

Towards an Educational Design Pattern Language to support the development of Open Educational Resources in videos for the MOOC context

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The creation and adoption of Massive Open Online Courses (MOOCs) can bring many benefits and impact on education, such as put forward diversity in education; enhance student's learning by encouraging and engaging them for lifelong learning; connect with more individuals in informal contexts creating opportunities to transition to formal higher education or lifelong learning activities; force a re-conceptualization of higher education through the use of online study; enhance teachers' skills from developing Open Educational Resources (OERs) and adopting learner-centered pedagogical approaches and active learning strategies; among others. In such perspective, several studies have investigated the potential benefits about the use of videos as a support for the process of teaching in virtual learning environments and, particularly, in the context of MOOCs. However, video production for MOOCs still presents several challenges that need to be better investigated. It is because, in general, educators and MOOC teams (e.g. educators, learning designers, and educational technologists) are still using ad hoc decision-making procedures based on empirical knowledge obtained from their experiences with face-to-face courses or even traditional virtual courses. There are also gaps about what adaptations need to be performed to video formats and what are the attributes and steps needed to support the production and validation of videos for the MOOC context. In addition, since MOOCs are part of the Open Educational Movement, as well as the OERs, it is also important to reflect on the construction of OERs in the form of videos for the MOOC context. There is, therefore, a need for research that investigates the current theoretical panorama involving video construction for MOOCs, in order to propose strategies empirically validated and useful to support and guide MOOC teams during the development of videos more theoretically informed. Considering such context, the main objective of this paper is to present a set of patterns and move towards the development of an educational design pattern language able to support MOOC teams in the construction of OERs in the form of videos. The paper presents a life cycle for OERs production in the form of videos. From such cycle activities, we extracted nine patterns that are presented in the form of patlets (problem-solution pair). The patterns were also collected and refined from a literature review on guidelines about the production of MOOCs, OERs, and educational videos. The patterns are divided into five categories related to the life cycle: analysis, planning, development, evaluation, and distribution. These patterns are expected to offer a compelling alternative to guide MOOC teams in designing OERs in the form of videos to enhance learning experiences, increase student engagement in the course, and emphasize self-directed learning, which are requirements for quality in MOOCs.

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1. INTRODUCTION

The rapid development of computers, internet, mobile phones, sharing and storage environments (i.e., youtube, vimeo) and authoring tools (i.e., powtoon) have motivated the use of videos to support learning in different contexts. An example of context is related to Massive Open Online Courses (MOOCs), whose contents are usually based on educational videos (SLUIS, GINN, ZEE, 2016, LI et al., 2015). In general, a MOOC is an online course with the option of free and open registration, an open curriculum, and open-ended outcomes (MCAULEY et al., 2010; ZHU; SARI; LEE, 2018).

In recent years, MOOCs have gained public interest and attention as a form of open and online education that has the potential to bring forward many benefits and impact on education. For instance, they can serve as a driver of diversity in education (SCHOPHUIZEN et al., 2018); enhance students learning by encouraging and engaging them for lifelong learning (ARIMOTO, 2016, p. 44); create opportunities of transition to formal higher education or lifelong learning activities (SCHOPHUIZEN et al., 2018); promote a re-conceptualization of higher education through the use of online study (LANE; CAIRD; WELLER, 2014); enhance teachers' skills from

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developing Open Educational Resources (OERs) and adopting learner-centered pedagogical approaches and active learning strategies (ARIMOTO, 2016, p. 42).

Watching videos is one of the most important activities in the virtual, open and massive context. Thus, understanding how students interact with this type of media is a critical point to improve MOOC quality (SLUIS; GINN; ZEE, 2016; LI et al., 2015). Click actions, such as pause, skip and repeat, may reflect the learner's difficulty in understanding the content of the video and indicate possible dropout reasons. Additionally, Guo, Kim and Rubin (2014), Li et al. (2015), and Santos et al. (2015) highlight that videos in MOOCs deserve special attention, in both pedagogical, technological, and design aspects, because they are usually created by educators who consider their own empirical knowledge from experiences related to the construction of face-to-face courses or even traditional virtual courses.

Such challenges have motivated research on (i) adaptations in video formats, (ii) identification of video attributes for MOOCs, and (iii) ways to rethink the design of videos to support non-formal education and lifelong learning (SLUIS, GINN, ZEE, 2016).

Santos et al. (2015), for example, systematized some principles for the design of video content for MOOCs. About 46 videos were analyzed, considering 26 indicators organized in seven categories, such as the focus of interest, types of framing or plans, place recording, among others. As a result, a textual guide is presented. It is important to highlight that Santos et al. (2015) only performed the cinematographic analysis, which studies the evolution of making and editing films based on the average of cut-off rates. Pedagogical issues and expected characteristics for videos in MOOCs were not considered.

Santos and Viana (2016), instead, described reflections and results obtained from the construction of MOOCs in the areas of basic sciences, engineering, and technology, at different levels of training. Most of the multimedia content produced were videos and the planning phase involved concerns about visual, scientific, technical and pedagogical quality, as well as the potential of digital technologies used to create video and types of content licensing. Video length, mainly including the short ones, as well as different video formats, were created, such as demonstration of exercises or experiences; exposition and explanation of concepts with frequent use of illustration and animation; interviews; among others. However, video processing creation was not detailed.

Guo, Kim, and Rubin (2014) conducted an empirical study to identify how video production affects student' engagement in MOOCs. They analyzed data from 6.9 million video access and viewing records from four courses available at edX provider. As a result, a set of recommendations for video creation was proposed from these quantitative and qualitative analyzes, from the instructors' viewpoint.

In a different but related perspective, it is important to highlight the concept of Open Educational Resources (OERs) in the form of videos. For example, Arimoto, Barroca, and Barbosa (2014) point out that OERs are "teaching, learning and research materials available at any media with public domain or openly licensed, allowing OERs to be used or adapted by third parties ". OERs can be textbooks, tools, videos, and more. Thus, considering that MOOCs are an instance of the Open Education Movement, as well as OERs, it is also important to reflect on the construction of videos for MOOCs based on OERs fundamentals.

According to a survey conducted by Arimoto, Barroca, and Barbosa (2014), the main challenges in the production and use of OERs include the lack of public and institutional policies to encourage production, as well as the lack of adequate methods and approaches to support the production of such resources.

Another challenge to be considered is the dissemination of strategies to support the construction of OERs between educators from different areas and teaching experiences. The language used to describe the solution must be simple, objective, and guided. One approach that can be used in this context is the formalization of good practices through the format of design patterns (GOODYEAR, 2005).

A pattern, in general, describes a context, a problem and a solution commonly used by the community to solve such problem (ALEXANDER et al., 1977). Additional fields include examples, related patterns, among others. A design pattern "conveys the core of the solution to some relevant, recurring design problem" (Alexander et al., 1977). In the educational environment, "pedagogical design patterns have been introduced as a way to sketch and share good practices in teaching and learning; specifically, in the context of technology-enhanced learning (e-learning)" (May et al. 2016). Patterns can be related to each other and thus offer a toolkit of interrelated design solutions that can be applied to novel problems (Alexander et al. 1977; Goodyear, 2005; Goodyear and Retalis, 2010). A Design Pattern Language, instead, is a set of patterns grouped and linked in a way to guide the development of a product.

Considering the context previously described, many researchers agree that more research about the current theoretical panorama involving videos in MOOCs is required, in order to propose validated strategies and to provide support for MOOC teams (for example, educators, educational technologists). Thus, such teams will be able to develop videos that are theoretically informed.

In order to decrease such limitations, an educational design pattern language to support MOOCs teams in the development of OERs in the form of videos for the MOOC context is under development. The language is based on the following elements: (i) a life cycle process that summarizes the production of OERs in the form of video, which describes fundamental steps to plan, evaluate and distribute OERs in the form of video; (ii) educational design patterns for the production of OERs in the form of video for the context of MOOCs, which are based on problems and recurrent solutions to solve the main activities described in the life cycle.

This paper presents the current version of an Educational Design Pattern Language to support the development of OERs in the form of videos, which can be used as an effective way to connect research results with design and development practice, acting as a guide to support MOOC teams and contribute to the improvement of students' experience in MOOCs.

The structure of this paper is as follows: Section 2 briefly describes the use of patterns in video production and some related works. Section 3 contextualizes the general aspects of the proposed Educational Design Pattern Language. In Section 4, one of the related patterns is described as an example, by following a specific template. Finally, Section 5 wraps up with conclusions and ideas for future work.

2. USING PATTERNS TO DESIGN OPEN EDUCATIONAL RESOURCES IN VIDEOS FOR MOOCs: AN OVERVIEW

Considering the use and application of patterns to describe and also to share tacit knowledge from the educational and pedagogical domain, the Pedagogical Patterns Project (www.pedagogicalpatterns.org) is among the most significant references in this area. The project began in 1996 with the aim of collecting and disseminating teaching and learning experiences about technology. However, the use of the related patterns to develop OERs in video for the MOOC context requires appropriate adaptations.

We found some patterns which can be used to support the development of educational videos for the MOOC context, but concepts associated with OERs were not considered in such works. As an example, we highlight the work proposed by Mor and Warburton (2016), who defined some patterns to support the educational design of videos for MOOCs. Their patterns are part of a project named *MOOC Design Patterns Project*. In such project, the methodology implemented in the form of participatory workshops was used to collect patterns and to validate them among the participants. As a result, five patterns were defined and categorized: CONSIDERED USE OF VIDEO; QUIZ - VIDEO - REFLECT; SIX MINUTE VIDEO; BALANCE PRESENCE AND COGNITIVE LOAD; HOOK, LINE AND SINKER.

In turn, Fassbinder (2018) as well as Fassbinder, Barbosa, and Magoulas (2017) proposed a Learning Design Framework for MOOCs, named LDF4MOOCs, which contains an Educational Design Pattern Language to support design for learning in MOOCs. Such language contains the essential patterns to cover all the main phases of a MOOC design process, such as exploration, planning, development, delivery, course evaluation, and updating patterns. Such LDF4MOOCs, however, encompasses only four patterns related to educational video design, which are WELCOME VIDEO, 2 OR 3 MINUTE VIDEO, ATTRACTIVE SCREENCAST, and MOOC MADE WITH OPEN EDUCATIONAL RESOURCES.

Our work differs from the previous ones because we collected and organized essential patterns to cover all the main phases of the production of educational videos (pre-production, production, and post-production) using OERs fundamentals, and useful for the specific context of MOOCs.

3. TOWARDS AN EDUCATIONAL DESIGN PATTERN LANGUAGE TO SUPPORT THE DEVELOPMENT OF OERS IN VIDEO FOR THE MOOC CONTEXT

In 2017, we began a project aimed to define and validate a pattern language to support MOOC teams in the production of OERs in videos (Fassbinder, 2018).

The pattern language structure is based on fundamentals from four main concepts: (i) Massive Online Open Courses; (ii) Educational Videos, (iii) Open Educational Resources, and (iv) Educational Design Patterns and Pattern Languages as strategies for storing and sharing tacit knowledge.

These four concepts or dimensions guided the development and validation of (i) a life cycle process for the production of OERs in video, which describes fundamental steps to plan, evaluate and distribute an OER in the

form of video for the MOOC context; (ii) educational design patterns for the production of OERs in the form of video for the context of MOOCs, which are based on problems and recurrent solutions to solve the main activities described in the life cycle.

In fact, the lifecycle model, which is presented in Figure 1, provides a high-level overview of the "what to do" items (i.e, phases, activities and tasks) in an OER production process in the form of video for the MOOC context. A way of "how-to-do" is the role of the Educational Design Pattern Language described following.

A process is an organized set of activities and procedures generating a specific result, and a life cycle prescribes a set of structured phases for achieving this result (Arimoto, 2016, pp. 88). Moreover, in general, ISO/IEC 12207 defines the structure of a life cycle process in terms of activities further designed in terms of constituent tasks, where a task is a set of basic or atomic actions that consumes inputs and produce outputs.

In our work, the life cycle process was elaborated through a study on the current strategies for the production of educational videos, OERs, MOOCs, and their gaps, and (ii) a review about the use of patterns and pattern languages to support the production and sharing of educational design experiences.

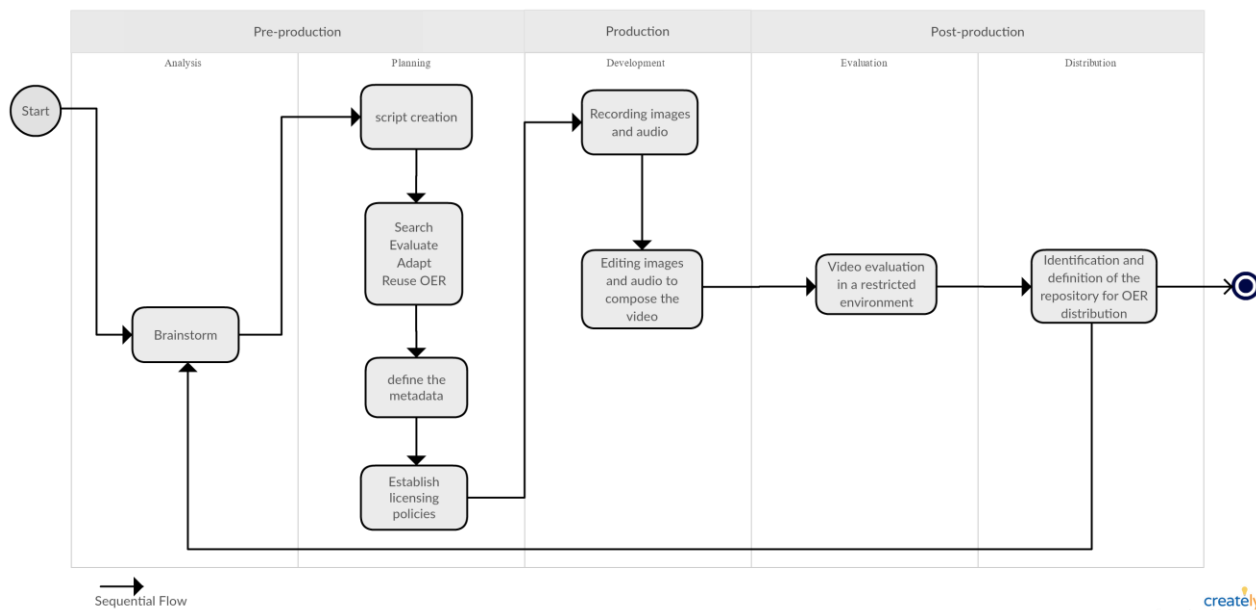


Fig. 1. A Life Cycle Process for the production of OER in Video for MOOCs.

The 'blueprint' resulting from the definition of the life cycle helped us to identify the acts of experts and then understand the knack of the acts. According to Iba, Sakamoto, and Miyake (2011), the extracted knacks are potential ideas for patterns, also named candidate patterns or proto-patterns. The corresponding problem to the solution may be related to the design activities presented in the life cycle process. The first patterns core elements were described as name, context, problem, and solution. The candidate patterns were also grouped into "families of patterns", that shared certain design goals. The groups represent key phases of the life cycle process for the production of OER in video for MOOCs.

The writing and refinement of the patterns were also divided into two main parts. First, the definition of the life cycle process for the production of OERs in the form of video, as described previously. Second, (i) a survey with educational video production specialists and (ii) a literature review on design guidelines for educational videos production, OERs and educational content for MOOCs also acted as a base to derive patterns and the relationship between them.

In this context, an Educational Design Pattern Language to support MOOC teams in the production of OERs in the form of video is under development. The language considers the activities described in the life cycle process previously presented as well as the recurring solutions which try to solve common design and production problems. Following we present the current nine patterns we have identified. They are described in the form of patlets (problem-solution pair) and were initially grouped into five categories: Analysis, Planning, Development, Evaluation, and Distribution.

Analysis Patterns

During the analysis phase, the learning goals, audiovisual language, and the necessary resources for the production of OERs in videos have to be defined. According to Becta (2005), Filato (2004), Wright and Reju (2012), and Morais et al. (2013), some of the questions required to be answered at this phase are:

- What are the learning goals to be achieved by the students through the video? This question focuses on the need to have clear and defined goals for video production.
- How to apply audiovisual language to meet the video learning goals? The audiovisual language is composed of three other languages - verbal, sonorous and visual. When conjugated, they convey a specific message. Therefore, since the first moments of the video construction, it is necessary to think about how to work with the audiovisual language to create the video script so that the chosen theme is linked in some way to the construction and verbal, sonorous and visual language, towards the construction of an attractive and engaging narrative.
- Will there be sufficient financial, human and technological resources for video production? This question aims to identify if there is a budget available for video production. If there will be a team with specialists responsible for the production of the content, for the graphics and audiovisual production, as well as for the technical development of the material. In addition, if there are technological resources such as computers, cameras, recording studio and software for video production or editing. Table 1 presents a related pattern.

Table 1 – Pattern to support the Analysis Phase.

PATTERN NAME	BRIEF DESCRIPTION (Problem-solution pair)
BRAINSTORM	You are about to produce a video for a platform of virtual, open, and massive courses where traditional lessons are not expected. Such task requires engaging video and well-defined learning objectives. But building a successful video is time-consuming and requires a team effort. Therefore , you should bring the whole team together and outline strategies to work out the learning goals that should be presented clearly at the beginning of the video and that can be measurable.

Planning Patterns

This phase determines how the learning goals will be achieved. The video must be developed by considering the aspects defined in the analysis phase, following a very specific set of rules. This systematic approach ensures that everything is aligned with a rational strategy aimed at the primary purpose of achieving video learning goals. It is essential to be attentive to details. The focus should be on the learning goals for script production, the search, evaluation, and reuse of OERs, the definition of metadata and the use of open licenses.

Each component chosen must respect logic, a purpose and be framed within the predicted macro context, always aligned with the learning goals. Table 2 presents the patterns related to this phase.

Table 2 – General set of patterns to guide the Planning phase.

PATTERN NAME	BRIEF DESCRIPTION (Problem-solution pair)
SCRIPT CREATION	You have already identified the learning goal that will be covered and explored some ideas that you would like to show in the video. But how do you transfer this to a video without losing important topics or leaving the team confused at the time of recording the scenes? Therefore you must create a script because it is going to act as a way to transpose the learning goals and the ideas defined in the previous phase to an audio-visual language, and will act as a mechanism with a written language standardized and easily understood by all the members of the team.
SEARCHING, EVALUATING, ADAPTING OR REUSING AN OER	You have already created the script and will need to create and/or reuse materials to compose the video. Many materials (texts, images, videos, music, simulators, etc.) about the subject of your video may have been created by others and are already available on the internet. Creating new content for video can be a time-consuming process. Therefore , search, use, enhance, recombine open educational resources for your video.
DEFINING METADATA	You want your video to be viewed by many students. But the internet is a vast environment and it can be difficult to them to find your video. Therefore , you should be concerned with defining semantic metadata and ontologies to ensure the availability of your video, making it easy to be searched, retrieved, and reused.
DEFINING USE LICENSES	The Internet has radically changed the way how educational materials are edited and published. However, the relationship between the developer, the work (i.e., the video) and the students has generated impasses in recent years regarding copyright protection. Therefore , you should worry about

	licensing your video preferably by using open licenses. Open licenses videos to be shared, used, reused and adapted with little or no restrictions.
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Development Patterns

During the Development phase, the activities defined in the planning phase are implemented. In this case, patterns that assist the MOOC team in preparing quality content with the least possible time and effort are provided in Table 3. In general, they involve tasks related to (a) recording the scenes that will be part of the OER in form of video and (b) perform the edition of the images and audio to compose the video.

Table 3 – General patterns to guide the Development phase.

PATTERN NAME	BRIEF DESCRIPTION (Problem-solution pair)
REPEATED RECORDING	You are about to transpose everything that was planned for an audiovisual language. But during the recording process, some unforeseen events can happen, for example, the actor may miss the text, some problem may happen with the camera or with its movement, with the capture or quality of the sound, in the end, some human or technical aspects may not be contemplated in the best way. Therefore , it is important to repeat the recording of the same scene more than once and follow the script so during the editing phase the best scenes can be chosen to compose the final version of the video.
VIDEO ASSEMBLE	Now you're about to put all the pieces together and finalize your video. This is an activity that requires a lot of sensibilities, a sense of aesthetic rhythm and in which someone can spoil or improve all the work that has been done so far. Therefore , you must select the best scenes, putting them in order as if you assemble a sentence with words; the sound must be improved, the colors of the scenes must be retouched, and everything that needs to be computerized must be inserted.

Evaluation Patterns

In the evaluation phase, the entire MOOC team should meet to discuss, evaluate and approve/disapprove the OER in the form of video what was produced. A set of activities should be conducted to evaluate and approve the OER. The pattern identified to support this phase is presented in Table 4.

Table 4 - Pattern to support the Evaluation phase.

PATTERN NAME	BRIEF DESCRIPTION (Problem-solution pair)
EVALUATION	You want to use different strategies to support evaluation and feedback for your OER in video form but you are unaware of techniques for doing that. What adaptations are needed for this context? Therefore you must manipulate the OER in the form of video in different use situations, where it must be verified if the learning paths associated with the content contribute to the learning; if there are no technical problems associated with playback, images, sound, subtitles, etc. The results obtained with the evaluation will allow corrections to be made in order to improve its quality and thus make it openly available.

Distribution Patterns

At this stage, the OER in the form of video should be made available in an environment appropriate for its use. This is the key to identify weaknesses and propose improvements. Effective access to the video must be done through platforms, repositories, and institutional or standalone sites, including metadata and associated licenses with little or no restriction on their (re) use. The wide availability of video allows other users (such as educators and other researchers) to reuse it and adapt it to their own context and needs.

Table 5 - Patterns to support the Distribution phase

PATTERN NAME	BRIEF DESCRIPTION (Problem-solution pair)
DELIVERING AND PROMOTING YOUR OER IN VIDEO	You're ready to deliver your video, but you need to create mechanisms for it can be used. Because the amount of feedback or the facility to find your OER will depend on the features available on the selected platform what you used to make your OER available. Therefore , you should look for repositories that support the insertion of previously defined metadata so that your OER can be (re) used, adapted and shared among multiple users, because the greater the (re) use of OER, the greater the maturity that it acquires, becoming more and more efficient for learning objectives.

4. DESCRIBING A SPECIFIC PATTERN

In this section, a specific pattern is detailed. The pattern `DEFINING USE LICENSES` directs you to use open licenses with little or no restriction so that the OER in the form of video can be used, adapted, and redistributed without infringing copyright laws.

This pattern was selected because it is considered as a crucial point in the production of an OER in the form of video since the correct choice of use licenses impacts directly on the re (use).

Different formats or templates have been used in the literature for pattern description. In all formats, a pattern is written through several elements. In our case, having Meszaros and Doble (1997) as a reference, the following elements were used: name (a unique identifier to distinguish the pattern), one-liners (a brief explanation of the pattern), illustration (a representative figure that helps practitioners in understanding the pattern meaning), context (a brief explanation of the origins and the context of the problem), problem (a brief description of the design problem), forces (factors or issues that may influence the adoption of a suitable solution to the problem), solution (a brief description of the solution proposed by the pattern that address the problem), action (a detailed and step-by-step description of the solution).

DEFINING USE LICENSES

Define use licenses so your video can be re (used), shared, and adapted to different contexts.



Open Educational Resources are digital materials used in the educational context, which have an open, clearly identified license to allow reuse, revision, recontextualization and redistribution. Establishing licensing policies in OER implies the use of such licenses that foresee little or no restriction.

Problem

However, the relationship between the creator, the work and the collective has generated impasses in recent years regarding the protection of copyright and intellectual property of the content developed. So how can you license your OER in video so it can be re (use) without infringing copyright laws?

Forces

- Directs the MOOC team in the correct choice of (re) use, sharing and adaptation licenses for the OER produced.
- If the use licenses are not properly used this can lead to legal problems related to copyright, licensing, use and redistribution.
- It is common to make mistakes when you are not familiar with this activity, so your full attention is needed.

Solution

Manage the distribution of OER in the form of video through appropriate licenses, i.e. open licenses such as Creative Commons (<https://creativecommons.org>), which guarantees access without going beyond the limits of legality. Thus, it offers the possibility of defining which rights the author wants to retain while encouraging the sharing of the material.


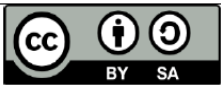




Action

From the legal point of view, an OER may consist of components with different degrees of openness, and a resource to be considered an OER needs to have the license open (AMIEL, 2013).

With regard to open licenses, their use allows the materials to be more flexible in adapting to the student's local context, without the need to ask for permission. However, authors are guaranteed the recognition of their work (UNESCO / COL, 2011), stimulating new ideas and improvements in existing material.

Therefore, in order to license your video using open licenses, you can use the Creative Commons licenses, which is a movement to democratize access to cultural assets, through the provision of free licenses, increasing the spectrum of works accessible by the community world. Table 6 shows the degree of openness of each Creative Commons license.

Table 6 - Types of Creative Commons Licenses and their degrees of openness

Licenses	Description
 (BY)	This license allows others to distribute, recontextualize, adapt or create derivative works, even for commercial use, provided that the original creation is credited. This is the least restrictive license of all offered, in terms of what uses other people can make of their work.
 (BY-SA)	This license allows others to recontextualize, adapt and create derivative works even if for commercial purposes provided that the credit is attributed to the author and that such works are licensed under the same terms. This license is generally compared to free software licenses. All derivative works must be licensed under the same terms as this one. In this way, derivative works may also be used for commercial purposes.
 (BY-NC)	This license permits redistribution and use for commercial and non-commercial purposes, provided that the work is redistributed unmodified and complete, and that the credits are attributed to the author.
 (BY-NC-SA)	This license allows others to recontextualize, adapt, and create derivative works on the licensed work, being prohibited the use for commercial purposes. The new works must contain mention of the author in the credits and also can not be used for commercial purposes, but the derivative works need not be licensed under the same terms of this license.
 (BY-NC-SA)	This license allows others to recontextualize, adapt and create derivative works on the original work, provided that for non-commercial purposes and provided that they credit the author and license new creations under the same parameters. Others may download or redistribute the work in the same way as in the previous license, but they can also translate, recontextualize and compile new stories based on the original work. All new work done from this must be licensed under the same license, so that any derivative work, by its nature, can not be used for commercial purposes.
 (BY-NC-ND)	This license is the most restrictive among the six major licenses, allowing redistribution. It is commonly called "free advertising," as it allows others to download the licensed works and share them, as long as they mention the author, but without being able to modify the work in any way or use it for commercial purposes.

5. CONCLUSION AND FUTURE WORK

In this paper, we presented an overview of an Educational Design Pattern Language to support MOOC teams in the production of OERs in the form of video for the context of Massive Open Online Courses. All the main patterns, in the form of patlets (problem-solution pair) were briefly described, and a specific pattern was detailed. More patterns related to the phases of the life cycle proposed to summarize the activities related to the production of OER in video (Figure 1) need to be extracted, mined and inserted into the pattern language. Future works include the refinement and inclusion of new potentially useful patterns and categories into the language and the conduction of experiments to validate the proposed language in real-world contexts of MOOC development and their educational videos.

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