

# Towards a Quality Model for Open Courseware and Open Educational Resources

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**Abstract.** Seeing the world's knowledge as a public asset that can be accessed, shared, used and reused, etc. mediated by technology, especially ICT, is a potent idea and it may have an influential impact on educational processes within our society. A decade of development of initiatives that offer open courseware and open educational resources has passed, and all the related projects have contributed to the provision of open university-level digital educational materials. For the time being, there is no articulated set of quality criteria to be used for development, use, modification, evaluation, and comparison of such resources, though, there is concern about this subject. We introduce here a set of criteria for Quality Assurance of open courseware and open educational resources, from a social and constructivist perspective, as a first step towards construction of a quality model. They have been grouped in four categories related with content, instructional design, technology and courseware evaluation.

**Keywords.** open courseware, open educational resources, quality assurance, quality criteria, quality model

## 1 Introduction

Within the last decade, the world's knowledge has been, and it is still seen, more and more, as a public asset that can be accessed, shared, used and reused, mediated by technology, especially ICT, and this powerful idea may have an influential impact on teaching and learning within our society. During this decade, a pleiad of initiatives that offer open courseware and open educational resources has emerged, resulting in worldwide related projects that have been providing open university-level digital educational materials. All these projects meet a huge demand for high quality educational resources that anyone may access from anywhere at any time via the Internet.

The most remarkable such initiative is, of course, MIT OpenCourseWare Initiative with the available instructional resources related to 2000 courses, and with the associated 250 universities and organizations that provide their course materials freely and openly for more than 13,000 courses in 20 languages [1-3]. MIT OCW has also triggered the development of The OCW Consortium, which supports the construction of OCW projects around the world, and which offers access to more than 6000 courses

from 64 sources in 12 languages [4]. Another comprehensive repository is OER Commons with more than 31,000 instructional materials, which are very diverse from textbooks, audio or video lectures, and readings, to lesson plans, assessments, syllabi, etc. or even games [5]. The Connexions project is also relevant both by its size (more than 20000 reusable modules combined into more than 1200 collections), and even more important by its approach to support high reusability and easy remixing of the content [6]. Other open educational resources initiatives like Carnegie Mellon University's Open Learning Initiative are interesting because they intend, beside providing open courseware, to serve as platforms that increase our understanding about human learning, aspiring to contribute to the development of better learning environments by using that understanding [7]. Other promising OER/OCW initiatives are Webcast.Berkeley, Universia, Open University, Open.Michigan, and so on [8-11].

Another approach is taken by The Free Education Initiative of The Saylor Foundation, which is driven by the idea of "building" a free online university without walls or any other boundaries of conventional higher education systems [12]. Currently, there are available course materials for over 200 courses from the slated 241 courses, which are necessary for majoring in 13 areas of study. The available educational materials may be used in various ways, though The Saylor Foundation invites its learners to use them aiming to simulate the traditional four-year higher education experience, i. e., to select a major, to fulfill its requirements, and to complete the General Education Program. Recently, The Foundation has started another challenging initiative The Open Textbook Challenge, which aims to offer learners a cost-free alternative to traditional textbooks. Thus, The OTC stimulates authors to write or re-license textbooks as CC-BY by offering a \$20,000 award for each textbook released this way. Another approach that is growing fast lately, which is somehow in between the two presented previously here, is Coursera, a Web portal that distributes interactive courses in humanities, social sciences, physical sciences and engineering that benefit from the constant support of the instructors and peers from a global learning community [13].

In this paper we propose a set of quality criteria that could serve as general guidelines for development, use, modification, evaluation, and comparison of open educational resources and open courseware, from a social and constructivist perspective. The structure of the paper is as follows: the second section offers a short motivation for research, the third one includes the criteria for Quality Assurance (QA) of open courseware and open educational resources, the fourth includes the related work and the last one consists of some conclusions and future work ideas.

## **2 Motivation for Research**

Despite that more than 10 years have passed since the launch of the MIT OCW program, a thorough search of the literature has revealed there is no articulated set of quality criteria or quality model to be used for construction, evaluation and comparison of OCW initiatives. Though, there is concern about this subject, and there are some projects aiming to develop such set [14, 15, 16]. However, no concrete results are available yet, so the users, being them learners, teachers, faculty etc., have no guidance in their quest for choosing the most suitable educational resources that match closely their educational needs at some point in time.

On the contrary, establishing quality criteria, benchmarks or metrics for evaluation of traditional online courses has been a constant preoccupation both for developers and users, on the one hand, and the educational institutions that provide such programs, on the other hand. Several programs or institutions have approached this subject and their efforts have resulted in standards for quality of online courses and learning, along with scoring systems to be used for their straightforward evaluation. These efforts have benefited from the work of teams of experts with various backgrounds (course development, instructional design, professional development, research, education, and administration) in education, both classical and online, who have been representing educational organizations that share an interest in online education and that are keen to offer to their students high quality online courses. Their work has been based on systematic literature review corroborated with specific surveys taken by significant actors in the online educational process [17-20].

Of course, we have to consider that while taking an online course in a blended learning environment or in a pure online learning program is a requirement for obtaining some formal recognition, like a degree, The OCW movement has started with the premise that OCW will not stand for a formal education, and it will not be granting university degrees or certificates. However, taking into consideration the magnitude of the progress of open courseware initiatives and their impact on users worldwide, it becomes crucial to provide the users, persons or institutions, with a valuable set of quality criteria, which can be used to assess the quality of open courseware and open educational resources. These criteria may be further used to develop a scoring system, aiming at helping users to establish the appropriateness of a particular open educational resource for their specific educational needs at some point in time.

### 3 Criteria for Quality Assurance of OER and OCW

In this section, we introduce a set of criteria for evaluation of the quality of open educational resources and open courseware. This work builds on the results of previous author's works on the matter of open resources for education, which have analyzed thoroughly the main open courseware initiatives around the world, and that have identified both the strengths and the weaknesses of their offer [1, 2, 21-25]. The QA criteria correspond to the quality characteristics of *quality in use*, *internal and external product quality* according to ISO/IEC 25000 SQuaRE standard, and they cover the next user needs: effectiveness, efficiency, satisfaction, reliability, security, context coverage, learnability, and accessibility. These quality criteria may be used for quality assessment of either small learning units or an entire courseware. They have been grouped in four categories related with *content*, *instructional design*, *technology* and *courseware evaluation*. A detailed presentation follows further on.

**Content related.** In this category we have criteria that reflect whether the resource provides the online learners with multiple ways of engaging with their learning experiences, promoting their mastery of the content. They evaluate the usefulness of each educational resource, being it a small learning unit or an entire courseware. First, we

think at easiness of using the resource, reflected by *readability* and *uniformity of language, terminology, and notations*.

When evaluating open courseware, users are first interested in the *availability of the course syllabus*, so they become aware since the very beginning of the content scope and sequence. At the same time, users might be equally concerned with the *comprehensiveness of the lecture notes*, i.e. whether the course content and assignments demonstrate sufficient wideness, deepness and rigor to reach the standards being addressed. *Modularity of the course content* is another issue to be approached in the first steps of the initiation of the learning process, as modular course components are units of content that may be distributed and accessed independently, giving each user both the *possibility to select the most suitable learning unit* at a particular time and the *opportunity to choose the most appropriate learning path* that matches user's needs and abilities, and which can be approached *top-down, bottom-up or as a combined approach*. *Availability of assignments* (with or without solutions), being them exercises, projects, and activities, is important as well, as they are content items that enhance the primary content presentation. These assignments may ask students to work independently or as a group, the latter especially when using open courseware for blended instruction.

When looking at a particular learning resource, other than an entire courseware, which can be a small learning unit, a course module, a lesson etc., users are particularly interested in various characteristics of the resource: *accuracy, reasonableness, self-containedness, context, relevance, availability of multimedia inserts, and correlation of the resource with the course in its entirety*.

**Instructional design related.** First, from the instructional design point of view, we have to consider the educational resource *goal and learning objectives*, which are expected to be clearly stated and measurable, as the learner's level of knowledge mastery and practical abilities is ought to be measured against both the main goal and each and every learning objective. The educational materials provide for multiple opportunities for learners to be actively engaged in the learning process, having meaningful and authentic learning experiences during undertaking various *appropriate instructional activities*: problem- or project-based learning, e-simulations, learning games, webcasts, scavenger hunts, guided analysis, guided research, discovery learning, collaborative learning groups, case studies etc. *Learning outcomes* state the learner's achievements after performing a learning activity, i. e. what learners will know and/or will be able to do as a result of such an activity, in terms of knowledge, skills, and attitudes. Related with them is the *availability of the evaluation and auto-evaluation means* (with or without solutions). The teacher users may be also interested in the *learning theory* (behaviorist, cognitivist, constructivist, humanist and motivational etc.) and in the *instructional design model* (ADDIE, ARCS, ASSURE etc.) that have been used to develop that particular educational resource.

Moreover, experiences that seed the stimuli for *reflective learning* will always add to the overall quality of the open educational resource or courseware. Under the reflection perspective, the desired outcome of education becomes the construction of coherent functional knowledge structures adaptable to further lifelong learning. Reflection here has two meanings. One would be the process by which an experience, in

the form of thought, feeling or action is brought into consideration (while is happening or subsequently) and the other refers to the creation of meaning and conceptualization from experience and to the potentiality to look at things from another perspective (critical reflection) [26-29].

**Technology related.** Both open educational resources and open courseware are expected to benefit fully from ICT technologies, to have user-friendly interfaces, to comply with standards for *interoperability*, and to provide for appropriate access for learners with special needs (*accessibility*). *Extensibility* of each educational resource, from a technological point of view, refers to easiness of adding content, activities and assessment, aiming at expanding learning opportunities. A high quality *user interface* is expected to provide for consistent and straightforward navigation throughout the resource, along with making available rich multimedia inserts, in various formats, and to match various learners' needs. A clear specification of the *requirements* with respect to the supporting technology at user's end (both hardware and software), along with the *prerequisite skills* to use that technology are useful to help learners understand how they are supposed to use that resource to benefit fully from its content. A high quality open educational resource is expected to work smoothly on a variety of platforms in use around the world (*multi-platform*). Having a true engaged learning relies on learner's opportunity to interact with the content and with other learners, which is not possible without the right *supporting tools*. *Security* of the confidential information regarding the learners is also an important issue to consider when evaluating quality of open educational resources and open courseware, despite the apparent anonymity in the online world.

**Courseware evaluation.** Despite the initial claim of just offering high quality educational materials to learners worldwide, with no other intention the support the learners during their learning journey, all major open courseware initiatives have started to be more involved with their learners. In this new context, there is a stringent need to evaluate the courseware regularly for effectiveness, using various assessment strategies, and to use the findings as a base for future improvement.

Each prospective learner would most probably first be interested in the *courseware overview*, which includes information about the *content scope and sequence*, the *intended audience*, the *grade level*, the *periodicity of updating the content*, the *author's credentials and the source credibility*, its *availability in multiple-languages*, *instructor facilitation or some kind of semi-automated support*, *suitableness for self-study and/or classroom-based study*, the *time requirements*, the *grading policy*, along with *instructions about using* that courseware and its components, in order to establish the most suitable learning paths. *Prerequisite knowledge* and *required competencies* are also useful for learners at the beginning of the learning process related to a particular educational resource. *Matching the course schedule*, if any, with learner's own pace is also desirable.

Another issue to be approached since the very beginning regards the *repository or institutional policies* with which the learner is expected to comply with respect to the use of resources, with licensing and copyright issues, with multi-cultural education, with privacy etc. To have open educational resources and open courseware that are

*free of bias and advertising* is also desirable for these resources. Another quality criterion is concerned with the option to provide, or aiming to provide, a formal degree or a certificate of completion (*degree or certificate*). *Participatory culture and Web 2.0* aspects are also important being them related to the possibility to contribute to the resources or to collaborate with fellow teachers/learners/developers etc. Other key aspects to be evaluated and improved constantly are concerned with *user interface, appropriate design and presentation* of the educational content to the users.

## 4 Related Work

Related work is rather scarce with just a few works approaching, in very broad lines, the subject of quality of open courseware and open educational resources in the context of evaluating the impact of these paradigms in education nowadays. All these works emphasize on the importance of the quality of OERs/OCW and on the need for continuous quality evaluation and assurance, but none of them include some guidelines or criteria for quality evaluation of OERs and open courseware [22-25, 30]. The policies to be used for Quality Assurance (QA) fall in three classes [21-22, 25]:

- QA activities are undertaken, prior to publication on the site, by the institution that offers open courseware or OERs, both as formal peer review process and as informal reviewing. Though, these processes are not open to the users;
- QA activities are performed by external peer reviewers on the institution's request, as external peer reviewing is one of the most powerful mechanisms to ensure quality in academia;
- individual users have the opportunity to review free educational resources, and to decide, on whatever arguments they want, whether the resource is useful, high-quality, or good in any way. This can be achieved by using star ratings, by adding evaluative comments, by describing in which way the resource has been used, or by displaying the number of the downloads for each particular resource. This approach is based on the argument that quality is not an intrinsic part of an instructional resource, but contextual, as a particular resource may be excellent for one user in a certain context, and, poor for another user in a different context [14];

Some authors consider that quality of open courseware and OERs is guaranteed by the reputation of their institution of origin, which is always interested to attract prospective students with the quality of its instructional offer, and to keep up with their prestige [21, 24-25]. Moreover, teachers and institutions seem to pay more attention to the QA process knowing that their instructional materials will be published as open content, and the whole world will be their audience [22, 24]. Thus, the QA awareness of each author is high and, consequently, quality of open educational resources is also high, especially for those derived from regular closed courses [22].

Quality assurance is seen as a built-in part of the development process, first by having pre-publication quality checks. However, there is concern about futile evaluation in the case of resources that have already been checked from a pedagogical point of view, because they have been developed by teachers, or by multi-disciplinary

teams that have been funded by public grants. The huge burden of pre-publication quality checks is pointed out as well in the literature [25].

A particular issue approached in the literature is relevance, as part of the concept of quality, as usually a user search for open instructional resources results in too many results, so it is difficult and time-consuming to select the most relevant resources that have the highest quality. Techniques and technologies that give users the opportunity to narrow their searches are expected to alleviate this particular problem [21].

## 5 Conclusions and Future Work

This paper introduces a set of quality criteria that may be used to evaluate and pursue quality of open courseware and open educational resources, and that may constitute the foundation of a quality model for such resources. This initial set of QA criteria needs to be significantly improved. First, compliance with the existing quality standards (such as ISO/IEC 25000 SQuaRE standard) is most wanted. Besides compliance, a scoring or rubric system that will help evaluate in a quantifiable manner both open courseware and open educational resources is foreseen. Furthermore, the assessment procedure needs to be established on more non-subjective grounds, in order to facilitate quality assessment performed by other users and evaluators. Other future work ideas envisage using these quality criteria to assess some particular open courseware, and learning, based on this experience, how to develop further the initial set of quality criteria.

The higher goal of the foreseen future work is construction of a quality evaluation framework for open courseware and OERs, which may help users to use, modify, evaluate, and compare such educational resources, while pursuing their educational goals. Moreover, developers may also use that framework to tailor their work.

Quality models and QA frameworks are very necessary for the time being, and, in our opinion, they may contribute significantly to the sustainability of the paradigm of open sharing of educational resources, as a key step to the development and evolution of open educational models. These models may finally lead to development of a *global reflective educational infrastructure*, which will provide for achievement of people's learning needs, both individually and collaboratively, supporting them and their communities on their lifelong and life-wide journeys for social construction of knowledge throughout their life.

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