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Quality Assessment of Digital Resources in Education

Saadia Marouane[1]*, Youssef Sefri[2], Abdallah Rhihil[1]

[1] Financial Engineering, Governance and Development Laboratory, National School of Business and Management, Hassan II University of Casablanca, Morocco

[2] Information and Education Science and Technology Laboratory, Faculty of Letters and Human Sciences Ben M'sik, Hassan II University of Casablanca, Morocco

* Corresponding author: saadia.marouane@yahoo.fr

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Abstract: The use of new information and communication technologies (ICT) in the field of training, where the ability to self-train, inform, and communicate via different technologies, is now becoming an essential condition for adapting to the programs taught. Moreover, the use of technologies for learning is currently a key skill to enable pedagogical actors to be more successful in an educational context. The problem that arises is how to ensure good management of the credibility of the digital resources used by learners, given the absence of central evaluation processes that constitute a risk for the reliability, credibility, and pedagogical value of the content used for teaching and learning. It is in this perspective that our article proposes an evaluation grid for digital training content that can be used by teachers and students. The proposed evaluation criteria have been inspired by a set of experiences and works of some authors who have worked on models of evaluation of the pedagogical quality of digital sources.

Keywords: teaching, pedagogical quality, information and communication technologies, digital sources, evaluation.

教育数字资源质量评估

摘要：新的信息和通信技术（信息通信技术）在培训领域的使用，即通过不同技术进行自我培训、通知和沟通的能力，现已成为适应所教授课程的重要条件。此外，使用技术进行学习目前是使教学人员在教育环境中取得更大成功的一项关键技能。出现的问题是如何确保对学习者使用的数字资源的可信度进行良好的管理，因为缺乏中央评估流程，这对教学和学习所用内容的可靠性、可信度和教学价值构成了风险。正是从这个角度来看，我们的文章提出了可供教师和学生使用的数字培训内容的评估网格。拟议的评估标准受到一些作者的一系列经验和作品的启发，这些作者致力于数字资源教学质量评估模型。

关键词：教学、教学质量、信息和通信技术、数字资源、评估。

Introduction

In the past, the sources of information were less

than today; the teachers were the biggest source of credible information for the students. Today, we are witnessing an increase in the quantity of information through the emergence of information and communication technologies (ICT), which have transformed our lifestyle and habits in all areas. This change has pushed the actors of education to integrate the ICT in the teaching and learning process. As a result, we are witnessing the emergence of a training practice that seeks to respond to new needs by exploiting the potentialities offered by digital technologies such as the Internet [1].

Indeed, the development of the Internet, by making information more accessible, has had a significant impact on both the roles of teachers and the practices of students [2]. Nevertheless, the absence of central evaluation processes constitutes a risk for the reliability, credibility, and pedagogical value of content for teaching and learning. It is, therefore, important to critically assess the quality of digital content used by teachers and students. From this perspective, our tasks are apprehending different models of digital content evaluation presented in the literature and proposing a synthetic approach encompassing the most appropriate evaluation criteria for teachers and/or students.

The research question: How can we ensure the quality of digital teaching materials used by teachers and students?

To answer this question, we have adopted a research methodology based on three stages, as shown in the diagram below. The first step consists, first of all, in elucidating an overview of the use of ICT in education. The second step is literature review on different international approaches adopted by some countries for evaluating digital content in the training environment. Finally, the last step consists in proposing a model of adapted evaluation grid allowing, on the basis of required criteria, to evaluate various digital supports offered to the users.

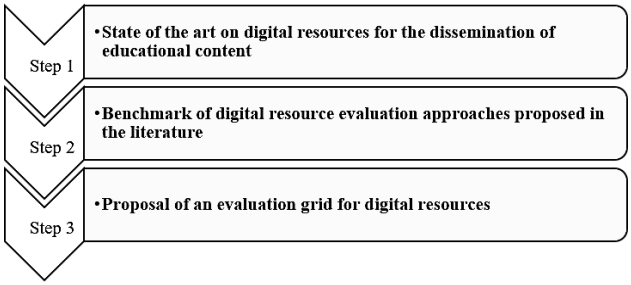

Fig. 1 Flowchart of the research methodology

1. General Context

From one year to the next, we are witnessing the diversification of ICT used in the field of training; with the availability of online courses such as MOOCs (massive open online courses) and the appearance of educational content management platforms or LMSs (learning management content) such as Moodle (modular object-oriented dynamic learning environment), many courses are freely available online for learners. With the freedom to produce and distribute information on the internet, this has led to an increasing production of content. The increase in resources has caused obstacles to separate good information from bad [3]. Faced with this situation, several countries have adopted a strategy for evaluating digital content in the educational environment. In addition, several authors have developed approaches based on grids and platforms for evaluating digital content [4]. For example, in the USA, the digital content offered to Californian schools has been judged according to the criteria defined by the California instructional technology clairinghouse since 1998. In the United Kingdom, the TEEM project aims to train teachers to evaluate digital content based on criteria established in the form of questions rather than standards to be respected to give more freedom.

The difficulty lies in the fact that it is difficult to define the very notion of quality due to the lack of consensus. Indeed, it is often considered that data quality can be defined on the basis of several dimensions, categories, criteria, parameter factors, or attributes. There are analysis grids on the Internet for all scientific fields, but we will focus on the evaluation criteria for digital content of educational websites oriented to teaching [5]. For example, the University of León in 2003 elaborated an analysis grid for the evaluation of educational websites with three criteria in the form of a questionnaire in which the user is asked to choose between the following three answers: author (choice between “no,” “sometimes,” or “yes”), content (choice between “poor,” “average,” or “good”), and educational interest (choice between “little,” “average,” or “good”). The emphasis of this grid is on the simplicity of the criteria, which focus on the identity of the site, the content, and the pedagogical interest provided to potential users [6].

There are also several online platforms for evaluating educational sources, including Merlot, Formist, Enpairs, Spiral, Starting Point, and Heal. The authors have analyzed their functioning and evaluation criteria to model “description-evaluation” scenarios for these resources.

Based on some models that present an idea about the criteria to be considered when judging the quality of a training content on the Internet, our research aims to develop an evaluation grid containing criteria with three aspects:

- *Reliability aspect* presents criteria related to the three headings, especially the author, update, and source.
- *Quality aspect of the presentation* is composed of headings relating to the design, readability, ease of finding the information, and coherence of the structure.
- *Relevance aspect* presents the criteria of the pedagogical value of the content.

2. Typology of Digital Resources

At the pedagogical level, a digital resource is made up of several digital documents that are used to provide comfort to the user (video-recorded courses, downloadable handouts, etc.), for teaching, such as scripted or mediated online courses, and for learning, such as the interactive or practical activities proposed (case studies, MCQs, simulators, etc.).

A digital resource dedicated to education was defined by Robert Bibeau [3]: "Digital resources for education correspond to all online services, management, publishing and communication software (portals, software tools, training platforms, search engines, educational applications, portfolios), data (statistical, geographic, sociological, demographic, etc.), information (newspaper articles, television programs, audio sequences, etc.) and digitized works (general reference documents, literary, artistic, or educational works, etc.) useful to the teacher or learner in the context of a teaching or learning activity using ICT, an activity or project that can be presented as part of an educational scenario."

Several approaches can be put in place to apprehend digital resources, one can adopt a classification that privileges broad and easily identifiable categories. Thus, we will be interested in the main categories of resources and the corresponding deposits on the Internet, based on their contexts of production and edition.

2.1. Institutional Digital Resources

An institutional digital resource is a resource specifically designed for teachers and students for learning purposes. They are financed by the state and developed by state services or by public or private operators on order. It must meet the requirements of the curricula and teaching reference systems. The rights of use and reuse that are attached to it allow use within the educational framework, in class, and/or outside the class.

2.1.1. National Portals in Morocco

- The portals and sites of teaching: taalimtice, portaltice, dedicated to information and communication technologies for education;
- The Department of Education website and the Higher Education website: men.gov, enssup.gov;
- The national portal for education professionals.

2.1.2. Academic Sites

- Disciplinary sites;
- The sites of academic institutions;
- The site of academic training;
- Etc.

2.1.3. National Scientific and Cultural Establishments

- National Center for Scientific and Technical Research (CNRST);
- Institute of Research for Development (IRD);
- French Institute of Morocco (IFM);
- Higher Institute of Audiovisual and Cinema Professions (ISMAC);
- National Library of the Kingdom of Morocco (BNRM);
- Moroccan Institute of Scientific and Technical Information (IMIST);
- King Abdul Aziz Al Saud Foundation;
- Etc.

2.2. Editorial Resources

2.2.1. Publisher Groups

- Education Digital Kiosk (KNE, Hachette).
- British Council Digital Library Morocco.
- ScholarVox, Digital Library, EBSCOHOS, JSTOR
- Etc.

2.2.2. Learning Platforms

A platform is software that assists in the conduct of distance learning. This type of software gathers the necessary tools for the main users of a device whose purpose is the remote consultation on pedagogical contents, individualization of learning, and remote tutoring.

- *Moodle:* Modular object-oriented dynamic learning environment, the most widely used e-learning platform for creating communities of learners around the educational content and activities.
- *MOOC:* Massive Open Online Courses allow users to learn online and interact with others, even on the other side of the planet for free.
- *Google Classroom:* Managing online courses, allowing collaborative learning and communication between teachers and students. Teachers can create classes, assign homework, send feedback, and see all the information in one place among other options.
- *Coursera:* Short courses.
- *Khan Academy:* Basic for distance learning.
- *MS Teams:* A digital hub that brings together conversations, content, tasks, and applications in one place, creating dynamic learning environments.
- *Ganesha:* Distance learning platform or learning management system (LMS) focusing on individualized learning paths. Unlike content-oriented platforms (content management system), it organizes activities around the learner rather than around a course.
- *Claroline:* A distance learning and collaborative work platform developed in 2002. It allows trainers to create online course spaces and manage training activities on the Internet.
- *Sakai CLE:* Educational and collaborative platform composed of tools for teachers, researchers, administrators, engineers, and students to create collaborative web spaces. Using a web browser, the

user chooses from a set of tools that will allow them to create a customized space.

2.3. Teachers' Productions

They are specially designed for teaching and learning. We can distinguish resources created by teachers in pedagogical sequences and those created by teams (including content, designers, producers, professionally edited resources), as is often the case for textbooks. One of the major challenges is the generalization of these resources, which often come from the experience of a teacher, so that they can be used by as many people as possible. Digital technology facilitates this generalization, but the noise of the internet complicates the retrieval of these resources. Hence the interest of "reading committees" in which experts select relevant resources for commercial or official distribution [7].

2.4. Editorial Resources of Opportunity

They are not designed by teachers and other education specialists, but they are used by teachers, such as newspaper resources, videos from YouTubers, and infographics. Most of the time, there is much adaptation work to be done because these resources are often beyond the scope of the curriculum and generally oriented toward an adult audience.

2.5. Editorial Responsibility and Reliability of Resources

This list of digital resources is far from being exhaustive as the offer is so important, but it has the advantage of presenting the main sources of resources, namely the publishers of digital educational resources.

The objective was to propose a panorama of the typologies of existing resources in view of their selection/acquisition. In this approach, the identification of editorial responsibility must be a professional reflex, a prerequisite to the adoption of any resource because it allows the evaluation of the reliability of the resource. Editorial responsibility implies responsibility for the content and sustainability of the service and protection of authors' rights and guarantee of usage rights, in particular through upstream management of the rights to the media and information incorporated.

3. Approaches for Evaluating Digital Resources

Many studies have addressed the question of the quality of websites and educational platforms by presenting criteria for evaluating content. We have focused on four models that consider pedagogical strategies, which we have listed in Table 1.

Table 1 Digital content evaluation criteria according to four models used (Developed by the authors)

Models' Headings	**Quality model according to [8]**	**Quality model according to [6]**	**Content quality model according to [9]**	**Quality model according to [10]**
Identification of the author	- Publisher-author is clearly identified; - The publisher's contact information is clearly indicated; - Access is open; - The site is free; - The target audience is clearly defined.	- The author of the page is identified; - The author introduces themselves (skills, membership in an institution, etc.); - E-mail address.	- Who is the author of the document? - Is the author recognized in this discipline? - If not: ○ Are they cited by someone well known? ○ Is the document cited in another reliable document?	- Content source; - Target audience; - The date of creation; - Update.
Contents	- Curricular content; - Program coverage; - The relevance of resources offered; - Accuracy and precision of information; - An indication of sources; - Display of advertising.	- Presentation and organization of information; - Sources and references.	- What is the purpose of the site and what does it contain? Who writes it and for whom? - What is the level of completeness, accuracy, and precision of the information provided? - Are the documents written in the correct language?	- Educational objectives were clearly identified; - The logic of the organization of activities; - The relevance of resources; - Quality of the language; - Instructions are clearly described; - Relevant illustrations; - The legibility of texts; - Image quality; - Relevant links.
Teaching strategies	- Clearly expressed educational objectives; - Relevant learning strategies; - The presence of evaluations; - The relevance of the proposed activities; - The clarity of activity instructions.			
Pedagogical interest		- Materials and educational activities; - Originality and methodological contribution.		
Ergonomics	- Easy to use; - The legibility of the content;			

- Image quality;
- Easy to find information;
- The coherence of the structure.

4. Proposal for a Model Evaluation Grid

4.1. Design of the Evaluation Grid

After the synthesis of the evaluation criteria presented by the literature in Table 1, we focused on the criteria evaluating the quality of the content and which appear in a recurrent way in the various models. Then, we reorganized them and divided them according to the aspects determining the quality of the information. Thus, we have identified the following three aspects (Table 2):

- Reliability;
- Relevance;
- Quality of the presentation.

Table 2 Criteria for the evaluation of digital content (Developed by the authors)

Aspects	Headings	Criteria
Reliability	Author	- Is information about the author mentioned?
	Freshness	- Is the date of the creation of the content mentioned?
		- Is the update date mentioned?
	Source	- Are references used to design the content cited?
Relevance		- Does the content cover a concept in the academic program?
		- Is the content relevant to the grade level?
		- Are the objectives to be achieved specified?
		- Is the plan detailed?
		- Do the exercises or examples achieve the intended objectives?
		- Are the explanations clear and understandable?
Quality of the presentation	Design	- Is the content organization consistent (section, chapter, title, subtitles, etc.)?
		- Are the colors and images attractive?
	Readability	- Is the text clear and legible enough?
		- Is the content written in the correct language?

4.2. Operationalization of the Evaluation Grid

The grid includes a total of twelve criteria divided into reliability, relevance, and presentation quality.

It has a two-level rating scale (yes and no), which we are asked to answer when evaluating content.

At the level of the grid, we also find the percentages distributed according to the degree of relevance of the criteria.

Assigning percentages to each criterion is a very difficult task because it is necessary to know exactly the degree of influence that each of them has to judge the quality of the content.

The assignment of percentages and the scale of evaluation were made on the basis of [8]. This article shows that when evaluating a document in general, the highest percentage should be given to the relevance aspect then the reliability aspect and to finish with the presentation aspect.

The percentages of the grid are thus constituted as follows:

- 60% for the relevance of the content, at a rate of 10% per criterion;
- 22%, of which 10% for the identification of the author and the source of the content and 2% for the date of update;
- To finish with the reliability aspect, the percentage attributed is 18%, of which 8% for design and 10% for readability.

Table 3 Sample digital content assessment grid (Developed by the authors)

Identification				
- Content name				
- Address (URL)				
- Access to the site: free tariff				
- Language option (French, English, other)				
Aspects	**Pedagogical value of the content**	**Yes**	**No**	**%**
Relevance	*At a rate of 10% per criterion:*			
60%	1. Does the content cover a concept from the academic program?			…/60
	2. Is the content relevant to the grade level?			
	3. Are the objectives specified?			
	4. Is the plan detailed (section, chapter, title, subtitles, etc.)?			
	5. Are the exercises or examples appropriate to the objectives?			
	6. Are the explanations clear and understandable?			
Reliability	*Notoriety of the author (10%):*			
22%	7. Is the author's information mentioned (name, email, organization, profession, phone, etc.)?			.../10

	Continuation of Table 3	
	Source of the information (10%):	
	8. Are the references used to design the content cited?	.../10
	Freshness of the information (2%):	
	9. Is the date of the update mentioned?	.../02
Quality of the Presentation	*Content design (8%):*	
18%	10. Are the references used to design the content cited?	.../08
	11. Is the quality of the colors and images attractive?	
	Legibility of the content (10%):	
	12. Is the text clear and readable enough?	.../10
Total		…/100

5. Conclusion

The widespread distribution of digital materials without quality control places users, teachers, and learners in the obligation to evaluate them themselves before integrating them into their teaching process. This exploratory study has shown that the difficulty lies in the fact that it is difficult to define the very notion of quality due to the lack of consensus. Indeed, it is often considered that data quality can be defined on the basis of an analysis grid containing a certain number of dimensions, categories, criteria, parameter factors, or attributes, hence the interest of this study, which is part of the current debate on the reliability of information in the face of the overabundance of digital sources that invade the field of education from one year to the next, especially with the advent of the Covid-19 pandemic, which transformed learning tools and information architecture [11]. This work synthesizes a set of proposals for digital information evaluation guides in the literature and proposes a grid that can be used as a basis for a content audit. This grid can be annexed to each course or research based on digital bibliographic references.

To improve the evaluation tool proposed in this study, the perspectives of this work will be to add other relevant criteria allowing to judge the value of the quality of the information, elaborate a guide of use of the grid to facilitate its use, make updates, etc., and constitute the first step toward the formalization of the content audit and other methods used in information architecture.

Nevertheless, the evaluation of a website or an educational platform based on a pre-established criteria grid is insufficient. It requires the use of usability tests to highlight the problems that may emerge during use in a real situation. Hence the limitation of this study, which makes it rather ephemeral research as long as it is not rigorously formalized and widely practiced.

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