BEST PRACTICES TO DESIGN A MASSIVE ONLINE OPEN COURSE

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Abstract: This article compiles a series of recommendations or best practices to keep in mind to design and implement a Massive Online Open Course. The best practices cover the following aspects: instructional design, game mechanics to encourage the participant's participation and skills development, collaborative activities, role of the facilitators and standard users, evaluation and certification of the acquired learning, user experience, and integration with other social networks. For the purpose of extracting the best practices, we designed an online assessment tool for massive online open courses and subjected it to a process of inter-rater assessment to conduct a content validation. Subsequently, it was applied to a sample of these courses.

Keywords: Best practices, MOOC, Connectivism, Inter-rater assessment.

I. INTRODUCTION

The objective of this article is to exhibit a series of best practices that can be taken into account to design a Massive Online Open Course (hereafter MOOC). To do this, we discuss learning opportunities offered by open education in the theoretical framework. We carefully examine connectivist learning theory and how it relates to MOOCs, as well as the facilitating figures of the learning process in open systems. In the second section we examine the construction process and validation of a tool that has made it possible to evaluate the best practices, as well as the sample of courses evaluated. Finally, in the third section we summarize the best practices obtained from the application of the MOOCs assessment tool.

II. THEORETICAL FRAMEWORK

2.1. Open learning systems

Open education offers any interested party, free of charge, both educational resources, which can be activities or explanations of some concepts (in this case we would be talking about Open Educational Resources or OER), as well as complete courses with a distinctly linear character, i.e., a unique training itinerary is established that defines what content to study and in what order, as well as the activities that should be performed to apply the acquired knowledge.

However, the educational experience based on connectivism is shaped by another type of actions with a different pedagogical approach, actions that are more focused on practice and collaboration among persons to produce a distributed intelligence. In these learning environments, information is available on the Internet in different areas and is not ordered linearly, thus allowing each participant to design his or her own learning pathway.

These learning environments are linked to connectivist learning theories, according to which knowledge is boosted through the process in which a learner is connected to and shares knowledge in a learning community (Kop and Hill, 2008). Siemens (2006) contends that connectivism is a necessary new theory of learning because knowledge does not reside in the mind of an individual, but rather it is distributed in a network, and thus learning is the act of recognizing patterns shaped by complex networks.

Open learning systems are the ultimate expression of the open and massive dialogue between learners and facilitators. In these environments, the learner is always the center of learning, being simultaneously the author and the recipient of the knowledge. Siemens (2008) suggests that learning occurs as the result of establishing relationships at the social, conceptual and neurological level. Connectivism maintains that knowledge is based on the diversity of opinions and is defined as the application of the principles of networks to define the learning process, understanding the latter as the ease of creating new connections and patterns, as well as the ability to manage connections and patterns that already exist.

Thus, connectivism is intrinsically bound to the digital age. It is a dynamic, open, and multi-directional learning in which the level of knowledge depends on the way in which ideas are created and connected. Obviously this approach to learning requires a high degree of autonomy on the part of the student, but even so, there is a danger that should not be overlooked. In his criticism of connectivism, Verhagen (2006) maintains that because learners are

able to choose the content that is useful to them they may be simply creating a learning network that confirms their preliminary point of view, rather than challenging it and testing it. He also explains that, when a learner is committed to the development and recreation of his or her own learning network, meaning arises through the application of metacognitive skills in the assessment of which elements in the network are useful for his or her own learning and which ones are not. If one thing is clear, it is that learners in these networks are the center in their learning process. Neither the professor nor the institution decides the content that is taught or shared (Siemens, 2006).

2.2. Massive Online Open Courses

According to the connectivist theory, traditional courses have to evolve to become nonlinear and less structured open learning spaces, where the user can create his or her own learning material and share it. At first, teaching and learning in these new open learning spaces is an arduous task because of unfamiliarity, because traditional elements are not identified and the information may be fragmented. The initial sensation upon entering an open learning environment online can be one of disorientation. In this sense, MOOCs are a good example of social learning in an open system, where learners self-organize the knowledge they acquire, giving it meaning and sense. The so-called "sensemakings" (Siemens, 2009) or methods of giving meaning to the information found in the environment, are ways of organizing information that are used when we find ourselves in a complex and changing environment. The sensemakings and the learning process are closely related. Participants can self-organize and navigate among them rather than follow pre-established patterns designed by professors. Obviously, the professor is still necessary, but education in an open environment is, without a doubt, a concept opposed to that of the organized curriculum and the traditional courses online.

There are two different types of MOOCs, called xMOOCs and cMOOCs. According to Claros and Cobos (2011), the xMOOCs have a more traditional approach and participants are more controlled and guided, whereas in the cMOOCs an open space is created where the student is the one who creates new networks of content and shares them. One of the key elements in many MOOCs is the introduction of game mechanics or gamification, which consists in the application of game mechanics focused on learning, improving the motivation and retention of users. It can be accomplished by introducing points, achievements, missions, progress bars that show the level in which the user finds himself. Although the application of gamification can be used in different environments, in education it takes on significant importance (Parry, 2012).

2.3. The role of the facilitator in open learning systems

In an open learning environment, the professor assumes the role of facilitator and may discover useful data that indicate when and how he or she should behave in order to become a guide or mentor: when a participant is disconnected or has a low participation, urge him or her to regain the rhythm of the course; identify key informants in the forums that may be of help; study the learning communities that are being created in order to observe the interactions and the exchange of information.

On the other hand, learning in an open learning system involves having a high amount of information available. Some authors speak of "infoxication" (Mela, 2011), referring to the information overload we currently face. Contradictions often arise among sources, which makes it difficult to obtain, compare and process relevant, accurate and safe information. Thus, the need arises to select or "cure" content. "Content curation" is a term coined by Bhargava (2009), the specialist in digital marketing, who described for the first time the different ways of performing the curation of content. "Content curation" consists of searching for, grouping, organizing, and sharing the most relevant content on a certain subject, transforming it into knowledge. The "content curator" is a critical knowledge middleman for finding and organizing what is of interest and useful among the different sources on a topic. Therefore, he must be an expert in one particular discipline or area of knowledge. As indicated by Borrás (2013), the content curator will be that person or company dedicated to surfing the Web searching for content, grouping it and selecting the most suitable to then share it in the community.

III. DESIGN, CONTENT VALIDATION AND APPLICATION OF A MOOC ASSESSMENT TOOL

In order to compile the best practices related to the design and implementation of a MOOC, we designed an assessment tool of these courses, divided into six sections: (1) Learning theories (2) Game mechanics (3) Collaborative activities (4) Roles of actors (5) Assessment and certification (6) User experience. Each these dimensions includes a series of subdimensions and items, as well as a rating scale.

The tool was validated by five experts from different Spanish universities, who were selected on the basis of the following characteristics:

- Academic background and area of knowledge: all the experts are professionals from the university setting, with experience and/or publications on technologies applied to education.

- Knowledge and relevant skills on the subject: the criterion of Lee and Reigeluth (2003) was applied, whereby the degree of experience in the field has been expanding for seven years.
- Availability and proximity of the experts to the investigative process, given that it implies dedicating time to the tool validation process.

To do so, the tool was emailed to them in Excel format, with a table underneath to perform the evaluation, in which they were to assess three aspects on a scale from 1 to 4 depending on the degree to which they agreed with each item (1.Strongly disagree 2. Disagree 3. Agree 4. Strongly agree):

- Clarity in the wording of each of the items.
- The suitability of the question regarding the general dimension to which it belongs.
- The suitability of the different categories of the assessment scale.

The selection and treatment of items was conducted studying the degree of agreement between the judges' opinions in the three aforementioned aspects. The process was carried out in several stages:

1. The percentages of inter-rater agreement for each of the items in the six proposed dimensions were calculated.
2. The two upper and lower categories on the assessment scale were merged to leave only two levels: agreement or disagreement.
3. Inter-rater agreement rates were estimated for the six dimensions using Cohen's Kappa statistic in its version adapted for evaluation situations with more than two judges (Fleiss, 1971).

The Kappa index allows assessment of the level of global agreement in the assessment of the clarity, the content and the scale of the six dimensions, and classifies this agreement in six levels:

Table 1. Interpretation of Cohen's Kappa agreement rate (source:) Viera and Garett, 2005)

Poor	Mild	Reasonable	Moderate	Considerable	Perfect
0	0.2	0.4	0.6	0.8	1

Values below 0.4 indicate the need to revise the items in the dimension and verify in which one there is less agreement. It was determined that there should be an 80% agreement in the assessment of the item to consider it appropriate. Below, due to limited space, we include only a summary of the results.

First of all it should be noted that the judges did not detect problems in the content of the different items of the tool, the rates of agreement (Cohen's Kappa) of the six dimensions reached 0.6. Highlighting the 'Actors' role' dimension that obtained a perfect agreement and the dimensions of Learning theories, Game mechanics and Collaborative activities that obtained a Kappa value of 0.8 or higher.

Second, the analysis of the clarity in the wording of the items only revealed problems in the user experience dimension (Kappa = 0. 33), so the percentages of agreement in this regard were revised in the items that make it up. The dimension of Assessment and certification, and Gameplay mechanics obtained values of moderate agreement (0.46 and 0.5 respectively). Although these can be considered acceptable values, those items were also revised. The rest of the dimensions obtained values equal to or greater than 0.6.

And thirdly, the assessment by the experts of the rating scale of the different items detected little agreement in the dimensions of User experience (0.06) and Theories of learning (0.2). However, in this respect a degree of perfect agreement was obtained in the dimensions of Collaborative tools, Assessment and certification, Game mechanics and Actors' role.

This analysis has made it possible to detect potential problems in some items of the instrument and carry out the appropriate adjustments in the wording or the scale.

Once the content validation of the instrument was done, it was applied to a sample of 5 MOOCs, whose selection criterion was that they be taught through well-known MOOC platforms, at both the Anglo-Saxon and Latin American level. The table below includes the sample courses evaluated.

Table 2.Analyzed MOOCs.

MOOC	PLATFORM	INSTITUTION
Resources and tools for starting a business	UNIMOOC	Instituto de Economía Internacional, Universidad de Alicante
Innovative ideas for new companies. The first step in entrepreneurship	Coursera	University of Maryland
Fundamental Microeconomics course	Miriadax	Universidad Rey Juan Carlos
E-learning and Digital Cultures	Coursera	University of Edinburgh

24.00x Introduction to Philosophy: God, Knowledge and Consciousness	EdX	MIT-Massachusets Institute of Techonology
Design, organization and evaluation of videogames and gamification	Miriadax	Universidad Europea

IV. BEST PRACTICES FOR THE DESIGN OF MASSIVE ONLINE OPEN COURSES

As a result of the analysis we extracted the following best practices for each of the categories studied, that could be applied to a virtual community:

4.1. Contributions of the learning theories onwhich the instructional design is based

(a) Behavioral:

- Include short self-assessment activities that will help reinforce the key concepts of each thematic section (for example, to join with arrows or fill spaces).
- Include a test in each themed section, with immediate feedback that includes questions about the resources provided.
- Provide automatic feedback when performing the tests, if the exercise is properly solved as well as if it is unsuccessful, including an explanation of the correct solution.
- Include a progress bar that makes it possible to check the scores on the tests.
- Award prizes for participating in the community.

(b) Cognitive:

- Use the video as a basic resource in each of the sections, although it is recommended to also use graphics and other text documents that complement the different topics.
- Include activities related to each thematic section.
- Conduct at least one virtual classroom related to each thematic section.
- Submit case studies related to real-lifeeveryday situations that do not have just one answer, but rather that have an open solution.
- Provide conceptual maps that make it possible to relate concepts.
- Provide synoptic tables, summaries and diagrams that will help the user to understand the more complex documentation.

(c) Constructivist:

- Include peer to peer assessment strategies to encourage learning, collaboration and participation in the community.
- At the end of each test or activity, open a discussion group about that task in particular that allows participants to share similar difficulties.
- Encourage the participant to share materials and resources with the virtual community.

(d) Connectivist:

- Make a video presentation to boost familiarity among the colleagues of the community.
- Filter users by areas of knowledge that can teach you something and to whom you can teach something.
- Create a blog where news and information of general interest can be published.
- Possibility of rating each of the contributions of the members of the virtual community.
- Possibility of subscription to those discussions that are considered more interesting.
- Facilitate learning by leaving several options to choose from for contacting other users.

4.2. Game mechanics

- Create Karma (reputation index) associated with the achievement of the objectives of the virtual community.
- Calculate Karma according to the number of topics (open discussion threads), remarks and points received.
- Assign a rating to the different posts from users through stars.
- A ranking exists with the participants in the forum that have received more positive comments in the community (easily visible).
- Offer the possibility of clicking "+1" (Google+) or "Like" (Facebook) on resources (videos, documents, etc.) and contributions.
- Grant users badges for participation in the community: in forums, for consulting certain resources or taking tests, by rating other users' answers, etc.

4.3. Collaborative activities

- Conduct virtual classrooms related to the different objectives of the course that users can participate in both in person and online, live.
- Provide real examples of cases, problems and projects in which members of the virtual community are involved.
- Encourage participation in discussions on those cases, problems or projects: the most active forums are those that are derived from the more complicated activities. Normally in the forum the participants give many more arguments to explain the exercises and very interesting discussions are created.
- Propose activities in varied formats: consulting of resources, blogs, readings, videos, participation in discussions, etc.

- Create different types of forums: virtual community, by sections and for technical support.
- Create virtual classrooms to participate in master classes and presentations that members of the community participate in (welcome to the community, success cases, etc.).
- Offer the ability to search for users to converse instantly, both orally and written.
- Provide a blog where participants share information.

4.4. Role of facilitators

a) Expert:

- Appears in some thematic videos: it's best that they be carried out by different professionals (including the members of the community) and even more than one speaker may appear, which makes the viewing more dynamic and enjoyable.
- Conducts the virtual classrooms.
- Answers questions in some forums (in others the enabler can do it).
- Selects content (in the absence of the role of content curator).
- Provides guidelines for peer review.
- Must be an expert on the subject.

(b) Enabler:

- Participates in forums, responding to any queries or even expanding certain issues or concerns of users.
- Guides the discussion forums which are derived from the exercises.
- All or almost all posts are answered by the enablers.

(c) Curator:

- Only works on some forums if the answer provided by other users is not the best or if he or she can complete it.
- Sometimes the expert also takes this role.
- Ensures that all items are well documented and referenced correctly.

(D) Role of the participant

- The interaction with the facilitators or other users takes place through forums and virtual classrooms.
- Opportunity of rating the comments in forums, which has impact on the reputation of who makes them.
- You can post on different types of forums (units, technical forum and specific).
- There is a cafeteria forum for introducing participants.
- It is necessary to comment in the forum as part of the learning process.

4.5. Feedback and certification

(a) Feedback:

- Although there are activities throughout all of the units and a final questionnaire, the objective isn't to achieve a score, but rather to pass with a minimum of 50% to move to the next unit.
- Continuous and summative: is carried out weekly and after each video conference.
- Quantitative: in each of the units several exercises must be performed and the application corrects them automatically.
- You can check on progress at all times.
- Final feedback based on the completion of a work, which is evaluated by peers (peer to peer evaluation).

(b) Certification:

- An accreditation is provided once all the MOOC units are completed and passed.
- The content of each section is passed by completing questionnaires: if the participant approves approximately 70% of the tests, he receives a certificate online in which the course is listed as completed. If he reaches 90%, he is awarded the commendation "passed with distinction".
- In the courses where the certificate is not obtained by passing a test, it is necessary to meet certain assessment criteria that may involve the development of an activity or final artifact.
- The courses are designed by different universities and companies, although in some cases we can appreciate content or presentations by reputed members or important positions in other companies.

4.6. User experience

(a) Design and navigation:

- The design should be very basic and intuitive, allowing the user to access all the contents and sections easily.
- There should be an introductory video or a specific section to explain how to cope with the platform. Users can consult it throughout the course.
- The navigation should be very intuitive, including a menu with all the subjects.

(b) Interaction with learning resources and course follow-up:

- It is possible to download the lectures.
- All videos are subtitled in English to facilitate follow-up and they can also be passed at different speeds. It should be easy to find a

specific content within the video thanks to the subtitles.

- The user can check what the latest displayed content was.
- The user can consult grades obtained.
- Upon entering the course there is a reminder of the content consulted in the last connection.

(c) Interaction with other participants:

- The chat rooms always work correctly.
- The discussions have a powerful search engine and also you can sort by date, number of positive votes or by number of comments. This allows the user to see which of the arguments has generated more interest, which comments are the top-rated, or simply search the most recent discussions.
- You can see the publications of a particular participant.
- There is a forum Course Feedback, used to post to the team members who run the course and tell them about the user experience.

d) Integration with social networks

- Use of Twitter to share what is happening in the course or virtual community abroad.
- The facilitator provides a hashtag for all participants to talk about it.
- It also lets the participants connect with Google + and Facebook for rating content.
- These practices attract potential users.

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