Design of a MOOC for teaching and research: The innovative experience of the MERGO project

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Abstract
Among the digital objects that support online learning, the diffusion of Massive open online courses (MOOC) has taken up more and more space. The ongoing debate has focused on the integration of MOOCs with traditional teaching due to their flexibility of content and participation. This article sets out the characteristics and essential elements in the didactic design of a MOOC. The MERGO (Erasmus +) project will use a validated pedagogical framework aimed at developing innovative tools. The aim of the project is to associate online learning with experiential learning in the acquisition of sensory skills. The theoretical paradigm of reference on which the MOOC is structured is linked to ICT, specifically the use of tangible user interfaces (TUI) and the gamification approach, which integrates theories on distance learning and new frontiers of MOOCs and short master. The purpose of this work is to expose the planning and design process of a MOOC oriented towards research and teaching, a fundamental moment for the success of the project.

Keywords 1
Mooc, Mergo progect, ICT, elearning, didactic design

1. Introduction

The didactic planning of online courses within the socio-constructivist theories of knowledge has the task of activating learning processes within digital didactic environments. The now-classic theory of technopedagogy [1] refers to two specific dimensions: the technological dimension relating to the construction of digital environments characterized by technological tools, virtual software platforms and multimedia resources, and the pedagogical dimension that makes it possible to target users, analyse their learning needs, develop appropriate content, plan activities and finally set up evaluation tools. Contemporary learning theories must embrace contemporary challenges in the educational context on the part of learners. The contemporary dimension of learning overcomes the limits of the physical dimension and allows the construction of unprecedented scenarios like of video games, which makes it possible to include gamification and interactive solutions to stimulate students' participation within the process. Fundamental elements for the educational success are the sharing of content and the co-construction of products. Contemporary platforms must be affected by innovative teaching methodologies and then asked to allow these two modes of action. The learning of correct behaviours within digital platforms develops when the user gives a correct response to a certain stimulus. This procedure could also be transferred to behavioural models for acquiring skills in a real context. In this context, learning-by-doing becomes synonymous with learning through a virtual mode of action. Educational planning, the possibility of enhancing the social aspects of the network aimed at collaborative learning, expanded accessibility and the introduction of online materials in face-to-face

courses are at the center of a new era of MOOC design [2] in which the techno-centric concern is passed to a preponderant educational attention, which enhances all the potential of new forms of didactic mediation. Despite the fact that MOOCs are increasingly being produced by Italian and foreign universities, there is no agreement on the metrics that define their quality [3], also because currently "MOOCs do not envisage particular international standards as regards technologies or methodologies of teaching" [4]. Furthermore, from a recent study on the didactic quality of MOOCs, it emerges that although most of the courses are well done and the didactic material is well organized, the quality of the didactic planning is low [5]. From this perspective, an important project assisted by the University of Foggia is LMC Erasmus plus, which aims to build a European certification system for MOOCs. The Mergo project aims to associate online learning with experiential learning in the acquisition of sensory skills. The theoretical paradigm of reference on which the MOOC is structured is linked to ICT, specifically the use of tangible user interfaces (TUI) and the gamification approach, which integrates theories on distance learning and new frontiers of MOOCs and short master. Planning and design of a research and teaching oriented MOOC, elements of a process, are the fundamental moment for the success of the project.

2. From e-learning to the MOOC

Over the years, e-learning has acquired increasingly specific characteristics. We can briefly describe three types of courses:

1. the closed online course, for regularly enrolled students, distributed on a platform (learning management system or LMS), which can also be part of a traditional training course;
2. the open online course, provided by a training institution or an educational institution, for all those who want to deepen their knowledge of a topic of interest;
3. the library or directory with didactic material made available on the platform.

MOOCs are connoted as a new form of e-learning. These retain some characteristics of the courses described above but are characterized by their purpose: they are courses open to anyone, and participation is free; they are massive and open.

The idea behind these courses is very simple: to offer online courses on topics that are part of the programmes of the affiliated universities and to distribute them openly and for free all over the world, with the aim of providing excellent educational content even to those who do not attend the university. They offer easy access, for various reasons, to university structures.

The term MOOC was coined in 2008 by Dave Cormier and Bryan Alexander in reference to the Stephen Downes and George Siemens course entitled "Connectivism and the Connective Knowledge", also called CCK08[6]. The structure of this course was designed to give participants the opportunity to take advantage of a series of technological tools (newsletters, wikis, blogs, etc.) through which to reflect on their learning process and interact with other participants [7]. MOOCs are often delivered by prestigious international universities. They have gained momentum in recent years, integrating the connectivity of social networks with the usability of online resources accessible easily and to all. Based on open educational resources (OER), these are fully online and open access courses, which see wide participation by the people of the web.

On average, the courses have a duration ranging from 4 to 10 weeks, excluding an additional week for the drafting of a final paper.

The elements characterizing these courses are:
- flexibility (regarding the time and place of study);
- free and open access;
- a formal evaluation at the end of the course accompanied by a certificate;
- scheduled teaching units;
- video lessons;
- quizzes or tests to check the skills acquired;
- additional books and articles for any further information.

Since 2010, MOOCs have spread very quickly thanks to the birth of several start-ups such as Udacity, founded by a professor from Stanford University; EdX, born from a collaboration between Harvard and MIT; and Coursera, created by Andrew Ng and Daphne Koller.

The table below illustrates the main differences between these two types of courses.

Table 1 *MOOC Differences between an e-learning course and a MOOC*

Elements	E-learning course	MOOC
Environment and access	It is developed on an e-learning platform (LMS) with some features and a very limited structure, designed for direct interaction with the teacher	It follows a technological design that facilitates the performance of activities by the participants through the use of one or more platforms
	Closed environment	Open environment
	Access is allowed only after paying for registration	Free access
Participants	Limited group	Massive participation
Support	The support from the teacher is direct.	Support from the community
Communication	Communication develops within the forum	MOOC
Evaluation	Oriented towards the evaluation and obtaining of CFUs	It follows a technological design that facilitates the performance of activities by the participants through the use of one or more platforms

Font: Vázquez Cano, E., López Meneses, E. & Barroso Osuna, J. (2015). El futuro de los MOOC, Retos de la formaciòn on-line, masiva y abierta p.24

The basis for the launch of these platforms was the idea of making education accessible to all: virtually anyone could attend a university course, breaking down economic, geographical or age-related barriers.

MOOCs do not adhere to any particular international standards regarding teaching technologies or methodologies, although the tendency is now general to place online interaction and collaboration between students, teachers and tutors at the centre of the training project.

Two categories of courses can be distinguished:

- cMOOCs, with a constructivist-connectivist slant, are based on the strong motivation of the participants and the availability of teacher facilitators. They enhance informal knowledge and produce a strong positive impact on attitudes;
- xMOOCs, of a donor-instructivist cut, based on behaviourist principles, are created by large institutions (platforms such as Coursera, edX, Udacity, etc. are largely linked to major US universities such as Stanford, MIT and Harvard).

xMOOCs have been criticized for a long time because they are considered to be based on traditional models of knowledge transmission and lacking a social dimension to learning; on the contrary, cMOOCs offer numerous opportunities directed towards non-traditional didactic approaches where students can confront and learn from each other.

A course designed in this way is capable of enhancing the social aspects of the network aimed at collaborative learning, the promotion of extended accessibility and the introduction of online materials

in face-to-face courses. From technocentric concerns, we move on to greater educational attention capable of enhancing the new forms of didactic mediation.

It is therefore essential to enhance such a course's aesthetic appeal, formulated on the basis of user needs, which includes the educational effectiveness on the didactic level and the multimodality of digital resources.

The video lessons, enriched with adequate digital resources, present the educational offer and the subjects that characterize the various subject areas, providing basic preparation for access to degree courses.

The design of complex resources, in terms of adherence to formats, teaching effectiveness, semantics and pragmatics of the web-based language, raises important questions in relation to the "protocol" of producing the same materials.

From this need arose the urgency of developing guidelines for the design and development work of these educational paths [8].

3. Design of a MOOC

The design of a MOOC must adhere to pedagogical and technical principles different from those of courses offered to a small number of students in university virtual learning environments (LMS).

Didactic planning is necessary, which must allow the student and the teacher adequate development of the course. A good instructional designer must ask himself the following questions:

- Is this course based solely on curricular skills?
- Will it be paid for linearly or on a discontinuous basis?
- Are there any tutors?
- Will the course end at the end of formal education?

It is of fundamental importance to remember that a MOOC is completely different from an e-learning course.

Currently, the MOOC market is offered by single universities, typically large ones, or by consortia of universities that share the experiences and skills of their teachers and staff.

The process that led the University of Foggia to define the guidelines behind the design of the online courses available on the EduOpen platform is illustrated below, including the guidelines, tools and work steps essential to proceed with the development of the video lessons.

The working methodology for defining the guidelines was divided into successive phases, which involved different types of actors.

In the first phase, the MOOCs delivered on international platforms and the related design criteria were benchmarked, which was accompanied by a survey of the sector literature.

After an initial exploratory phase, a first proposal for guidelines was developed and tested on a small group of teachers. At the end of the first comparison, the guidelines were subjected to a review process and disseminated within the group of teachers involved in the creation of the MOOCs. This final sharing made it possible to detect further proposals for integration and revision via scanning the production phases, design and development methods, and forms of collaboration between teachers and work teams.

During the design phases that involved comparison between teachers and experts in the online teaching sector, the analysis and subsequent categorization of the guidelines involved three main, closely interrelated actions:

- Definition of the structural characteristics of the MOOCs in formal and didactic terms: temporal extension of the course, type of teaching materials, forms of evaluation, characteristics of the video and graphic elements and interaction methods between teachers and students. This level concerns the structural framework of the MOOCs.
- Creation of shared design documents: definition of the macro-design scheme in order to guide the teacher-designers in the definition of the teaching approach, the choice of thematic nuclei and the explanation of the course structure; and of the micro-design scheme, conceived as a guide to the development of a "storyboard" relating to the individual training

moments of the educational path. This level concerns the narrative-formal framework and the definition of documents and guidelines for the design.

- Activation of the collaborative planning protocol, in order to guide the teachers in the production and delivery of the educational path with the development team. This level concerns the procedural framework, aimed at defining the co-design phases[10].

4. An example of a MOOC for research: The MERGO project

The MERGO project launched on 1 September 2020 with a partnership with international universities in Portugal, Turkey and Croatia and partners in the wine business sector aiming to develop an explanatory MOOC of procedural learning in relation to the recognition of sensory characteristics of wines. The theoretical paradigm on which the MOOC is structured is linked to ICT, specifically to the use of tangible user interfaces (TUI) and the gamification approach. The project will use a validated pedagogical framework aimed at the development of innovative ICT tools that will allow autonomous and remote training for students with some olfactory stimuli recognized by a digital interface and orchestrated by artificial intelligence modules (adaptive artificial tutors). An immediate feedback given by the technology that indicates the acquisition of knowledge and the progress made. The MERGO project aims to strengthen the knowledge triangle in this sector in order to bring together education, research and innovation.

Figure 1. *Triangulation of knowledge*
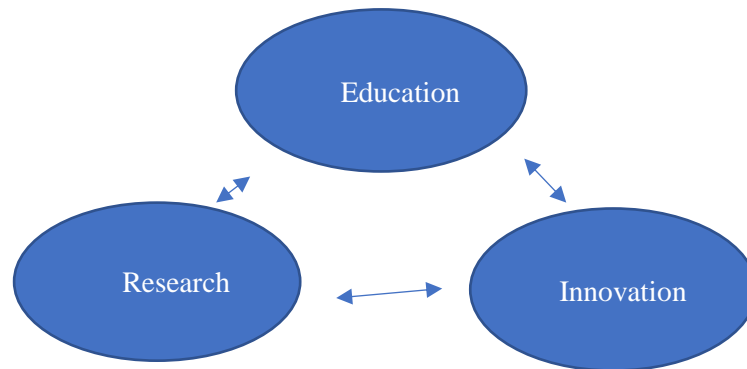
The full title of the project is "MOOC in oenology aimed at strengthening skills by applying a game-based approach and olfactory learning for wine tasting. A taster to understand an olfactory bouquet of a specific wine, immerse the nose and in a series of sensory stimuli determining discrimination. The creation of a MOOC on wine tasting in a European dimension by applying a co-design with the interested parties of the wine sector". The MOOC will follow the phases of micro- and macro-design described in the paragraph previous one.

Table 2 *MOOC design phases*

Phase 1 (Structural Framework)
• • temporal extension of the course;
• • type of teaching materials;
• • forms of evaluation;
• • characteristics of the video and graphic elements;
• • methods of interaction between teachers and students.
Step 2 (Shared Documents)

- • definition of the scheme for the macro-design;
- • micro-design scheme for choosing the thematic nuclei and explaining the articulation of the course;
- • a "storyboard" relating to the individual training moments of the educational path.

Phase 3 (Procedural Framework)

- • Collaborative design protocol;
- • Guidelines for teachers in the production and delivery of the educational path with the development team;
- • Phases of co-planning

5. Conclusions

The inclusion of ICT in the field of education has generated a profound change in teaching-learning processes within educational contexts. E-learning has improved not only the efficiency of the educational process but also, due to the many experiences, the process itself [11]. The continuous progress of new digital technologies in recent years has allowed the creation of learning environments based on methodologies that enhance collaborative rather than predominantly individual learning, from a co-construction of knowledge rather than from the transmission of knowledge [12]. Participatory learning is presented as a process not centred so much on the teacher as on the learner, with a focus on communication and therefore on the interactions between the actors involved at a horizontal level. The student, who previously played the role of a passive actor, today becomes the main agent, capable of determining his own learning process [13]. In this scenario, the devices that have amply responded to the growing demand for open learning are MOOCs, and therefore the whole phenomenon of platforms that offer a multiplicity of open, online and massive courses on the most diverse topics at an international level.

The recent scientific literature on the causes of dropout in MOOCs [14,15] takes into consideration the factors linked to the design of the MOOC and in particular to the duration and its correlation with the risk of abandonment. In particular, Rebecca Ferguson and colleagues [14highlighted that the duration of the course influences the model of involvement, and therefore, in the design of courses, this effect should also be taken into consideration to reduce the dropout phenomenon. It is clear that in order to try to reduce the dropout rate, it is necessary to implement strategies that allow the user to feel particularly active and therefore involved in the learning process. Particular attention should be paid to the "duration" variable in the design of MOOCs as this seems to affect the possibility of completing the course. In general, time monitoring and therefore time spent analysis can have significant repercussions on the completion of courses. As emerges from a qualitative analysis conducted by Eriksson and colleagues [15], "Time is the bottleneck", since the lack of time to dedicate to self-training is one of the main causes of abandonment. Despite the many difficulties and rapid obsolescence of knowledge the MOOC sector is rapidly developing on the international scene.

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