications are defined, and all the recording infrastructures prepared at ISEP premises. The QEF approach is being used to evaluate the PGTIAE MOOC so that its strengths and limitations are identified. With this still in progress project a serious contribution for promoting education professionals' personal training at distance, in a stimulating, interactive and flexible environment, is being prepared.

We believe that the transversal features of the PGTIAE course units offered as MOOC consist in an added value within academic degree certification for education professionals in Portuguese Speaking countries all over the world.

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