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Proposal for a Conceptual Framework for Educators to Describe and Design MOOCs

Carlos Alario-Hoyos
(Universidad Carlos III de Madrid, Spain
calario@it.uc3m.es)

Mar Pérez-Sanagustín
(Universidad Carlos III de Madrid, Spain
mmpsanag@it.uc3m.es)

Dave Cormier
(University of Prince Edward Island, Chartlottetown, Canada
davcormier@upei.ca)

Carlos Delgado-Kloos
(Universidad Carlos III de Madrid, Spain
cdk@it.uc3m.es)

Abstract: Massive Open Online Courses (MOOCs) are a disruptive trend in education. Several initiatives have emerged during the last months to give support to MOOCs, and many educators have started offering courses as MOOCs in different areas and disciplines. However, designing a MOOC is not an easy task. Educators need to face not only pedagogical issues, but also other issues of logistical, technological and financial nature, as well as how these issues relate and constrain each other. Currently, little guidance is available for educators to address the design of MOOCs from scratch keeping a balance between all these issues. This paper proposes a conceptual framework for supporting educators in the description and design of MOOCs called the MOOC Canvas. The MOOC Canvas defines eleven interrelated issues that are addressed through a set of questions, offering a visual and understandable guidance for educators during the MOOC design process. As a practical usage example, this paper shows how the MOOC Canvas captures the description and design of a real 9-week MOOC. An analysis of the different elements of the course shed some light on the usage of the MOOC Canvas as a mechanism to address the description and design of MOOCs.

Keywords: MOOC, Design, Framework, Canvas
Categories: K.3.1, K.3.2

1 Introduction

MOOCs (Massive Open Online Courses) are a disruptive educational trend, especially in Higher Education and lifelong learning [Hyman, 2012], [Yuan, 2013]. MOOC initiatives like Coursera, Udacity, edX or MiríadaX[1], replicating a more traditional learning approach (xMOOCs) [Siemens, 2012a], as well as MOOCs based on a

[1] http://miriadax.net

connectivist pedagogy (cMOOCs) [Siemens, 2005] are allowing to spread learning in different areas and fields beyond frontiers, surpassing traditional online courses [Hill, 2012], [Severance, 2012].

Consequently, more and more institutions are joining the MOOC movement (e.g. Coursera currently counts with more than 70 institutions[2], while edX[3] and MiríadaX[4] have more than 20 partners), and more and more educators are starting to offer MOOC courses. This increasing interest on MOOCs opens up opportunities for exploring new online pedagogies and business models in education [Kolowich, 2012], [Martin, 2012]. However, designing and running a MOOC from scratch involves several issues [McAuley et al., 2010] of logistical, technological, pedagogical and financial nature that educators must face.

Regarding issues of logistical nature, educators need to be aware that designing and running a MOOC can be a very time demanding task, and so they need to plan carefully the feasibility of the course depending, for instance, on the available human resources. The survey by Kolowich [Kolowich, 2013] concludes that a MOOC typically takes over 100 hours before running the course for the first time, and an average of another 10 hours per week on upkeep while running it. The same study points out that most educators are not able to keep a balance when riding the MOOC wave, diverting time from their normal duties like research or traditional teaching. These numbers would depend for instance on the subject and duration of the course and on the number of materials that need to be produced (e.g. recording videos takes much more time than providing links to existing Open Educational Resources). In any case (and as Kolowich's survey suggests), we believe that there are strong relationships between issues of logistical nature and design decisions, and teachers should keep in mind these relationships in order to succeed when running MOOCs.

In terms of technological issues, educators should be clear about the supporting systems they will use to run MOOCs. Nowadays, most educators are employing platforms to centralize the access to learning contents (either by embedding resources in the platform or by including links that redirect to the original source) [Siemens, 2011], [Siemens 2012a], no matter if these contents are provided by the teaching staff or by the own learners (if following a more connectivist pedagogical approach). As an example, institutions that signed agreements with initiatives like Coursera, edX or MiríadaX, encourage their staff to embed learning contents in the platforms hosted by these companies. Therefore, educators should be very aware of the affordances provided by the supporting platforms at the time of designing MOOCs, since those may determine for instance the format of learning contents or the types of assessment activities that can be supported.

With respect to pedagogical issues, educators need to change their mindset from face-to-face and online courses [Hill, 2012], since in MOOCs they teach to a massive number of learners from different countries, with different backgrounds, status and motivations. Moreover, due to time constraints educators cannot play a central role in MOOCs and so, didactics that promote learner autonomy [Downes, 2010] and allow building connections among learners [Kop et al., 2011] should be explored.

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[2] https://coursera.org/partners
[3] https://edx.org/schools
[4] http://miriadax.net/web/general-navigation/universidades

Finally, financial issues cover two different aspects in MOOCs. The first aspect takes into account the amount of money that educators (and institutions) can invest to create and run a MOOC. The second aspect deals with the revenue that can be obtained by running a MOOC, which affects the mid-term sustainability of the MOOC [Kolowich 2012].

All this complexity demands mechanisms that guide educators in the design of MOOCs and that consider these issues and their relationships (e.g. if the technological support does not include social tools, that may preclude the teaching staff from following a connectivist pedagogy). These mechanisms should be simple and understandable, since MOOCs can be taught by any educator, and also applicable to a wide range of fields of knowledge. Giving support to educators in the design of MOOCs begins to awaken interest in the community, and there are already some works offering general advice [GCB, 2012], [Guàrdia et al., 2013], [Siemens, 2012a], most of the times based on their own experience after running a MOOC [McAndrew, 2013]. However, none of these works provides a simple and understandable mechanism to design MOOCs helping the teaching staff to reflect and discuss about the main issues of logistical, technological, pedagogical and financial nature.

In this paper, we present an early-stage conceptual framework for educators to describe and design MOOCs from scratch, called *the MOOC Canvas*. The MOOC Canvas considers eleven interrelated issues of logistical, technological, pedagogical and financial nature that should be taken into account at the time of designing a MOOC. The MOOC Canvas takes some ideas from the literature in the field, and is inspired by the Business Model Canvas [Osterwalder and Pigneur, 2010], a simple and visual representation of blocks (issues) related with the design of business models. Following these ideas, the MOOC Canvas offers a visual representation of issues to guide educators throughout the MOOC design process, helping them to reflect and discuss about these issues by means of given questions.

The rest of this paper proceeds with section 2 studying the state-of-the-art in the design on MOOCs, in order to gain a better insight before proposing the MOOC Canvas, which is described in detail in section 3. Then, section 4 introduces a practical example of how to use the MOOC Canvas, including a discussion in section 5. Finally, section 6 draws the conclusions and presents the future work.

2 The design of a MOOC

The design of a MOOC like the design of any other course, no matter if face-to-face or online, can be addressed from the perspective of learning design [Conole, 2008a]. Learning design is a research field that provides tools and methods for both articulating and representing the design process of learning experiences, making them more explicit and shareable [Conole, 2008b], while assisting educators in planning and organizing pedagogically sound educational events [Persico et al., *in press*]. Learning design methods and tools have been shown especially beneficial when employed to design complex learning contexts, as is the case of MOOCs, in which a significant number of resources and stakeholders are involved [Conole, 2010]. This section reviews the solutions and approaches in learning design that set the basis for defining the MOOC Canvas and its main issues. Concretely, this review focuses on two areas: (1) learning design representations, which give the clues for proposing a

visual representation for the description and design of MOOCs and (2) the few initiatives of MOOC design models published in the literature.

2.1 The importance of the "visual" for supporting the design of MOOCs

One of the areas within the learning design research field proposes the use of *design representations* as a support for the design process [Conole, 2010]. Design representations are "codifications of the learning aspects that the designer anticipates will take place" [Conole, 2010]. Conole argues that design representations can have several formats (verbal, textual, visual or data-based) and can be used to describe different aspects of the design cycle (from small-scale learning activities to a whole curriculum).

A significant number of research works have proposed tools to help visualizing learning designs and/or implementing them. Examples of these works are LAMS (Learning Activity Management System)[5] or Collage [Hernández-Leo et al., 2006]. Both works propose a practice-oriented support for teachers in the design process and in the deployment of small-scale learning designs. LAMS offers a visual authoring environment to design, manage and deliver sequences of online collaborative activities. Collage is a graphic-based high-level authoring tool for supporting the design of Collaborative Learning Flow Patterns (CLFPs) [Hernández-Leo et al., 2006], which are techniques for structuring the flow of learning activities in order to potentially produce effective learning from collaborative situations [Hernández-Leo et al., 2010a]. More examples of recent tools developed for mobile devices that are helping teachers design courses advising about the pedagogical approaches that can be applied are Instructional Design Wizard[6] (for Android) and DesignJot[7] (for iOS).

Other researchers provide more theoretically-based solutions by proposing models to support the design of different learning activities. For instance, the model 4Ts [Persico and Pozzi, 2011] defines a schema with the 4 components that designers need to focus when working on Computer Supported Collaborative Learning (CSCL) designs: Task, Teams, Technology and Time. Also, the model 4SPPICes [Pérez-Sanagustín et al., 2012] organizes 4 factors, the Space, the Participants, the Pedagogical Method and the History as the main elements to be considered when designing Computer Supported Collaborative Blended Scripts, a particular type of collaborative scripts that combine formal and informal activities occurring across different spatial locations. Other examples of models conceived to provide designers with the mechanisms to produce learning designs keeping the balance between technology and pedagogy are detailed in Persico's survey [Persico et al., *in press*].

All these tools and methods, although of different nature and educational purposes, stem from the idea that providing visual approaches is a good solution for supporting reflective communication and creative generation of designs [Hernández-Leo et al., 2007]. This idea does not only apply to the educational field. For instance, in the business research area, the successful initiative called "Business Model Generation" [Osterwalder and Pigneur, 2010] evidences the potential of providing visual solutions for supporting a systematic way to understand and design business

[5] http://lamsinternational.com/
[6] https://play.google.com/store/apps/details?id=com.madhuri.mobytes
[7] https://itunes.apple.com/us/app/designjot/id447686146

models. Concretely, these authors propose the Business Model Canvas, a graphic schema of the main building blocks needed for collaboratively and dynamically creating innovative business models, fostering "visual thinking" and shareable designs. In the case of the Business Model Canvas being able to work collaboratively on a visual representation enhances dialogue, improves the communication among participants, triggers new ideas and allows to capture the big picture at a glance [Osterwalder and Pigneur, 2010].

In this paper the idea of the Business Model Canvas inspires the proposal of a visual solution as the means for supporting the collaborative description and design of MOOCs. On the one hand, MOOCs are complex learning events that involve the management of issues of logistical, technological, pedagogical and financial nature. Providing a visual schema that includes all these issues would offer a holistic view of what to take into account when planning these courses, as well as supporting decision-making design processes. On the other hand, the number of stakeholders involved in the design and running of a MOOC, from the teaching staff to learners and facilitators [McAuley et al., 2010], makes necessary to provide solutions able of supporting a participatory design process, shifting the learning design from the abstract towards the concrete. All in all, a visual approach can facilitate a common understanding between all the stakeholders and a dynamic way of sketching and changing different alternatives over the same MOOC design.

2.2 Models for the design of MOOCs

Regardless of the popular adoption of MOOCs, many researchers agree that more research and experimentation about the design of MOOCs is required [McAuley et al., 2010], [Ostashewski and Reid, 2012]. In fact, in the literature, very few initiatives are devoted to study what the relevant aspects in the MOOC design are [GCB, 2012], [Guàrdia et al., 2013], [McAndrew, 2013], [Siemens, 2012a].

So far, MOOCs have been commonly classified and designed from two perspectives, as defined by Stephen Downes: xMOOCs and cMOOCs [Siemens, 2012a]. Both models share most of the features in terms of multimedia resources, massive number of learners and courses deployed over a series of weeks. Major differences stem on the role of both teachers and students in the course, as well as on the way learning is achieved [Rodriguez, 2012], [Siemens, 2012a]. According to authors in [Ostashewsky and Reid, 2012], xMOOCs adopt a cognitive-behaviorist lecture and knowledge dissemination pedagogical approach similar to that of traditional face-to-face and online courses; while cMOOCs follow a more connectivist learning approach, where knowledge is found in the connections between people, and learning is the development and traversal of those connections [Siemens 2005].

Recently some researchers and instructors started arguing that using this classification is not enough for describing the variety of MOOCs and the way they are designed. In response to this concern, a few initiatives appeared defining new classifications for MOOCs. One of the main initiatives in this line is the one proposed by Conole [Conole, 2013]. She classifies MOOCs according to twelve dimensions: "the degree of openness, the scale of participation, the amount of use of multimedia, the amount of communication, the extent to which collaboration is included, the type of learner pathway, the level of quality assurance, the extent to which reflection is

encouraged, the level of assessment, how informal and formal it is, autonomy, and diversity". Conole states that these twelve criteria can be used not only for classifying MOOCs, but also to plan the design of MOOCs.

This and other similar works highlight some of the relevant aspects to be considered in a MOOC design, but always from a pedagogical perspective. However, when designing a MOOC, not only the pedagogical approach that is going to be followed (the pathways as referred by Conole) or the learning objectives to be achieved influence the final design. There are other issues of technological, logistical and financial nature to be considered (e.g. the technological platform in which the MOOC is deployed has an impact on the type of assessment activities supported, while the available human resources condition the amount of contents that could be produced). Actually, this is nothing new, and Conole and Mulholland [Conole and Mulholland, 2007] already identified that learning designs, in general, can be seen from three layers: the educational layer, which describes the pedagogical intentions and aspirations; the technological layer, which defines the technologies to be used; and the meditational (logistical) layer, which describes how the other two layers are linked and operate. The MOOC Canvas proposed in this paper includes all these layers and adopts some of the ideas behind the aforementioned models to define eleven interrelated issues of logistical, technological, pedagogical and financial nature that educators should consider during the MOOC design process.

3 The MOOC Canvas

The MOOC Canvas is a simple and visual framework for educators that need to design a MOOC from scratch. The MOOC Canvas is inspired by the ideas and structure of the Business Model Canvas [Osterwalder and Pigneur, 2010], but gathering the main issues of logistical, technological, pedagogical and financial nature that educators need to think of during the design of a MOOC.

Figure 1 depicts the MOOC Canvas. The authors recommend completing the MOOC Canvas from left to right and from top to bottom until the eleven issues are filled out and the teaching staff has reflected on all of them. This order is advisable, since the issues may be constrained by their predecessors, and may constrain the subsequent issues.

The eleven issues are arranged in two categories: *available resources* and *design decisions*. Available resources refer to those key resources that the teaching staff have at their disposal at the moment of designing the MOOC. That includes human resources, intellectual resources, equipment (hardware and software resources) and the platform in which the MOOC will run. It is convenient to point out that the MOOC Canvas does not consider financial resources as a separate issue since money can be exchanged for human resources (e.g. hiring more teachers), intellectual resources (e.g. acquiring the rights to use third-party material), equipment (e.g. buying new video cameras) and the platform (e.g. paying a fee so that initiates like edX hosts the MOOC in their platforms). Available resources are independent of the actual design of the MOOC, and do not affect each other, although they may affect the design decisions. If there are different educators participating in the MOOC, the issues in this category must be clarified by all the teaching staff before making any design decision.

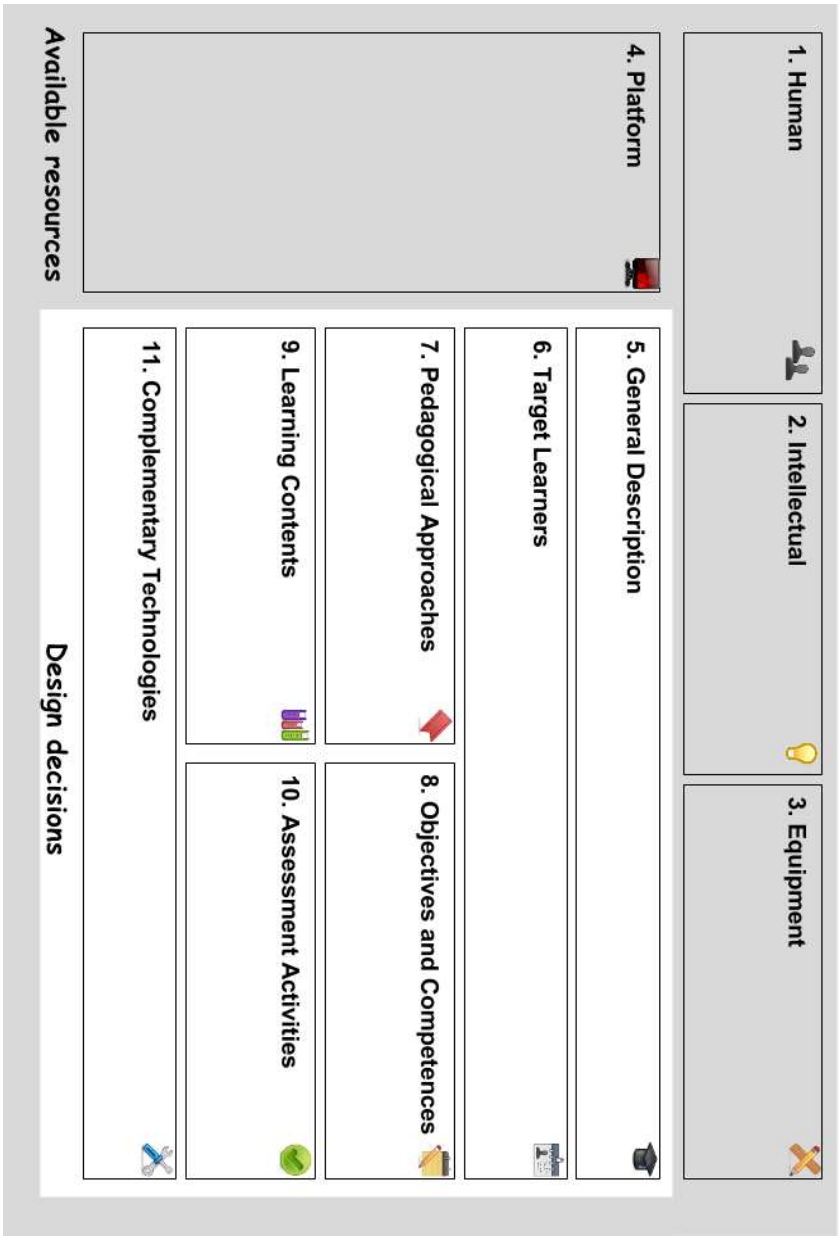

Figure 1: Overview of the MOOC Canvas. Issues in the available resource category (1-4) are marked in grey, while issues in the design decisions category (5-11) are marked in white. The key questions related to each issue are in Tables 1 and 2. A full version of the MOOC Canvas with key questions is available in Google Drawings[8]

[8] https://docs.google.com/drawings/d/11ldMejrMj-RcP7pICYPbiHfIcY5RjKFF63gw4g-ltj8

Once the available resources are set, design decisions must be discussed between the teaching staff. Seven issues are included in the design decisions category: a general description of the course (name, duration and field/area), the target learners of the course, the pedagogical approaches that will be followed, the objectives and competencies pursued with the course, the learning contents that will be delivered, the assessment activities employed, and the complementary technologies that will support the MOOC.

Each of the eleven issues is addressed through a set of key questions that invite the teaching staff to reflect and discuss about the issue, guiding them in the overall description and design of the MOOC. Finally, it is important to note that the MOOC Canvas shows a static picture of a particular moment in the design process. Different iterations can be built over the same MOOC design resulting into different versions of the MOOC Canvas. That is the motivation for including a version history on the top of the MOOC Canvas with three fields: *design by*, *date*, and *version*.

3.1 Available resources

The available resources category includes 4 main issues that need to be considered at the time of designing a MOOC: (1) *Human*, (2) *Intellectual*, (3) *Equipment* and (4) *Platform* (see Table 1). To be aware of the available resources from the beginning is crucial to avoid failures due to trying to run overambitious MOOCs.

As previously pointed out, it typically takes over 100 hours to set up a MOOC before running it, and another 10 hours per week on upkeep while the course is on [Kolowich, 2013], which is a considerable amount of **human resources**. Although not specified in Kolowich's study, a standard 6-7-week course could be taken as a reference for these figures; obviously, longer MOOCs generally demand a higher workload. Significantly, the tasks required to launch a MOOC may involve, not only the teaching staff (to create materials, record videos or foster discussions among learners in social tools), but also other actors like audio visual staff (to process and edit videos before submitting them) or technical staff (to provide advice on the technological support employed). The reflections about the available human resources and the possibility of hiring more help are captured in questions (1.1) and (1.2) in Table 1. The available human resources can affect other issues in the MOOC Canvas: for example, the less the available human resources, the less the duration of the MOOC, the more the need for pedagogies that help learners interact to each other, the less the amount of contents and assessment activities that can be generated, and the less the complementary applications that teachers are able to support.

A complex subject related to the available resources in MOOCs is **intellectual resources**. It might be the case that MOOC teachers have already prepared learning contents packaging text, images or other multimedia materials within slides or videos. In such cases, teachers should keep in mind that learning contents must be free from copyright infringements. Teachers have generally employed copyrighted materials in face-to-face or "closed" online courses, and it is well accepted that special licenses are rarely required for such uses [Butler, 2012]. Nevertheless, when coming to MOOCs, the teaching staff should own permissions for any external item that they want to package as part of their learning contents, especially when acting with for-profit partners like Coursera or Udacity [Butler, 2012]. A good practice is to look for

Issues in the Available Resources category	Key Questions	Affected issues
1. Human	*(1.1) What human resources (number of people available and dedication in hours...) do you have for launching the MOOC?* *(1.2) Do you have the possibility of hiring someone else to help you in the operation of the MOOC?*	5, 7, 9, 10 and 11
2. Intellectual	*(2.1) What intellectual resources (learning materials, OERs, pictures, videos...) do you have for launching the MOOC?* *(2.2) Do you have the possibility of paying for additional intellectual resources?*	5, 6 and 9
3. Equipment	*(3.1) What hardware resources (recording studios, cameras...) do you have for preparing the contents?* *(3.2) What software resources (licenses for video recording and editing software...) do you have for preparing the contents?* *(3.3) Do you have the possibility of buying/hiring additional hardware or software resource?*	9
4. Platform	*(4.1) Regarding learning contents: What types of formats (multimedia, text…) are supported in your platform?* *(4.2) Regarding assessment activities: What type of assessment activities (multiple choice, peer review...) are supported in your platform?* *(4.3) Do you have any social tool available in your platform?*	7 **Strongly constrained**: 9, 10 and 11

Table 1: List of issues in the available resources category, questions related to each of these issues, and issues in the MOOC Canvas that can be affected or that are strongly constrained.

external items in open image and video databases or to get the rights from the authors. Alternatively, teachers could use links to public Internet contents so that learners access the original source. The reflections about the available intellectual resources and the possibility of paying for some of them are captured with questions (2.1) and (2.2) in Table 1. The available intellectual resources can affect the duration of the MOOC, the target learners (e.g. if most intellectual resources are in one particular language), and of course the amount of learning contents that will be delivered.

Another kind of resources that the teaching staff should consider are those related to the available **equipment**, both hardware (question (3.1) in Table 1) and software (question (3.2)), and the possibility of getting or hiring more equipment (question (3.3)). As an example, the contents of a MOOC can hardly be offered in the form of videos (unless using third-party videos) without having, at least, a webcam, a microphone and a recording program (and its license if not for free). Recording studios, tablets or editing programs are other examples to be noted here.

Nowadays, most MOOCs (especially xMOOCs) are deployed in a **platform** that centralizes learning contents and interactions [Siemens, 2011], [Siemens, 2012a]. Educators generally know the platform at the time of designing the MOOC (in most cases the institution demands the teaching staff to employ a given platform) and so, they should be aware of the resources and features provided by the platform. The platform is also a key available resource since it strongly conditions the final MOOC design. For instance, a design using peer-review assessment activities will be only possible in a platform offering this assessment functionality. Specifically, three issues

are strongly constrained by the platform: the Learning Content (captured in question (4.1) in Table 1); the Assessment Activities (question (4.2)); and the Complementary Technologies (question (4.3)). Also, and as a consequence of the lack of appropriate social tools in the platform (question (4.3)) the Pedagogical Approaches employed can also be affected. Alternatively, educators may use a platform just to organize links that redirect to external resources (this often occurs in cMOOCs). In that particular case, learning contents, assessment activities (if any) and social tools will not be constrained by the platform, but will demand several Complementary Technologies.

3.2 Design decisions

The design decisions category includes 7 main issues that teachers should reflect and discuss in the given order. These are: (5) General Description, (6) Target Learners, (7) Pedagogical Approaches, (8) Objectives and Competences, (9) Learning Contents, (10) Assessment Activities and (11) Complementary Technologies (see Table 2).

The **General Description** must be filled out with the name of the MOOC, its estimated duration (in weeks) and the field/area of knowledge it will cover (questions (5.1), (5.2), (5.3) in Table 2). The name of the MOOC can help attracting participants so it is recommended to choose a creative name to catch learners' attention. The duration of the MOOC can be quite varied. For instance, as of this writing MOOCs in Coursera range from 3 to 20 weeks, the median being 7 and the mode 6[9]. The field/area of the MOOC could be something that the teaching staff masters [Siemens, 2012b], providing this way a deep knowledge and being seen as experts by the learners. An alternative could be teaching a MOOC in a new field the teaching staff would like to explore, getting feedback from the community of learners and building the knowledge upon the basic course contents in a more connectivist way [König, 2013]. The General Description conditions the decisions related with Target Learners, Pedagogical Approaches and Objectives and Competences addressed in the course.

Although MOOCs are open by nature and anybody can register and take the course, the teaching staff should keep in mind the **target learners** that they expect to be the core audience of the MOOC [Siemens, 2012b]. Several questions around target learners need to be addressed. The *countries* from which target learners are expected to come from determine the leading language and, possibly, the need for translating or subtitling contents (question (6.1) in Table 2). The *literacy* of target learners is related with their educational background in the area of the MOOC, their ability for self-learning, and the tone of the lectures they are used to (question (6.2)). The *professional sector* of target learners is somehow related to the weekly dedication, with workers normally being able to devote less time to the MOOC than students or unemployed (question (6.3)). Finally, the *motivations* that will make learners to join the course need to be kept in mind by the educators to define the overall character of the course (question (6.4)). Thus, this issue may affect the Pedagogical Approaches and also the Objectives and Competences.

[9] https://www.coursera.org/courses

Issues in the Design Decisions category	Key Questions	Affected issues
5. General Description	*(5.1) What is the name of your MOOC?* *(5.2) What is the duration (in weeks) of your MOOC?* *(5.3) What is the field/area of your MOOC?*	6, 7 and 8
6. Target Learners	*(6.1) What countries do learners come from?* *(6.2) What is the literacy of learners?* *(6.3) What professional sectors do learners belong to?* *(6.4) What is the motivation of learners to join the course?*	7 and 8
7. Pedagogical Approaches	*(7.1) What pedagogical approach/es and/or teaching methods are you going to use to design your course (knowledge dissemination, connectivism, project-based learning, case-based learning, collaborative learning, active learning...)*	8, 9, 10 and 11
8. Objectives and competences	*(8.1) What are the learning objectives of the course?* *(8.2) What are the competencies that learners should acquire during the course?*	9 and 10
9. Learning Contents	*(9.1) How are you going to structure learning contents?* *(9.2) What formats are you going to employ for learning contents (videos, pdfs, ppts, e-books...)?* *(9.3) Does your platform allow this structure and formats?*	11
10. Assessment Activities	*(10.1) What formative assessment activities are you going to include?* *(10.2) What summative assessment activities are you going to include?* *(10.3) Does your platform allow these assessment activities?*	11
11. Complementary Technologies	*(11.1) Are you going to use complementary technologies for delivering learning contents (YouTube, Flicker...)?* *(11.2) Are you going to use complementary technologies for the assessment activities (Hot Potatoes...)?* *(11.3) Are you going to use complementary technologies for promoting communication and discussion among learners (Facebook, Twitter...)?*	-

Table 2: List of issues in the design decisions category, questions related with each of these issues, and issues in the MOOC Canvas that can be constrained.

Another important issue the teaching staff should reflect and discuss is the **Pedagogical Approaches** that will be used during the course. The term pedagogical approach is used in a broad sense, although teachers can also detail in this issue didactics and concrete teaching methods, depending on the granularity they want to express in the MOOC design. Among the wide variety of existing pedagogical approaches, didactics and teaching methods (e.g. knowledge dissemination, connectivism, project-based learning, active learning, etc.) educators should agree which of them will be used at the different stages of the MOOC (question (7.1) in Table 2). The outcome of the discussion about this issue is the basis for defining the course structure, affecting the Objectives and Competences, the Learning Contents and the Assessment Activities; and maybe demanding Complementary Technologies.

The teaching staff should also agree on the **Learning Objectives and Competences** they expect learners to acquire. These design decisions are captured in questions (8.1) and (8.2) in Table 2. Depending on the pedagogical approaches, it may be the case that teachers expect some of the objectives or competences to emerge during the MOOC; that also should be noted here in questions (8.1) and (8.2). As in

any other course the Learning Objectives and Competences may affect the Learning Contents and the Assessment Activities.

Learning Contents in MOOCs are typically delivered in multimedia formats. However, multimedia contents can also be complemented with other types of resources (e.g. pdfs, links to blogs, forum threads, tweets, etc.), these resources being produced by the teaching staff, the own learners or a third-party. In any case, at design time educators should reflect about the contents they will produce for the course, indicating their structure (question (9.1) in Table 2), their formats (question (9.2)), and if the MOOC platform provides support for this structure and formats (question (9.3)). Since some content types may not be supported by the platform, this issue can affect the Complementary Technologies.

Assessment activities are normally classified in two types: formative and summative [Harlen and James, 1997]. Formative assessment activities promote learners' reflection and improve students' attainment [Black and Wiliam, 1998]. Summative assessment activities are those that are considered to compute the final learners' scores. The teaching staff should reflect and discuss here the types of assessment activities that are going to be included in the course by answering questions (10.1) and (10.2) in Table 2, and whether the platform supports them or not (question (10.3)). In case some of the activities cannot be supported by the platform, teachers could select Complementary Technologies.

Finally, **Complementary Technologies** can be employed to add some functionality required to run the MOOC and not provided by the platform; they being particularly important when the platform is employed just to arrange links that redirect to external resources (i.e. in most cMOOCs). Among all the possible complementary technologies, the MOOC Canvas focuses on those related to additional support for delivering learning contents (question (10.1)), for setting assessment activities (question (10.2)), and for promoting communication and discussions among learners (question (10.3)).

4 A Practical Example: Digital Education of the Future

This section shows a practical example of how to use the MOOC Canvas for describing and designing a real course. The MOOC employed as example is "Digital Education of the Future", a course delivered at the Universidad Carlos III de Madrid (Spain) that addresses the use of technologies in education. Figure 2 shows the MOOC Canvas filled out for this example course. As shown in the figure, the main aspects of this MOOC are captured in the MOOC Canvas. That includes the description of the available resources at design time and a summary of the main design decisions taken by the teaching staff. Five teachers participated in the design of this course, this being the first experience teaching MOOCs for all of them.

In this case, the most constraining issue at the time of designing this MOOC was the platform, MiríadaX, which was imposed by the institution. Figure 2 shows for instance that this platform could not host multimedia resources like audios or videos, and YouTube had to be employed as complementary technology in order to support these formats. Also, since one of the objectives of the teaching staff was promoting active learning, Mentormob was selected as a complementary tool to allow learners to upload their own materials and share them with the rest of the course participants.

Besides, the limited support to social tools in MiríadaX (except for a general purpose forum and a Q&A tool) resulted in the use of Facebook and Twitter to facilitate the interactions among learners. Finally, the assessment activities were constrained to only multiple choice tests and peer-to-peer activities; in this case, however, teachers decided not to use complementary technologies and adapted the formative and summative assessment of the MOOC to these two types of assessment activities.

The use of this example MOOC to illustrate the MOOC Canvas can be considered representative, since in this course learning contents are mainly delivered following a traditional knowledge dissemination approach, but including an important social component. Actually, a deeper analysis of learners' interactions with the social tools of the course shows the importance of both the tools included in MiríadaX, and the external complementary tools employed in this MOOC [Alario-Hoyos et al., 2013]. Nevertheless, the MOOC Canvas still needs to be tested in a wider range of platforms to see the effects that those may have in the design decisions. Illustrative examples of real MOOCs designed with the MOOC Canvas and deployed in major platforms are planned to be provided as supporting material for educators.

5 Discussion

The MOOC Canvas presented in this paper is the result of a first iteration with six educators with technological background that participated in a workshop in which they were asked to design a MOOC from scratch using the MOOC Canvas (see Figure 3). The six educators were arranged in two different groups, one designing a MOOC following more traditional teaching methods (xMOOC), and the other designing a MOOC with emphasis in the collaboration among learners (cMOOC). The workshop aimed to discuss and reflect about the selected issues and the need to add or remove some of them. The discussion in this workshop served to detect some flaws in the former version of the MOOC Canvas. Particularly, there were misconceptions with the names of some of the issues. Also, educators complained that there was no specific order to fill out the issues, leading to problems when reflecting about how a particular issue was affected by the others. Finally, the platform was not considered as an issue by itself, despite the strong constraints it imposes on the design decisions. All the problems identified in the workshop were annotated and have been addressed in the current version of the MOOC Canvas.

Another significant discussion point was financial issues. It was already mentioned that the MOOC Canvas integrates the money educators (and institutions) are willing to invest to create and run a MOOC as part of the available resources (human, intellectual, equipment and platform). This decision was also taken during the workshop with educators since the MOOC Canvas is intended to be a generic conceptual framework beyond commercial platforms like Coursera or Udacity (in which MOOCs are generally quite costly), as the selection of the platform is a decision that the teaching staff almost never takes. On the other side, it is noteworthy that the MOOC Canvas only provides support for the design of MOOCs, but it does not care about the medium and long-term economic sustainability of these MOOCs. Actually, the business models employed by the educational institutions (or by the own educators) to get revenue from MOOCs were left out of the scope of the MOOC Canvas as a result of the aforementioned workshop.

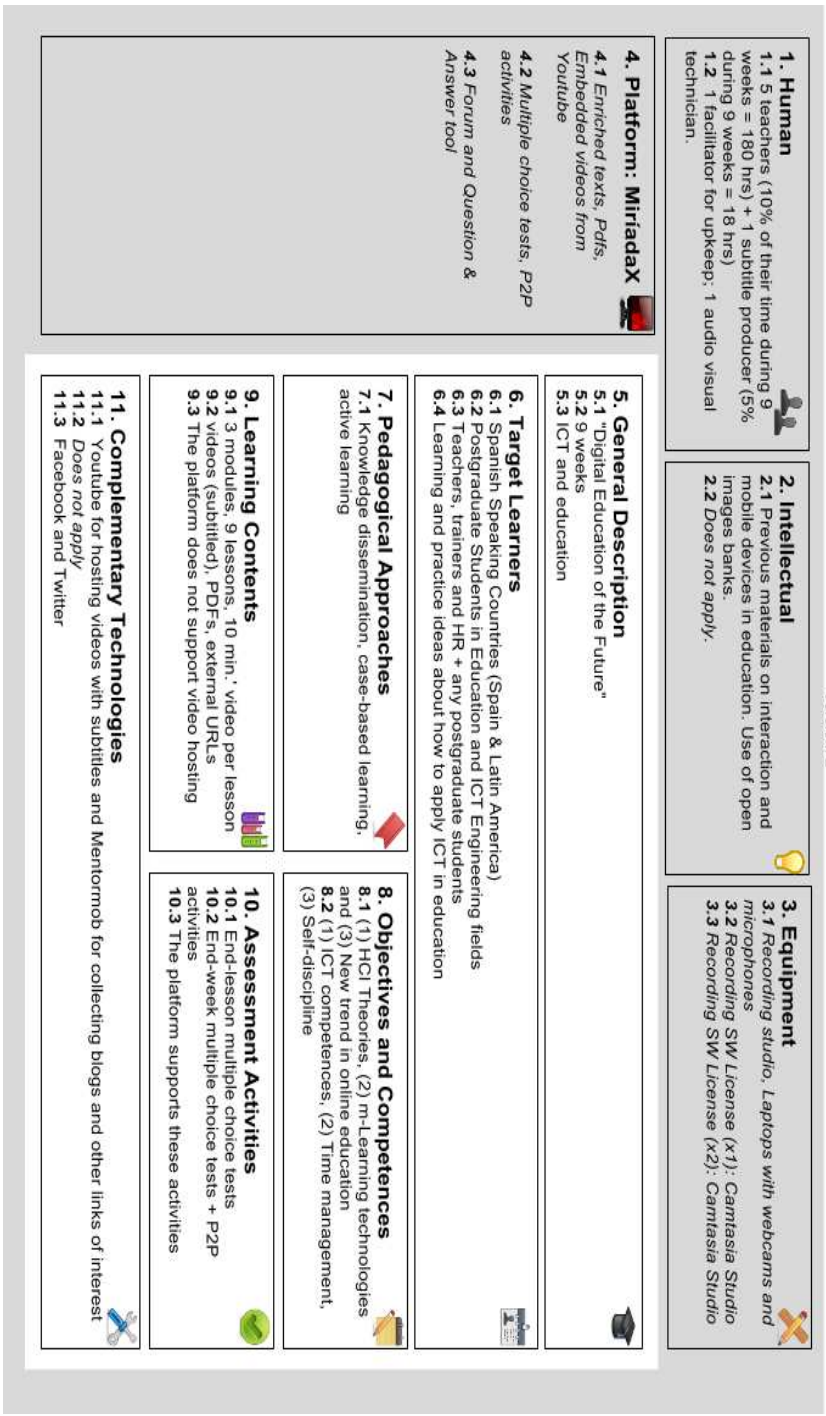

Figure 2: MOOC Canvas filled out for "Digital Education of the Future".

The MOOC Canvas is a first effort to shed some light on the design of MOOCs, which is a cumbersome task that involves an important number of resources and stakeholders. Nevertheless, the MOOC Canvas is not intended to be a standard for modeling and formalizing MOOCs, but a framework for the teaching staff to reflect and discuss about the main issues to be considered in the design of a MOOC, having them organized in a simple and visual way. Also, the MOOC Canvas is useful to see the MOOC description at a glance, and to share the experience of designing the MOOC with other educators that may face similar design decisions in their courses.

The MOOC Canvas is proposed to help teachers of any country design MOOCs about any subject. Nevertheless, at the moment the MOOC Canvas has only been tested in the design of MOOCs taught in Spanish (for an audience of Spanish and Latin American students) about subjects related to technology and education. Thus, the applicability of the MOOC Canvas needs to be assessed with educators from different nationalities and cultural contexts delivering courses that cover a wider range of subjects. Also, following an xMOOC or a cMOOC approach strongly affects the final design. How this is captured by the MOOC Canvas is something interesting to analyze in further research.

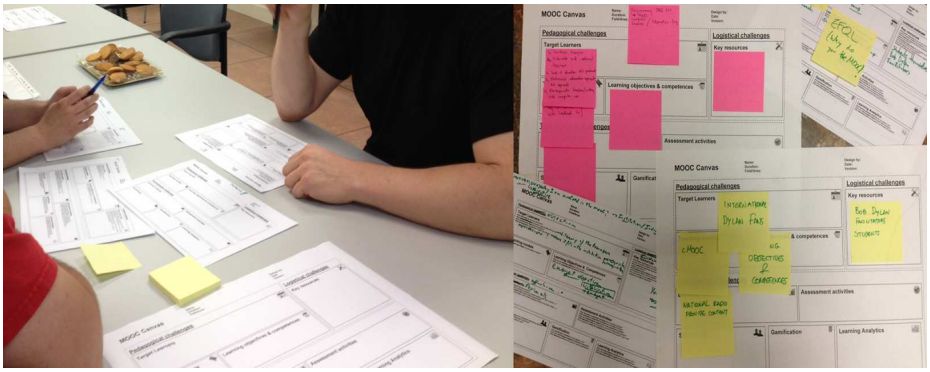

Figure 3: Workshop with expert educators designing a MOOC using the MOOC Canvas: on the left, some experts discuss about the design; on the right, the two canvases show the design outcomes of the discussion.

6 Conclusions and future work

Designing MOOCs is a complex task. As a first effort towards reducing this complexity, this paper has proposed the MOOC Canvas, an early-stage visual conceptual framework for supporting educators in the description and design of MOOCs. The MOOC Canvas considers eleven interrelated issues organized in two categories: available resources and design decisions. Each of these issues is addressed through a set of key questions that invite the teaching staff to reflect and discuss about the MOOC main design elements, while guiding them throughout the design process.

Nevertheless, there are several questions and ideas regarding the MOOC Canvas that need to be pursued in future work. In a short-term, another workshop with a large number of educators is planned to evaluate the MOOC Canvas. The objective of this

evaluation is (1) to understand the capabilities of the MOOC Canvas to express the diversity of possible MOOCs, (2) to identify potential problems with the issues nomenclature and their interrelationships and (3) to assess the usefulness of the MOOC Canvas, the average usage time by the teaching staff and the evolution of a MOOC design since the moment teachers sketch a first draft with the MOOC Canvas. Long-term work includes the exploration of the computational representation of the MOOC Canvas beyond the one currently available in Google Drawings. As a result, we plan to develop a web application that allows the collaborative edition of the MOOC Canvas and its storage in personalized collections. Also, this tool aims at becoming a space for educators to share and discuss about MOOC designs.

In conclusion, this works proposes a first approach for reflecting about the complexity related with the MOOCs design. We contend that the MOOC Canvas framework is a first attempt to capture and understand the design elements that make MOOCs different from traditional online courses.

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