Design of a pedagogical model to promote knowledge generation in virtual communities

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Abstract: This article presents a pedagogical model specifically designed to encourage the generation of shared knowledge among participants in a virtual community and the process followed to develop it. The model is based on three pillars: 1) structured learning resources that allow individual and collaborative work by the user; 2) game mechanics that increase participation in the community; 3) dynamisation of the community by the community manager or facilitator. The model was developed starting with a literature review of open learning systems, and specifically, massive online open courses. This review served as a basis to design a specific tool to assess these courses and identify best practices. The tool was subjected to an inter-rater evaluation process prior to its application.

Keywords: pedagogical models; virtual communities; massive online open courses; MOOC; best practices; gamification; learning.

Reference to this paper should be made as follows: Redondo-Duarte, S., Sánchez-Mena, A.; Navarro-Asencio, E. and Gutiérrez Vega, S. (2017) 'Design of a pedagogical model to promote knowledge generation in virtual communities', *Int. J. Learning Technology*, Vol. 12, No. 1, pp.3–25.

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This paper is a revised and expanded version of a paper entitled 'Best practices to design a massive online open course' presented at ISER 3rd International Conference, Paris, France, 22 August 2015.

1 Introduction

More and more we hear of the benefits of community learning as web users become active creators of information that they themselves control and manipulate in a collaborative way. Thus, according to García Aretio (2007, p.126), communities are fostered by the interaction among individuals and by the exchange of meanings and identities within a group: people access, share, cogenerate and generate knowledge from those relationships and the communicative exchanges among them

The importance that virtual communities have garnered as a learning vehicle in recent years is the primary rationale that motivates the proposal presented in this article, which

is the design of a specific pedagogical model for encouraging the generation of shared knowledge among participants in a virtual community. The analysis of Massive Online Open Courses (MOOC hereafter) has been used to develop this model because, as Gea and Montes (2009, p.125) point out, they can be a good tool for the creation of virtual communities that facilitate permanent learning. As Siemens (2012) points out, this type of course presents learning as an exchange of ideas between participants whereby "the learning comes from content presented by a lecturer, and then dialog via social media, where the contributions of the participants are shared. Assessment comes from participation and reflection, without explicit contextualised practice" (Siemens, 2012). These courses, moreover, constitute one of the best examples of how the principles of Web 2.0 and game mechanics have been incorporated into learning.

In the next section, learning opportunities offered by open education are explored by looking at connectivist learning theory and how it relates to systems. The third section illustrates the construction and validation process of a tool that has made it possible to evaluate the best practices carried out in a MOOC sample. The fourth section presents the best practices drawn from the application of the MOOC assessment tool, classified in the following aspects: instructional design, game mechanics to encourage participation and competence development, collaborative activities, role of the facilitators and users, evaluation and certification of the acquired learning, user experience, and integration with other social networks.

Finally, the pedagogical model designed specifically for virtual communities is presented, based on three fundamental and interrelated pillars:

1 structured learning resources that allow individual and collaborative work on the part of the user

2 game mechanics that increase participation in the community

3 dynamisation of the community by the community manager or facilitator.

2 Literature review

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 Open Educational Resources or OERs), as well as complete courses with a distinctly linear character. In the second case, 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 other types of actions with a different pedagogical approach, which are more focused on practice and collaboration among persons to generate distributed intelligence. In these learning environments, information is available on the internet in different areas and is not ordered linearly, allowing each participant to design his or her own learning itinerary.

These learning environments are linked to connectivist learning theories, according to which knowledge is stimulated through the process whereby 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 is distributed in a network and therefore learning is the act of recognising 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 centre 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 network principles 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 type of dynamic, open, and multi-directional learning in which the level of knowledge depends on the way in which ideas are created and connected. This approach to learning obviously requires a high degree of autonomy on the part of the student, which can generate other issues. In his criticism of connectivism, Verhagen (2006) maintains that, because they are able to choose the content that is useful to them, learners 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 assessing 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 centre of their learning process. Neither the professor nor the institution determines the content that is taught or shared (Siemens, 2006).

2.2 Massive online open courses

According to 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 with the system, as traditional elements are not identified and the information may be fragmented. The initial sensation upon entering an online open learning environment can be one of disorientation. In this sense, MOOCs are a good example of social learning in an open system, where learners self-organise the knowledge they acquire, giving it meaning and sense. The so-called 'sensemaking' (Siemens, 2009) method of giving meaning to the information found in the environment is a way of organising information that are used when faced with a complex and changing environment. Sensemaking and the learning process are closely related. Participants can self-organise and navigate rather than follow pre-established patterns designed by teachers. Obviously, the teacher is still necessary, but education in an open environment is, without a doubt, a concept significantly different to those of organised curriculums and traditional online courses.

Following Hew (2015), the main factors behind the popularity of a MOOC are:

1 problem-centric learning with clear explanations

2 instructor accessibility and passion

3 active learning

4 peer interaction

5 helpful course resources.

Two different kind of MOOCs can be identified: cMOOCs and xMOOCs. cMOOCs are described by Rodriguez (2012), are an online course where alignment with the course content or the instructor does not exist. The alignment instead is with learners and their knowledge. In contrast, xMOOCs use interactive media adopting a more behaviourist pedagogical approach which is focused on individual learning instead of peer learning (Conole, 2014).

According to Romero (2013), the methodologies that the most popular MOOCs use are similar to those used in a lecture-based setting. These features are text-based materials, video-lectures and forum-based interactions. The problem is that using only these kind of resources may lead to a low interaction between instructor and the participants, and some of the possibilities in terms of interactions that a MOOC allows are not maximised.

One of the key elements in many MOOCs is the introduction of game mechanics or gamification, which consists of the application of game mechanics focused on learning to improve the users' motivation and retention. It can be accomplished by introducing points, achievements, missions, and progress bars which show the level of the user (Parry, 2012). Although the application of gamification can be used in different areas, in education it takes on significant importance, as Klopfer et al. (2009, p.1) establish:

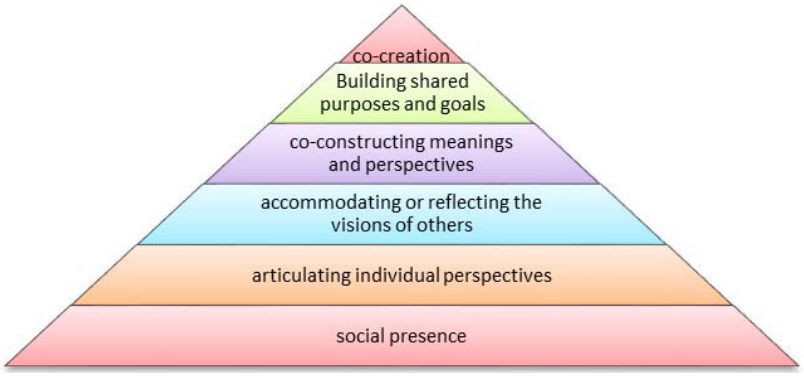
> "Games players regularity exhibit persistence, risk-taking, attention to detail, and problem-solving, all behaviours that ideally would be regularly demonstrated in school."

Gamification has been defined as 'the use of game design elements in non-game contexts' [Deterding et al., (2011), p.9]. As Huang and Soman (2013) point out, these game mechanics can be classified as self-elements (points, achievement badges, levels, which are oriented to competing with oneself and recognising self-achievement), or social-elements (i.e., leaderboards, where students achievements are shown in public).

2.3 The role of facilitator in open learning systems

In a virtual community two key figures are necessary to dynamise learning: the community manager and content curator. According to Zapata (2011), we can assume that the community manager oriented toward a network that has informal learning as one of its purposes will have a role of dynamiser, tutor or even professor, emerging as a new figure of educational community manager. This community manager is focused on the 'informal student' or user, encouraging a high level of participation, satisfaction and learning that draws on the knowledge and achievement of some objectives to achieve better results and relationships with participants. Thus, we can understand that the community manager is configured as a teacher or tutor who, based on knowledge and achievement of educational objectives, achieves better relationships with the participants of the digital community thanks to the knowledge of their needs and difficulties (Pérez, 2010).

Figure 1 Murphy's collaboration model (see online version for colours)



Source: Murphy (2004)

A major challenge the community manager faces is to get members of the community to move from interaction to collaboration, concepts that Murphy (2004) addresses. Collaboration can be identified along a continuum in which six processes or stages can be identified. This continuum moves from mere interaction towards a relationship focused on a purpose such as the co-creation of a product/deliverable. The higher levels cannot be reached without having carried out actions in lower ones. Simple interaction is a necessary prerequisite for full collaboration. The six processes are shown in Figure 1.

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 faced. 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), a specialist in digital marketing, who first described the different ways of performing content curation. 'Content curation' consists of searching for, grouping, organising, and sharing the most relevant content on a certain subject, and transforming it into knowledge. The 'content curator' is a critical knowledge middleman for finding and organising what is of interest and useful among the different sources on a topic. Therefore, he or she must be an expert in a 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 with the community.

3 Design, content validation and application of a MOOC assessment tool

With the aim of designing a pedagogical model to encourage the generation of shared knowledge among participants in a virtual community, it was necessary to extract the best practices implemented in an open learning system, in this case a MOOC. For this purpose, the authors decide to follow a methodology which encompassed three phases:

1 an exhaustive literature review which has been used as a basis to develop an assessment tool

2 the creation of a MOOC assessment tool as well as its validation through an inter-rater procedure

3 the elaboration of a set of best practices for the design of MOOC analysing five of these courses (using the tool previously validated) and using a real-time Delphi.

In order to compile the best practices related to the design and implementation of a MOOC, an assessment tool was designed 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 of these dimensions includes a series of sub-dimensions and items, as well as a rating scale. The following is an explanation of the analysis categories, the subcategories, and their definition.

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 related to education.
- Knowledge and relevant skills on the subject: the criterion of Lee and Reigeluth (2003) was applied, whereby a level of experience of at least seven years is required.
- Availability and proximity of the experts to the investigative process, given that it implies dedicating time to the tool validation process.

The tool was emailed to each of them in Excel format, with a table below to perform the evaluation, by which they were to assess three aspects on a Likert scale of agreement across 4 points:

- 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 response scale.

The process of validation was carried out in three 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 the version adapted for evaluation situations with more than two judges (Fleiss, 1971).

The Kappa index allows us to estimate the degree 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

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

Source: Viera and Garett (2005)

We took values below 0.4 as an indicator of the need to revise the items in the dimension and verify in which one there is less agreement. 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, with outstanding results in the 'Actors' role' dimension which obtained a perfect agreement and also 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 of the wording of the items only revealed problems in the user experience dimension (Kappa = 0. 33), so the percentages of inter-rater agreement in this regard were revised in the items that compose it (it was decided that there should be an 80% agreement in the assessment of the item to consider it appropriate). The dimensions of Assessment and Certification, and Game mechanics obtained values of moderate agreement (0.46 and 0.5 respectively). Although these can be considered acceptable values, these items were also revised. The rest of the dimensions obtained values equal to or greater than 0.6.

And thirdly, the experts' assessment 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.

The principal recommendations made by the evaluators were the need to split up some of the items, to improve writing and to shorten them to facilitate their readability.

The final version of the MOOC assessment tool is below. Each item is assessed using a dichotomous scale (yes/no).

Once the content validation of the instrument was carried out, it was applied to a sample of five MOOCs.

A convenience sample was used, where representativity is determined by the researcher following subjective criteria (Casal and Mateu, 2003). Thus, the aim is neither generalisation of the results nor evaluating each MOOC, but obtaining best practices when designing a MOOC. For this purpose, there were two selection criterion:

1 courses should be taught through well-known MOOC platforms, at both the Anglo-Saxon and Iberoamerican level

2 courses should represent different areas of knowledge.

Table 3 includes the sample courses evaluated.

Table 2 MOOC assessment tool

Dimension	*Subdimension*	*Item*
Learning theories	Behavioural	It promotes task-based learning
	Cognitivism	It promotes reasoning and problem solving
	Constructivism	It fosters social learning
		It fosters scaffolding
	Connectivism	It facilitates nodes connection with social networks
Game mechanics	Participation badge	It is possible to obtain recognition in the community associated to the level of participation
	Karma	There are tools to assess user reputation
	Skill badge	The user can obtain awards associated to knowledge and skills acquisition
	Other strategies	Other game mechanics are used (rankings, awards, etc.)
Collaborative activities and tools	Type of activities	There are peer to peer activities
	Use of tools	Participants use blogs
		Participants use wikis
		Participants use chat rooms
		Participants use debates forums
		Webinars are carried out
Role of actors	Expert teacher	There is an expert that teaches the course: answering questions, providing feedback, conducting virtual classrooms and assessment rubrics
	Dynamiser	Promotes interaction and participation among the participants in the course and assists in problem solving
	Content curator	Content expert that selects information sources and checks bibliographic references
Assessment and certification	Assessment	The course includes a continuous, formative, summative and/or final assessment system through different activities
	Learning progress	It is possible to check learning progress at any time
	Certification	How to get a certification is specified once the course is finished
User experience	Design and usability	It is easy to access the learning resources
		Navigation is intuitive
	Social networks	The course is integrated into social networks (Facebook, LinkedIn, Twitter, etc.)
	Training on the use of the platform	There is a tour or introductory video that explains the operation of the platform

Source: Author compiled

Table 3 Analysed MOOCs

MOOC:	*PLATFORM*	*INSTITUTION*
Resources and tools for starting a business	UNIMOOC	Institute of International Economics, University of Alicante
Innovative ideas for new companies. The first step in entrepreneurship	Coursera	University of Maryland
Fundamental Microeconomics course	Miriadax	University Rey Juan Carlos
E-learning and Digital Cultures	Coursera	University of Edinburgh
24.00 x Introduction to Philosophy: God, Knowledge and Consciousness	EdX	MIT-Massachusetts Institute of Techonology
Design, organisation and evaluation of videogames and gamification	Miriadax	Universidad Europea

Source: Author compiled

The research team carried out the analysis and identification of best practices for each MOOC using real-time or modified Delphi (a shorter variant of Delphi technique), where the process takes place during the course of a meeting, using mechanisms to summarise responses immediately (Villiers et al., 2005). The Delphi method is a forum for ideas where the decision- maker is interested in having an informed group to present options and supporting evidence rather than having a group reach a decision (Clayton, 1997). Thus, the proposal of a pedagogical model for designing virtual communities was developed following five phases:

Each expert analysed one MOOC individually based upon the tool's indicators.

1 Each expert identified a series of best practices, classifying them according to the sections of the MOOC assessment tool.

2 In order to compile individuals' results, the coordinator integrated the obtained information highlighting the differences and similarities found in the MOOCs.

3 A panel with all researchers involved was set up, where the document prepared in the previous phase was analysed until consensus was reached. No significant disagreements were found.

4 A proposal for a pedagogical model for designing virtual courses was developed. It was built following a practical approach to serve as a guide for instructional designers and teachers.

An important limitation of this study is the fact that the tool is mainly focused on the pedagogical elements to foster shared knowledge in a virtual community. Items related to the user experience and usability are less developed and need to be refined.

4 Best practices for the design of massive online open courses

As a result of the MOOC's analysis and having the literature review as a framework, we extracted the following best practices for each of the categories studied, which could be applied to a virtual community:

4.1 Contributions of the learning theories on which the instructional design is based

From a Behavioural perspective, the MOOCs that have been analysed include short self-assessment activities that help to reinforce the key concepts of each thematic section. Secondly, they include a test in each themed section, with immediate feedback. Thirdly, they provide automatic feedback when performing the tests, if the activity is properly solved as well as if it is not. It also includes an explanation of the correct solution (Area, 2004). Another practice is including a progress bar that makes it possible to check the scores. Finally, prizes for participating in the community can be awarded.

Following a Cognitive approach, some practices identified are as follows. First, the use of videos within the MOOCs is a basic resource and includes activities related to each thematic section. However the alternative use of graphics and other text documents that complement the different topics is also recommended. At least one virtual classroom related to each thematic section can be carried out. Case studies can also be submitted related to real-life situations that do not have a single solution, but rather have an open solution. Providing conceptual maps makes it possible to relate concepts and synoptic tables, summaries and diagrams that will help the user to understand the more complex documentation (Ertmer and Newby, 1993).

From a Constructivist perspective, when designing a MOOC it is recommended to include peer-to-peer assessment strategies in order to encourage learning, collaboration and participation in the community (Suen, 2014). At the end of each test or activity, opening a discussion group about that task in particular allows participants to share similar difficulties.

Finally, from a Connectivist point of view, making a video presentation can boost familiarity among the colleagues of the community. Second, if users can be filtered by areas of knowledge, it would help in knowledge sharing as you can identify who can teach you and what you can teach to the rest of the users. Third, creating a blog is recommended so news and information of general interest can be published where the contributions of the members can be rated and those that are considered more interesting can be useful to others. Finally, it helps to facilitate learning by leaving several options for contacting other users.

At present, a constructivist approach is increasingly being used for online courses because it helps students to better develop professional skills and face multiple realities (Guardia and Sangrà, 2005). Nevertheless, there is not one best pedagogical model. According to Gros (1997), any learning and teaching theory is partial and insufficient to explain all learning situations.

4.2 Game mechanics

Regarding game mechanics, best practices include granting users badges for participation in the community: in forums, for consulting certain resources or taking tests, for rating other users' answers, etc. Badges are achievements given to users who have performed an action. They provide positive feedback to some tasks and also let them show those achievements to the rest of users (Giannetto et al., 2013). Badges help the learner to follow the activities in order to reach the learning objectives (Beneit et al., 2015).

Other game mechanics can be created using Karma (reputation index) associated with the achievement of the objectives of the virtual community. These include calculating

Karma according to the number remarks and points received in topics (open discussion threads), assigning a rating to the different posts from users through stars, creating a ranking of forum participants who have received more positive comments in the community (easily visible), and offering the possibility of clicking '+ 1' (Google +) or 'Like' (Facebook) on resources (videos, documents, etc.) and contributions.

4.3 Collaborative activities

A collaborative activity could be explained as an instructional strategy that allows interaction between two or more learners increasing their own and each other's learning (Dabbagh, 2005). The collaboration activities guide the participants and may be used for later evaluation. An intentional point of collaboration may be characterised by a goal, a collaboration process, participant information, and a dataflow (Theilmann et al., 2005).

This collaboration can be encouraged conducting virtual classrooms related to the different objectives of the course by providing real examples of cases, problems and projects; by encouraging participation in discussions on them; by proposing activities in varied formats (readings, blogs, videos, discussions, etc.); by creating virtual classrooms to participant in master classes as well as different types of forums; by offering the possibility of searching for users to converse instantly, both orally and in writing; and y a blog where participants share information.

4.4 Role of facilitators

The role of facilitators includes expert, moderator, curator and role of participant.

An expert in MOOCs analysis must be an expert on the subject. He or she appears in some thematic videos, conducts the virtual classrooms, answers questions in some forums (in others the dynamiser can carry out the same task), selects content (in the absence of the role of content curator) and provides guidelines for peer review.

Secondly, moderators participate in forums, responding to any queries or users' concerns, expanding certain issues, guiding the discussion forums that arise out of the exercise and, finally, they answer all or almost all posts.

Thirdly, curators only participate in some forums if the answer provided by other users is not the best or if he or she can complete it. The curator ensures all the items are well documented and referenced correctly (Reig, 2010). The expert sometimes takes this role.

Last but not least, the role of the participant. In this role, the interaction with the facilitators or other users takes place through forums and virtual classrooms. He or she has the opportunity to make comments in forums, which affect the reputation of the person who makes them. It is possible to post in different types of forums (units, technical forum and specific). The café forums are used to introduce participants. In some MOOCs it is necessary to comment in the forums as part of the learning process.

Online discussions have several benefits as they promote users' critical thinking and knowledge construction. Additionally, online discussions can improve students' social skills, as they enable students to interact with others such as peers, experts or teachers. Furthermore, online discussions need facilitation or moderation to make them effective (Wang, 2008).

4.5 Feedback and certification

Although there are activities throughout all of the units as well as 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. Usually, the feedback is continuous and summative (it 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), and the user should check his or her progress at all times. Final feedback is based on the completion of a task, which is evaluated by peers (peer-to-peer evaluation).

Peer assessment in MOOCs needs to be:

1 simple and easy to understand for students

2 efficient in execution without occupying much time

3 limited in that each student rater is asked to rate no more than a handful of other students' assignments (Suen, 2014).

In addition, these authors point out that peer-to-peer evaluation can´t replace the teaching given by an expert.

Regarding 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 passes 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 task.

4.6 User experience

Navigation should be very intuitive, including a content menu. There should be also an introductory video or a specific section to explain how to use the platform, which users can consult throughout the course.

Regarding the learning resources, students can check what the latest content displayed was, as well as consult grades obtained. Upon entering the course there is a reminder of the content consulted in the previous connection. All videos are subtitled in English to facilitate follow-up and they can also be watched at different speeds. It should be easy to find any specific content within the video thanks to the subtitles.

Interaction with other participants can be fostered through discussions. Courses must have a powerful search engine and can also be sorted by date, number of positive votes or by number of comments. This allows the user to see which of the arguments has generated most interest, which comments are most highly rated, or simply search the most recent discussions (Gros et al., 2009). There is a forum for Course Feedback, used to post to the team members who run the course and tell them about the user experience.

Integration with social networks is a key practice to attract potential users (Reig, 2010). It includes the use of Twitter to share externally what is happening in the course or virtual community. For that purpose, the facilitator provides a hashtag for all participants to talk about it. It also lets the participants connect with Google + and Facebook to rate contents.

5 Proposal of a pedagogical model for designing virtual communities

Finally, as a result of extracting the best practices for each of the categories studied, a proposal of a pedagogical model for virtual communities was built. It is based on three fundamental and interrelated pillars (see Figure 2). These have been considered in the literature review (see 2.2 and 2.3) as the key components in order to foster social learning in an open system:

- Structured learning resources in each virtual community, so that the user can access resources and work with them on an individual level (videos, complementary documentation, test fulfilment, participation in virtual classrooms) and on a collaborative level, as a community making a concerted effort to respond to a task (case or problem solving, participation in discussions, etc.)
- Participation and game mechanics: communication will be multidirectional, with the community manager as well as with the other members of the community. To encourage this participation the techniques of gamification or game mechanics are essential.
- Dynamisation of the community: the role of the facilitators is crucial for keeping the community current and active, and to that end online group moderation strategies and scripts for interaction should be used.

Figure 2 Key elements of the social learning model (see online version for colours)

Source: Author compiled

5.1 Structured learning resources

In each community, there should be a variety of resources that contribute dynamism to the user's learning experience and which meet different learning objectives (see Table 4).

Table 4 Learning resources and objectives

Learning resource	*Objective*
Virtual community file	To introduce potential users to the community and its objectives
Motivating introductory video	To introduce the virtual community and encourage participation in it
Theme videos	To introduce the main concepts of a particular section
Complementary documents	To expand upon concepts or procedures discussed in the virtual community
Tests	To check immediately to see if users have understood the concepts or procedures dealt with in the theme videos or supporting documents
Quick task	To consolidate the concepts or procedures worked on through quick activities and reflect on them
Cases and real problems	To collaboratively solve a case or a real problem or to present its resolution to the virtual community
Discussions	To promote the exchange and generation of knowledge related to various learning resources
Press releases	To waken or keep alive the interest in a particular topic
	To promote discussion and group knowledge generation
Famous quotes	To waken interest in some of the topics of the virtual community
Virtual classroom	To explain certain concepts present in each subject
FAQ	To collaboratively generate answers to key aspects of the themes of the community
Glossary of terms	To define key concepts of the virtual community
Logos	To promote participation in the virtual community
	To generate community identity

Source: Author compiled

1 *Virtual community file:* each virtual community must have a file that includes the objectives of the virtual community, the possible topics to be discussed, the recipients they are directed towards, the person who is responsible for dynamising it, as well as the obligations assumed (if any) by participating in it.

2 *Videos:* different types of videos can be included in the virtual community, depending on the objective to be achieved:

- *Video/tour of the platform:* it is advisable to have a video that, in a few minutes, explains the features of the platform, how to communicate with the community manager and other users, or where to request technical assistance if necessary.
- *Motivational video on the virtual community:* the first video that the user views should be motivational, introducing the virtual community and its goals, the main topics to be discussed, and encouraging the user to participate. In a few minutes, the video should provide a general overview about what the user can find there. In addition, it should explain who will be responsible for dynamising the virtual community and what can be expected of them, as well as the kind of participation required of the users in the community to keep it lively.

- *User-created videos:* users who wish to become members of the community could create a one minute video that explains what they can contribute to the community and what they would like to find in it.
- *Theme videos:* they should be around five minutes in length. The objective is to attract the user's attention by presenting high-impact content. The videos must be created by the community manager, searched for by him or by other users.

3 *Discussions:* assuming that learning does not take place in the individual, but is rather the result of the interconnections that the learner establishes in networks, attention needs to be focused on the discussions. These encourage the exchange of knowledge on the topics associated with each resource. Here are some recommendations to incorporate into the forums in the virtual communities:

- You can include a *discussion for each of the resources* that are uploaded to the virtual community to promote discussion and debate.
- The *videos, activities, news and famous quotes* or any other content posted to the community can each have its own discussion associated with it, providing that they be on-topic.
- It is important to have a *dynamiser* to channel the discussion in case it deviates from the initial thread, but to be responsible above all to maintain the activity and to promote participation.
- One possibility is to allow *access to the discussion* only to participants who have completed a previous activity. For example, individual reflection is promoted initially in answering test questions, and once the user receives the qualification, he or she has access to the discussion forum. The idea is to enrich the forum with high level discussions.

4 *Press releases:* in the virtual community there may be a variety of resources, such as press releases, since it is a way for users to associate the content they are learning to their immediate reality. This also facilitates participation and analysis.

5 *Complementary documents:* the documents are also a valuable resource, provided that they are not too long (except manuals) to keep the user's attention. The document should summarise the main ideas in two or three pages maximum, and have an attractive layout.

6 *Questionnaires:* another resource that may prove useful is the questionnaire, understood as a tool for self-assessment and reinforcement of concepts and procedures explained in a blog, a video, a document, etc. It is important that the student can verify, if desired, whether or not the basic knowledge has been acquired, as well as check any weaknesses so to review any content if necessary.

The questionnaire can also be used as a motivating element (for example, considering a simple case, one question) that wakens interest in participating in a debate.

7 *Quick tasks:* the quick tasks or quick activities can be associated with each resource, and are intended to help set the fundamental concepts and to reflect on them. The quick tasks may be true or false questions, wikis for the elaboration of joint documents, conceptual maps or participation in discussions.

8 *Cases, problems and projects:* cases, problems or real projects, directly related to the interests and objectives of the community, such as challenges in which members of the community can work collaboratively, should be considered. These activities can have peer-to-peer evaluation.

9 *Virtual classrooms:* virtual classrooms can be useful to have discussions in real time, present solutions to problems or cases, ask questions, etc. Virtual classrooms can be recorded and made available to the community.

Aside from the resources that have been referenced, the community dynamiser and the other participants can contribute others that arise spontaneously. The biggest advantage of these platforms is that they are semi-structured and any strategy that can contribute to learning has a place in them.

10 *FAQ:* the virtual community can incorporate frequently asked questions related to each of the topics of interest. These questions should be able to be constructed among all members of the community.

11 *Glossary of terms:* the virtual community can incorporate a glossary that defines the main concepts and procedures addressed in the virtual community. These concepts should be able to be constructed among all members of the community.

5.2 Dynamisation of the community

The dynamiser should keep the virtual community updated, making it grow in line with the interests and needs of its members. To do this, he or she should use online group moderation strategies which are very effective for solving problems. It is appropriate to dynamise the group weekly, developing the following functions:

- stimulate participation and encourage the development of arguments
- dynamise interactions that raise the conceptual level
- start and lead discussions, synthesise ideas, rebuild and develop themes
- formalise the knowledge generated in the discussions in a summary document
- develop and promote non-authoritarian, positive and objective communication by restricting the use of humor or sarcasm
- dynamise discussions underlining the significant participations
- select reinforcement teaching resources, to ‘nurture’ the virtual community
- propose activities that help members of the community achieve the goals for which it was created
- ‘correct’ deviations publicly and in private if it is necessary to admonish them
- encourage the participation of members of the community who are inactive
- identify users who lead specific thematic lines
- check what discussions generate more votes and comments.

Also, it is advisable that the community manager or facilitator *structure participation* through scripts for online interaction (Dillenbourg and Fischer, 2007), because it improves the level of engagement among users and between users and the content (Means et al., 2010). Here are some guidelines to design and structure interactions among participants:

- *Generate new thematic lines* as the community grows, based on its interests and needs.
- *Every week include some resource* (video, news, activity, document, etc.) and suggest a discussion or make a comment on that resource.
- *Pre-design necessary moments of interaction* in the resolution of a complex task, such as a case, problem or project (interaction may be suggested according to the different phases or milestones during the resolution, including peer-to-peer evaluation).

In addition, *integration with external social networks*, such as Twitter and YouTube, is advisable as it can be interesting and motivating for generating informal learning. Twitter can be used in the virtual classrooms or other training events, so that in the very place where the event is happening a hashtag is created and attendees share impressions and comments that they feel are relevant to sharing knowledge.

5.3 Game mechanics

A new trend known as gamification which consists of the application of game mechanics to learning should be incorporated in the key elements of the pedagogical model. The main objective of this trend is to solve one of the fundamental requirements for success in the learning process: the *motivation and loyalty of the user*. Thus, it is to be expected that the application of these techniques will promote:

- *Increased interest* on the part of the user both in the run-up to the participation in the community as well as during it.
- *Knowledge acquisition* by users, who will create their own challenges.
- A greater *durability of the knowledge* acquired.

The following is a proposed list of good practices which should be included in the system at the platform level:

1 *Game rules:* one of the main points for a gamified system to meet its objectives is knowledge of the rules (points, rewards, times, etc.) that users should follow to achieve the different objectives. In this way, the user must receive continuous and contextual information within the platform. In addition, how to obtain the different awards will be explained in the community file.

2 *Awards:* the following actions performed by users should have an associated *reward in the form of a badge*:
   - upon completing the first participation (for example, the first resource consulted)

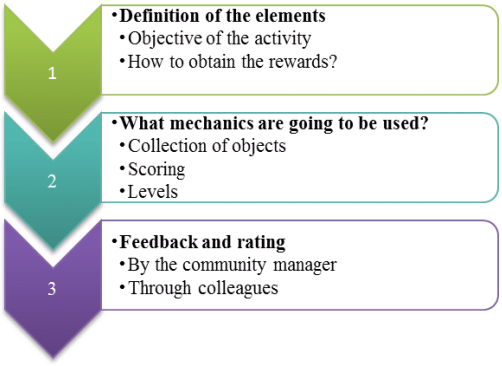
- completing an activity with the highest rating
- demonstration of certain skills that should be developed in the virtual community: teamwork, communication, problem solving, etc.
- problem solving of cases associated with the development of technical skills.

The *most participative users* should be able to distinguish themselves. To do this the following *rankings* could be used, indicating the 10 most outstanding in each section (Top 10):

- number of resources visited
- average evaluation received
- contributions to forums.

Finally, in relation to recognition, it is advisable to show a *summary of users with longest presence* in the previous rankings.

Figure 3 Planning of a reward system (see online version for colours)



Source: Author compiled

Although, as we have seen so far, the platform should provide some gamified features, one of the most important aspects is based on the content design and the activities of the virtual community. To achieve the objectives of the virtual community, each one must plan a reward system that is suitable to its needs and idiosyncrasies, as shown in Figure 3.

Finally, the possibility of *publishing on external platforms the awards received* can be taken into account, where the following differentiation should be noted:

- *Social networks:* ability to add a new publication in some of the social networks used by the user.
- *Badges BackPack:* the user shall have the possibility to store different badges received in appropriate BackPacks, one of the main ones being the Mozilla initiative with its OpenBadges platform.

6 Conclusions

The objective of this article is to propose a pedagogical model for encouraging the generation of shared knowledge among participants in a virtual community. For that purpose, a set of recommendations are presented that can be followed by instructional designers and teachers in order to design and implement a virtual community. These are articulated on the basis of three pillars:

1 structured learning resources

2 participation and game mechanics

3 dynamisation of the community.

The methodology followed encompassed:

1 an exhaustive literature review that has been used as a basis to develop an assessment tool

2 the creation of a MOOC assessment tool as well as its validation through an inter-rater procedure

3 elaboration of a set of best practices for the design of MOOC analysing five of these courses (using the tool previously validated) and following the real-time Delphi.

Although content validity was guaranteed thanks to the interrater assessment, future research should address a more in-depth study. In this sense, an option would be to check the tool's reliability and validity by allowing different experts to assess the same MOOC so as to observe if they get similar results. The Delphi technique that has been used is a valid method to identify best practices but it may increase subjectivity. For this reason, authors consider the expert selection process as a cornerstone and it can be improved including participants, moderators, and facilitators of the analysed MOOCs.

One of the most important limitations of the study is precisely the number and representativity of the analysed MOOCs. For future research, more courses would need to be evaluated, and the popularity of these courses should be considered as a sampling criterion. This analysis will help to know if different knowledge domains demand different requirements in terms of learning design. Afterwards, it would be necessary to conduct a follow-up study with the revised version.

Thus, the present article must be considered as an approximation of the key components that should be taken into account in order to design a pedagogical model for virtual communities. The authors consider that the tool can be a useful guide for instructional designers, teachers and trainers that seek to motivate their students by introducing social learning in their teaching practices.

References

Area, M. (2004) 'Máquinas que enseñan. Una revisión de los métodos de enseñanza- aprendizaje con ordenadores', *Bordón*, Vols. 3–4, No. 56, pp.483–491.

Beneit Montesinos, J.V., Carabantes Alarcón, D., García Álvarez, Y., García Morales, E.A., Martínez, L., Luis, J. and Sanz Corbalán, I. (2015) *Uso de insignias digitales para aumentar la motivación y el reconocimiento social online de logros formativos*, Research Project Memory (online) http://eprints.ucm.es/34859/1/-PIMCD385_2014.pdf (accessed 30 January 2017).

Bhargava, R. (2009) *The 5 Models of Content Curation* [online] http://www.rohitbhargava.com/2011/03/the-5-models-of-content-curation.html (accessed 27 September 2015).

Borrás Gene, O. (2013) *Comunidades Virtuales. Gabinete de Tele-Educación*, Universidad Politécnica de Madrid, Madrid.

Casal, J. and Mateu, E. (2003) 'Tipos de muestreo', *Revista de Epidemiología y Medicina Preventiva*, Vol. 1, pp.3–7 [online] http://minnie.uab.es/~veteri/21216/TiposMuestreo1.pdf (accessed 19 August 2015).

Clayton, M.J. (1997) 'Delphi: a technique to harness expert opinion for critical decision-making tasks in education', *Educational Psychology*, Vol. 17, No. 4, pp.376–386.

Conole, G. (2014) 'A new classification schema for MOOCs', *The International Journal for Innovation and Quality in Learning*, Vol. 2, No. 3, pp.65–77.

Dabbagh, N. (2005) 'Pedagogical models for e-learning: a theory-based design framework', *International Journal of Technology in Teaching and Learning*, Vol. 1, No. 1, pp.25–44.

Deterding, S., Dixon, D., Khaled, R. and Nacke, L. (2011) 'From game design elements to gamefulness: defining gamification', *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, pp.9–15.

Dillenbourg, P. and Fischer, F. (2007) 'Basics of computer-supported collaborative learning', *ZeitschriftfürBerufs-undWirtschaftspädagogik*, Vol. 21, pp.111–130.

Ertmer, P.A. and Newby, T.J. (1993) 'Conductismo, cognitivismo y constructivismo: una comparación de los aspectos críticos desde la perspectiva del diseño de la instrucción', *Performance Improvement Quarterly*, Vol. 6, No. 4, pp.50–72.

Fleiss, J.L. (1971) 'Measuring nominal scale agreement among many raters', *Psychological Bulletin*, Vol. 76, No. 5, pp.378–382.

García Aretio, L. (2007) *De la educación a distancia a la educación virtual*, Ariel, Barcelona.

Gea, M. and Montes, R. (2013) 'abiertaUGR, la formación abierta basada en comunidades online de aprendizaje', in SCOPEO INFORME No. 2. MOOC: *Estado de la situación actual, posibilidades, retos y futuro*, pp.122–138 [online] http://scopeo.usal.es/wp-content/uploads/2013/06/scopeoi002.pdf (accessed 19 August 2015).

Giannetto, D., Chao, J. and Fontana, A. (2013) 'Gamification in a social learning environment', *Issues in Informing Science & Information Technology*, Vol. 10, pp.195–207.

Gros, B. (1997) *Diseños y programas educativos*. *Pautas pedagógicas para la elaboración de software*, Ariel, Barcelona.

Gros, B., García, I. and Lara, P. (2009) 'El desarrollo de herramientas de apoyo para el trabajo colaborativo en entornos virtuales de aprendizaje', *RIED, Revista Iberoamericana de Educación a Distancia*, Vol. 12, pp.115–138 [online] http://www.utpl.edu.ec/ried/images/pdfs/vol12N2/desarrolloherramientas.pdf (accessed 02 April 2015).

Guardia, L. and Sangrá, A. (2005) 'Diseño instruccional y objetos de aprendizaje; hacia un modelo para el diseño de actividades de evaluación del aprendizaje on-line', *RED. Revista de Educación a Distancia, número monográfico II*, pp.4–14 [online] http://www.um.es/ead/red/M4/ (accessed 17 de septiembre de 2011).

Hew, K.F. (2015) 'Promoting engagement in online courses: what strategies can we learn from three highly rated MOOCs', *British Journal of Educational Technology*, Vol. 4, No. 2, pp.320–341.

Huang, W.H.Y. and Soman, D. (2013) *Gamification of Education*, Research Report Series: Behavioural Economics in Action (online) (online) http://inside.rotman.utoronto.ca/-behaviouraleconomicsinaction/files/2013/09/-GuideGamificationEducationDec2013.pdf (accessed 30 January 2017).

Klopfer, E., Osterweil, S. and Salen, K. (2009) 'Moving learning games forward. Obstacules, opportunities and openness', *The Education Arcade*, Massachussets Institute of Technology [online] http://education.mit.edu/wp-content/uploads/2015/01/MovingLearningGamesForward_EdArcade.pdf (accessed 02 April 2015).

Kop, R. and Hill, A. (2008) *Connectivism: Learning Theory of the Future or Vestige of the Past?* [online] http://www.irrodl.org/index.php/irrodl/article/view/523/1103 (accessed 05 May 2015).

Lee, J.Y. and Reigeluth, C.M. (2003) 'Formative research on the heuristic task analysis process', *Educational Technology Research and Development*, Vol. 51, No. 4, pp.5–17.

Means, B., Toyama, Y., Murphy, R., Bakia, M. and Jones, K. (2010) 'Evaluation of evidence-based practices in online learning', *A Meta-Analysis and Review of Online Learning Studies*, U.S. Department of Education, Washinghton, D.C. [online] http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf (accessed 20 May 2014).

Mela, M. (2011) *What is Infoxication?* [online] http://noticias.iberestudios.com/%C2%BFque-es-la-infoxicacion/ (accessed 02 January 2015).

Murphy, E. (2004) 'Recognising and promoting collaboration in an online asynchronous discussion', *British Journal of Educational Technology*, Vol. 35, No. 4, pp.421–431.

Parry, M. (2012) *5 Ways That edX Could Change Education*, The Chronicle of Higher Education [online] http://chronicle.com/article/5-Ways-That-edX-Could-Change/134672 (accessed 18 March 2015).

Pérez, E. (2010) in Davinia Suárez (Ed.): *El community manager representa los ojos y los oídos de la empresa en internet*, p.7, Diario Canarias.

Reig, D. (2010) 'El futuro de la educación superior. Algunas claves', *REIRE, Revista d'Innovació y Recerca en Educació*, Vol. 2, pp.98–113 [online] http://www.raco.cat/index.php/reire/article/view/196168/263002 (accessed 18 March 2015).

Rodriguez, C.O. (2012) 'MOOCs and the AI-Stanford like courses: two successful and distinct course formats for massive open online courses', *European Journal of Open, Distance and E-Learning* [online] http://www.eurodl.org/materials/contrib/2012/Rodriguez.pdf (accessed 05 May 2016).

Romero, M. (2013) 'Game based learning MOOC. Promoting entrepreneurship education', Elearning Papers, Special Edition *MOOCs and Beyond*, Vol. 33, pp.1–5.

Siemens, G. (2006) 'Connectivism: learning theory or pastime of the self-amused?', *Elearnspace blog* [online] http://www.elearnspace.org/Articles/connectivism_self-amused.htm (accessed 08 October 2014).

Siemens, G. (2008) *What is the Unique Idea in Connectivism* [online] http://www.connectivism.ca/?p=116 (accessed 08 October 2014).

Siemens, G. (2009) *What is Connectivism?* [online] http://docs.google.com/Doc?id=anw8wkk6fjc_14gpbqc2dt (accessed 17 March 2015).

Siemens, G. (2012) *MOOCs for the Win* [online] http://www.elearnspace.org/blog/2012/03/05/moocs-for-the-win (accessed 17 March 2015).

Suen, H.K. (2014) 'Peer assessment for massive open online courses (MOOCs)', *The International Review of Research in Open and Distributed Learning*, Vol. 15, No. 3.

Theilmann, W., Altenhofen, M., Gerteis, W. and Leidig, T. (2005) U.S. Patent No. 6,975,833, U.S. Patent and Trademark Office, Washington, DC.

Verhagen, P. (2006) *Connectivism: A New Learning Theory?* [online] http://elearning.surf.nl/elearning/english/3793 (accessed 30 February 2015).

Viera and Garett (2005) 'Understanding interobserver agreement: the Kappa statistic', *Family Medicine*, Vol. 37, No. 5, pp.360–363.

Villiers, M., Villiers, P. and Kent, A. (2005) 'The Delphi technique in heath sciences education research', *Medical Teacher*, Vol. 7, No. 27, pp.639–643.

Wang, Q. (2008) 'Student facilitators' roles in moderating online discussions', *British Journal of Educational Technology*, Vol. 39, No. 5, pp.859–874.

Zapata Ros, M. (2011) *El Community Manager Educativo: Retos y Posibilidades* [online] http://www.learningreview.com/articulos-y-entrevistas-gestion/2654-el-community-manager-educativo-retos-y-posibilidades (accessed 10 May 2015).