

Development of a Tool for Quality Assessment of Digital Learning Resources

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ABSTRACT

Today, the use of computers in education is booming and the use of digital learning resources and educational websites invite educators and computer scientists to reflect more on the design of such tools. In fact, this paper outlines a number of criteria and recommendations that can guide and direct any teaching tool design be it campus-based or online (e-learning).

This work is at the heart of this issue. It suggests examining academic, pedagogical, didactic and technological criteria to conduct this study which aims to develop an assessment and analysis grid of the quality of educational programs and applications.

The approach adopted consists in addressing the specific and relevant factors of each assessment criterion. Then, the article explain the detailed structure of the grid. Finally, on the basis of the description given, all data are collected in the evaluation grid and its methods of use are discussed..

General Term

Technology, applications, programs, website, quality, evaluation.

Keywords

Digital learning resources, teaching, pedagogy, didactics, design, assessment grid.

1. INTRODUCTION AND ISSUE

Thanks to the possibilities offered by Information and Communication Technology (ICT) in education today, many educational products (educational resources, multimedia and interactive educational websites) are elaborated within the framework of a campus-based or online education (e-learning).

However, from a pedagogical and didactic perspective, the question now facing pedagogy and computer science agents is not whether to integrate digital pedagogy or not (its usefulness is quite evident and needs no reflection), but it is rather about the educational mission of these products [1]: Do these products really carry out their due tasks? (teaching and developing skills), or are they only electronic versions of traditional courses that will not bring anything special to the learner, who is sometimes disturbed by inadequate use of technology (choice of colors, number of links, the complexity of the interface)? What are the techno-pedagogical criteria to be taken into consideration for the development of digital learning resources in education?

Literature in educational multimedia offers many criteria or recommendations [2] that can guide and direct any digital design of educational resources in campus-based or online education. Several studies have been conducted in this context such as the work of S. Crozat, P. Trigano Hû and O. [3] D. Scapin and Bastien CH. [4]. However, these criteria are not always easy to implement or turn out to be very difficult to adapt in the case of customized products or small teams, which is true in most cases.

This paper proposes to make a contribution in this area by developing an assessment grid of the quality of digital learning resources used in a campus-based or online education. In this context, the study aims to enhance the assessment grid itself, taking into account the academic, pedagogical, didactic and technological constraints.

The purpose of this work is to develop a tool to carry out an assessment and analysis of digital tools destined for education. In other words, the study is intended to assist those in the field of education to assess the (pedagogical, didactic and technical) quality of digital, pedagogical and educational resources they use or intend to use.

2. METHODOLOGY

The assessment of a digital educational resource remains an arduous and difficult task. Efforts have been undertaken by several researchers: Flagg [5], Reeves [6] Reigeluth and Schwartz [7] Romiszowski [8] to specify the conditions, methods and assessment tools adapted to digital learning resources.

To carry out this study, which aims to create a simple assessment, a systematic approach is adopted in order to identify the different aspects constituting a digital learning resource and describe each separately in its own context: academic, educational, didactic and technological aspect. From the description given and an exploration of the conducted research in this field, all data are collected in an "assessment grid" in order to manipulate it in a new context.

3. CONCEPTION OF THE ASSESSMENT GRID

The adopted assessment grid of a digital and educational resource has been designed to be easily used. It is developed using specific vocabulary to avoid multiple interpretations.

To identify the main criteria to be assessed, the proposed approach consists in consulting a number of digital

educational resources and visiting educational websites all dealing with the same subject, and then identifying elements which enable to compare and evaluate them.

In addition to the identification part and overview, which enable featuring each product assessed, the assessment grid is built around four main relevant topics for the evaluation of both the content and the form of digital learning resources. These sections are "academic quality", "pedagogical quality", "didactic quality" and "technical quality". Each section is associated with a set of additional criteria, and each criterion is then associated with one or more questions [9] to verify the suitability of the product examined with each reference criterion. They all form a tree structure with three levels as show the Figure 1.

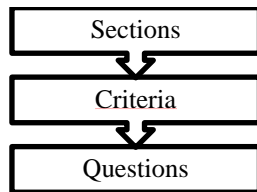


Fig 1: Tree structure of the assessment grid

The next part describes more precisely the different sections and criteria on which the evaluation grid is based.

4. DESCRIPTION OF THE DIFFERENT SECTIONS

4.1 Product Identification

This section identifies and presents a digital educational resource. It is used to indicate the name or title of the content and identify the name of the authors or those responsible for the production in addition to the target audience.

4.2 Academic quality aspect

The objective of this section is to assess the quality of information presented in the digital learning resource. Indeed, the quality of information is an essential component of the experience the learners will be living by checking the content. There are two essential criteria to define the concept of quality applied to information:

4.2.1 Information reliability

Information reliability lies in credibility and accuracy. To assess this criterion, it must be questioning whether the information is reliable, accurate and error-free. Is this accuracy sustainable over time? Is information security guaranteed? Is there any correspondence between the perceived reliability and the actual reliability of information?

4.2.2 Information relevance

This criterion is related to the effectiveness of information. It must be asked if the information transmitted will trigger desirable behaviors for the learner ? Is the information workable and usable?

These two elements (reliability and relevance) of academic quality are highly interdependent: the mechanisms implemented to ensure information reliability will obviously affect its relevance if the perceived reliability is good.

4.3 Pedagogical quality aspect

The assessment of teaching quality is of paramount importance. To enhance learning and enable the learner to construct his/her knowledge, a digital learning resource must

refer to a differentiated pedagogy, active and learner-centered which promotes the development of skills.

This section examines the various facets of the educational dimension brought by the digital learning resource. The main criteria that will face each product during the evaluation are:

4.3.1 Pedagogical formulation

Pedagogical formulation represents a concern of comprehension by learners who use digital educational resources for learning. This formulation is characterized by the quality of simplification, the presence of summaries or abstracts as well as the use of diagrams, figures and illustrations.

4.3.2 Pedagogical construction

Pedagogical construction assesses whether the structure of the digital learning resource promotes its use in a pedagogical context [10] through the presence of appropriate interactivity, logic of organization, ease of orientation (eg summary, site plan), ease of browsing (back-forward, back to home page, scroll box) and readability of pages (internal summary, back buttons).

4.3.3 Pedagogical Strategies

This criterion assesses the teaching strategies adopted. Developing an appropriate instructional strategy lies in designing and organizing learning activities based on techniques, methods, approaches and diverse educational models to handle different learning styles.

Teaching strategies should be based on active teaching approaches (constructivism, social constructivism) to build meaningful and motivating situations for learners and engage them actively in learning.

4.3.4 Assessment methods

The assessment methods are tools implemented for evaluation, teaching monitoring and learners' support, such as exercises and tests. This criterion aims to evaluate the assessment practices used. It also helps to ensure whether the assessment is promoted or opposes the emergence of learning.

4.4 Didactic quality aspect

Didactics focuses on the central role of learning activities, disciplinary content and epistemology (the nature of knowledge to be taught).

This section examines the didactic quality of pedagogical digital resources in education. Two key criteria to assess the quality of educational content can be defined :

4.4.1 Veracity of learning activities

To enable the learner to manipulate the presented content, the activities proposed in the product must be appropriate. These activities must refer to real problems that could possibly face the learner outside the classroom.

4.4.2 Content of the educational tool

To achieve the learning objectives, the content of the product must be in line with the objectives and target audience. Knowledge conveyed must undergo changes without minimizing, deviating or affecting the concept.

4.5 Technical quality aspect

The technical quality of a digital learning resources is paramount. In fact, it is not acceptable that the learner will not be able to achieve an educational activity because of usage problems.

The technical quality measures the resource elaboration from the perspective [11]:

4.5.1 Design:

The content and organization of the visual product should promote appropriate use of colors, interactivity, graphic quality and pleasing aesthetic for the selected images and illustrations.

4.5.2 Browsing:

The product design must facilitate browsing. While manipulating the resource, the learner should be able to find a plan, an index or a detailed table of contents. The suggested choices should be clear and the groupings within the menus should be consistent.

4.5.3 Technological ingenuity:

Multimedia techniques aim to combine and exploit the capacities of new technologies in education to enhance knowledge transfer and assimilation of knowledge by learners.

During product development, the designer should use multimedia techniques in favor of information and education such as animations, flashing text, animated images and multiple windows.

Table 1 below shows the designed assessment grid.

Table 1 : Assessment Grid of the quality of a digital learning resources

| Assessment grid of the quality of a digital learning resource | | |
|---|--|-------------------|
| Identification and presentation of the product: | | |
| •Name (Title): | • Author (s): | •Target Audience: |
| Academic quality | | Score/5 |
| Information reliability | 1. Is the information presented reliable? | |
| Information relevance | 2. Is the information presented relevant? | |
| Pedagogical quality | | |
| Pedagogical formulation | 3. Is the quality of content simplification good ? | |
| | 4. Does the educational content present overviews and summaries? | |
| Pedagogical construction | 5. The content is clearly structured it (a plan or a summary, for example)? | |
| | 6. Structuring the content she promotes its use in an pedagogical context? | |
| Pedagogical strategies | 7. Are the objectives to be achieved stated? | |
| | 8. Does the product include stimuli likely to promote learning? | |
| | 9. Are knowledge and existing learners' representations taken into account? | |
| | 10. Is the active mental engagement of the learner favored? | |
| | 11. Is learning based on learner-centeredness? | |
| | 12. Are there any problem-solving tasks fostering a constructive learning ? | |
| | 13. Does the tool present activities creating interactions between learners? | |
| 14. Does learning allow anticipation of development by taking into account the ZPD ¹ ? | | |
| Assessment method | 15. Does the tool provide an assessment procedure? | |
| Didactic quality | | |

¹Zone of Proximal Development "is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving, under adult guidance ". Vygotsky, L., 1978.

| | | |
|--------------------------|--|--|
| Learning activities | 16. Do activities refer to real problems which the learner will possibly facing outside the classroom? | |
| Learning content | 17. Is there a match between the audience, content and objectives? | |
| Technical quality | | |
| Design | 18. Is browsing between different elements of the product easy? | |
| Browsing | 19. Are multimedia techniques in favor of information and pedagogy? | |
| Technological ingenuity | 20. Do multimedia techniques promote information and pedagogy? | |

5. METHODS OF USE OF THE ASSESSMENT GRID

The assessment grid must indicate if each product complies with the different criteria. For each question, referring to a criterion, is assigned a score ranging from 0 to 5 on Lickert scale². The testing of different products using the grid provides quantitative results about its quality.

The grid allows making two types of assessment. On the one hand, it enables doing an overall assessment of the quality of digital learning resources in education based on a rating scale. This first type of assessment allows having a general idea about the quality of the assessed products. On the other hand, the assessment grid can evaluate the quality of each section (academic, pedagogical, didactic and technical).

5.1 Global assessment of quality

This assessment process uses the rating method following Lickert scale. The rating intervals show, for each average found, the quality level of the assessed product.

- **81 to 100:** the product is an excellent educational resource. It offers different functionalities and meets the required quality criteria;
- **61 to 80:** the product includes some interesting elements despite some weaknesses;
- **41 to 60:** the product category is average. It does not allow a sufficiently significant educational use;
- **0 to 40:** the product is below the average. It does not meet several required (educational, scientific, technical) quality criteria.

5.2 Assessment of each section

This second type of assessment helps focus the analysis on the impact each item can have on the quality of assessed content. In this regard, to begin this assessment, the assessor must proceed as follows:

- For each product, calculate, for each section of the assessment grid the sum of the scores:
 - "academic quality" section: sum of scores/10;
 - "pedagogical quality" section: sum of scores / 65;
 - "didactic quality " section: sum of scores / 10;
 - "technical quality" section : sum of scores / 15.

- For the whole sample, calculate for each section, the average score.

This assessment gives a rating for each of the four examined sections.

6. CONCLUSION

Learning with digital learning resources takes place in a highly different context from traditional learning, where human interactions become publicized. In this new environment where the learner finds himself alone in front of the machine, the need for educational support is of great importance.

From this perspective, to be able to create products that meet most of the teaching and learning criteria, assessment should be conducted before making these products at the disposal of learners to identify irregularities and make the necessary adjustments in the design process.

The assessment grid proposed can serve as a reference for the development of activities in order to elaborate digital learning resources for education. Therefore, it is a tool for pedagogy agents, who are not only concerned to design, but also to observe, analyze and assess their teaching practices through elaborating digital learning resources. Accordingly, this grid has been originally developed and tested in collaboration with professionals [12].

7. REFERENCES

- [1] Ezzahri S., Talbi M., Erradi M., Khaldi M., Jilali A. (2008). Elaboration d'un outil d'évaluation de cours de formation continue a distance. ISDM, n°39.
- [2] Park I., Hannafin M.-J. (1993). Empiically-based guidelines for the design of interactive media, Educational Technology Research en Development, vol.41, n°3.
- [3] Crozat, S., Trigano, P. and Hû, O. (1999). EMPI : Une méthode informatisée pour l'évaluation des didacticiels multimédias. Publié dans RHIM, la Revue d'Interaction Homme Machine (ed Europia), Vol 1, n°2.
- [4] Scapin D., Bastien CH. (1997). Ergonomic criteria for evaluating the ergonomic quality of interactive systems. Behaviour & Information Technologie.
- [5] Flag, B.N. (1990). Formative Evaluation for Educational Technologies. Hillsdale, NJ : Lawrence Erlbaum
- [6] Reeves, T.C. (1993). Evaluating interactive multimedia in Multimedia for Learning Development, Application,

²Lickert scale is a rating scale where the interrogated person expresses his/her degree of agreement or disagreement regarding a statement. The scale contains five or seven answer choices which enable to formulate the degree of agreement.

- Evaluation. Gayeski, D.M. (ed.), Englewood Cliffs, New Jersey: Educational Technology Publications, p 97-112.
- [7] Reigeluth, C.M., Schwartz, E. (1989). An instructional theory for the desing of computer-based simulations. *Journal of Computer-Based Instruction*, 16 :1-10.
- [8] Romiszowski, A.J. (1986). *Developing Auto-Instructional Materials: from Programmed Texts to CAL and Interactive Video*. New York: Nichols Publishing Company.
- [9] Hù O. (2001). Contribution à l'évaluation des logiciels multimédias pédagogiques, PhD Thesis, University of Technology of Compiègne, France.
- [10] Ecaterina G-P. (2003). Conception et Evaluation des Environnements pédagogiques sur le Web. Université de Technologie de Compiègne (UTC).
- [11] Pierre M, et Renata J. (24 octobre 2001). Outils pour l'analyse de sites Web éducatifs. Module n°3, version 4.
- [12] El Mhouthi A. and Erradi M. (2012). An evaluation model of teaching digital educational resources.