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**CONTACTOS**

Centro de Competência da Universidade do Minho  
 Instituto de Educação  
 Campus de Gualtar  
 4710-057 Braga  
 T.F.: 251 456 301/870  
 F.AX.: 251 452 601/871  
 e MAIL: [ccum@uminho.pt](mailto:ccum@uminho.pt) | [inova@uminho.pt](mailto:inova@uminho.pt)

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## ONLINE LEARNING ENVIRONMENT SURVEYS FOR HIGHER EDUCATION. COMPARATIVE ANALYSIS AND FUTURE RESEARCH

Ângelo Jesus<sup>1,2</sup>; Agostinho Cruz<sup>1</sup>; Maria João Gomes<sup>2</sup>

<sup>1</sup>Núcleo de Investigação em Farmácia; Centro de Investigação em Saúde e Ambiente, Escola Superior de Tecnologia da Saúde do Porto, Vila Nova de Gaia, Portugal

<sup>2</sup> Centro de Investigação em Educação, Instituto de Educação, Universidade do Minho, Braga, Portugal

acj@eu.ipp.pt

**Resumo:** A qualidade dos ambientes online de aprendizagem, desempenha um papel primordial. Investigadores e profissionais da educação devem dispor de meios através dos quais possam quantificar certas características do ambiente de aprendizagem antes de aprovar qualquer alteração no ambiente online com vista a uma melhoria da efectividade do processo de aprendizagem. Questionários relativos a ambientes online de aprendizagem têm sido utilizados em vários países, em vários níveis de ensino e muitas áreas de educação, porém não há registos de tais instrumentos serem validados e utilizados em Portugal. O objectivo da presente revisão integrativa consiste na análise de diversos questionários/instrumentos concebidos para a avaliação dos ambientes online de aprendizagem de forma a tecer uma apreciação crítica sobre as dimensões avaliadas e, finalmente, estabelecer um plano de acção para a validação e adaptação transcultural de um desses instrumentos para a Língua Portuguesa.

**Palavras Chave:** Aprendizagem Online, Survey, Questionário, Tecnologia Educativa, Ambiente de Aprendizagem Online

**Abstract:** The quality of the environment in which students learn, plays a paramount role. Researchers and education practioners should have means by which they can measure the learning environment before they can enact any changes in that environment that will lead to improving the efetiveness of education. Learning environments questionnaires have been utilized in multiple countries at multiple educational levels and many educational areas, however there are no records of such instruments being validated and used in Portugal. The aim of this integrative review is to analyze several questionnaires/instruments designed for the evaluation of learning environments, in order to make a critical appreciation about the assessed dimensions and finally establish an action plan for the adaptation and cross-cultural validation of one of these instruments for the Portuguese Language.

**Key Words:** Online Learning Survey, Questionnaire, Educational Technology, Online Learning Environment

### Introdução

Contemporary education can be understood in a cognitive-constructivist perspective, assuming knowledge as a personal construction, resulting from the interaction between the individual and his environment and integrated in a social context (Wills & McNaught, 1996; Solomonidou, 2009). Constructivism, as a philosophy of learning, sees itself as a process of constructing knowledge based on individual interpretation of experiences, considering prior knowledge, mental structures and framework of existing values (Jonassen, 1993). In a constructivist perspective, knowledge instead of just being passed, it must be built. This educational approach emphasizes essentially practical components (learning by doing) and

social interactions (learning with others). In this manner, constructivism involves the adoption of strategies and activities appropriate to the motivations, initial conceptions and knowledge of the student. Moreover, constructivism supports the integration of evaluation in the process of constructing meaning, and thus tries to ensure an informed and reflective learning over the quality of the results (Wenger, 1998). With the implementation of this educational philosophy, the teacher has essentially the role of facilitator, guiding, encouraging and mediating the learning process. If we consider the traditional teaching in the classroom, we can observe that the same is characterized by unilateral diffusion of knowledge and presence of teachers and students, in the same space, at the same time, and adopting the same pace for all students. The teacher transmits knowledge and this is welcomed by a group of students, usually passive, and just called to intervene. Changes to this model can be achieved through technological support, if accompanied by pedagogical changes, as well as a restructuring of methods and contents. On this topic Ramos (2003) argues it is imperative to associate the technology with new pedagogical models. McKenzie (1998) advocates that technology would transform the act of teaching, whether or not teachers and students are ready for this inevitable change. The incorporation of distance education activities by institutions of higher education is considered an important contribution to create new opportunities for teaching at both initial and continuing training. (Gomes, 2003). The existence of different approaches to distance learning, offers opportunities to create resources that make the learning process more flexible (McKenzie, 1998), particularly in the context of diversifying the curriculum, the modular organization of content and flexibility of spatial and temporal moments for education (Gomes 2008). Consequently, the changes brought about by this new educational paradigm implies a different relationship between teachers and students and even among institutions, in the sense that students can take a greater role in education, training, interaction and direct manipulation of information and knowledge (Gomes 1996).

Living in today's information society, driven by the widespread diffusion of Information and Communication Technology (ICT), will undoubtedly create the need to acquire new skills. The European Commission has identified a "digital competence" as a core competence for personal use and development, active citizenship, social inclusion and greater employability (Punie & Cabrera, 2005). It is important to learn not only how to use new technology but also understand what it means to live in a society of networks. This applies not only to students but also teachers and staff (Punie & Cabrera, 2005). We cannot ignore that ICT have created new spaces of knowledge construction. Each day more people are studying at home, and from there, accessing to cyberspace training and distance learning. They are searching, outside of schools, institutions of higher education or other training centers, informations available in computer networks and services provided by Internet, to meet their personal requirements of knowledge. The phenomenon of e-learning as a learning environment supported by Web technologies, becomes increasingly present in education and training scenarios, both in formal, informal and non-formal learning contexts.

Cyberspace broke with the idea of proper time for learning (Coutinho & Bottentuit,2007). ICT, particularly in the context of the Internet and Web 2.0, are a valuable element of teaching practices, since they add in terms of access to information, flexibility in time and space as well as diversity of media in presentation (Gomes,2008). It also enhances processes for understanding various concepts and phenomena, because it can associate different kinds of representation ranging from text, image and animations, to video and sound (Martinho & Pombo, 2009). But we must not fall into the illusion that technology by itself produces or promotes knowledge (Alspaugh, 1999; Honey, 2000). For a technological element to have a significant impact on the learning process, certain variables must be considered, namely the quality of implementation, design and structure, the teacher's experience and teaching philosophy (Bielefeldt, 2005). The use of ICT in Higher Education, promotes a change in the roles of all stakeholders in the process of teaching and learning. This amendment seeks to bring a better quality of education, such as the fight against failure, the awakening of motivation for learning and skill development

The quality of the environment in which students learn, plays a paramount role. Researchers and education practioners should have means by which they can measure core dimensions of the learning environment before they can enact any changes in that environment that will lead to improving the effectiveness of education. Qualitative observation, inquiry, ethnography, student and teacher interviews, case studies, among other qualitative and subjective forms of assessment have commonly been used by researchers to gather information on educational environments (Tobin&Fraser, 1998). To bridge the gap between the third-party observer/researcher views and the students' and teachers' own perceptions of what goes in on their environments, a less subjective, qualitative and economical means of measuring the learning exists through the use of learning environment survey instruments. This alternative research method is based on validated, efficient, and broadly relevant questionnaires (Fraser 1998). Learning environments questionnaires have been utilized in multiple countries at multiple educational levels and many educational areas, however there are no records of such instruments being validated and used in Portugal. Simultaneously there is no evidence that the surveys are addressing to the core dimensions of an Online Learning Environment nor has a comparative study been made in order to assess the similarities, strong points or weaknesses of each survey.

### **Objectives**

The aim of our study is to analyze several questionnaires/instruments designed for the evaluation of learning environments, make a critical appreciation about the assessed dimensions and finally establish an action plan for the adaptation and cross-cultural validation of one of these instruments for the Portuguese Language. Specifically, the questions that this research addresses are:

1. What core dimensions should be considered crucial for the success of an online learning environment?
2. Do the existing Online Learning Environment Surveys, address these core dimensions? Which scales are adopted in each survey?
3. Are the Online Learning Environment Surveys validated and adapted to different contexts?
4. Which Online Learning Environment Surveys can be best suited for translation and cultural adaptation to Portuguese Language?

## **Methods**

The study design was descriptive (MacMillan & Shumaker, 1997) and, within these, adopted the format of an integrative review (Cooper, 1984) since the objective was to make a synthesis of results (secondary analysis) from previous studies (primary analysis), in order to respond to new questions, new hypotheses and to verify or establish new relationships (Fortin, 2009).

A systematic search of published Journal Articles, between 2000 and 2010, relating Online Learning Environment Surveys in Higher Education was made in the database ERIC. Key Words utilized for the search consisted in: "Online Learning", "Survey", "Questionnaire", "Computers in Education", "Online Learning Environment", "Perceptual Measures", "Evaluation", "Students Perception". Finally we also conducted a search of relevant references found in the articles analyzed. Criteria for selection included at least one of the following: (1) Description of the construction and/or validation of a scale/ questionnaire; (2) Application of a scale/ questionnaire in Higher Education; Cross Cultural validation of a scale/ instrument. Being considered all criteria for inclusion we have identified seven Online Learning Environment Surveys.

**Results**

Being considered all surveys, the first task is to comparatively analyze them. Considering the objectives of this study, we present dimensions/scales addressed by each survey, as well as the statistical procedures pursued for validation, and finally the educational level in which each survey has been tested.

Name and Acronym	Dimensions/Scales	Statisticals procedures	Educational Level Tested
<b>DOLES-Distance and Open Learning Environment Scale</b>	<ul style="list-style-type: none"> <li>• Student cohesiveness,</li> <li>• Teacher support,</li> <li>• Personal involvement and flexibility;</li> <li>• Task orientation and material environment,</li> <li>• Home environment</li> </ul>	<ul style="list-style-type: none"> <li>• Content Validity (Experts, Students and Teachers)</li> </ul>	Higher Education
<b>WEBLEI - The Web-Based Learning Environment Inventory</b>	<ul style="list-style-type: none"> <li>• Emancipatory Activities</li> <li>• Co-participatory Activities</li> <li>• Qualia</li> <li>• Information Structure and Design Activities</li> </ul>	<ul style="list-style-type: none"> <li>• Cronbach alpha reliability</li> <li>• Discriminant validity</li> <li>• Descriptive statistics</li> </ul>	Higher Education
<b>COLLES - Constructivist On-Line Learning Environment Survey</b>	<ul style="list-style-type: none"> <li>• Relevance</li> <li>• Reflection</li> <li>• Interactivity</li> <li>• Tutor Support</li> <li>• Peer Support</li> <li>• Interpretation</li> </ul>	<ul style="list-style-type: none"> <li>• Content Validity</li> <li>• Descriptive statistics</li> </ul>	Higher Education
<b>OLLES -Online Learning Environment Survey</b>	<ul style="list-style-type: none"> <li>• Computer Competence</li> <li>• Material Environment</li> <li>• Student Collaboration</li> <li>• Tutor Support</li> <li>• Active Learning</li> <li>• Information Design and Appeal</li> <li>• Reflective Thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Cronbach alpha reliability</li> <li>• Discriminant validity</li> <li>• Descriptive statistics</li> <li>• Factor Analysis</li> </ul>	Higher Education

<p><b>DELES - Distance Education Learning Environments Survey</b></p>	<ul style="list-style-type: none"> <li>• Instructor Support;</li> <li>• Student Interaction and Collaboration;</li> <li>• Personal Relevance;</li> <li>• Authentic Learning;</li> <li>• Active Learning;</li> <li>• Student Autonomy</li> </ul>	<ul style="list-style-type: none"> <li>• Cronbach alpha reliability</li> <li>• Discriminant validity</li> <li>• Descriptive statistics</li> <li>• Factor Analysis</li> </ul>	<p>Post- Secondary Students.</p>
<p><b>CFL -Computer-Facilitated Learning Environments Instrument</b></p>	<ul style="list-style-type: none"> <li>• Learning framework</li> <li>• The origin of the knowledge</li> <li>• Learning directions</li> <li>• Knowledge focus</li> <li>• Learning process</li> </ul>	<ul style="list-style-type: none"> <li>• Information not available</li> </ul>	<p>Aimed for Secondary Education.</p>
<p><b>CMLES -The Constructivist Multimedia Learning Environment Survey</b></p>	<ul style="list-style-type: none"> <li>• Negotiation;</li> <li>• Inquiry Learning;</li> <li>• Reflective Thinking;</li> <li>• Relevance;</li> <li>• Complexity;</li> <li>• Challenge</li> </ul>	<ul style="list-style-type: none"> <li>• Cronbach alpha reliability</li> <li>• Discriminant validity</li> <li>• Descriptive statistics</li> <li>• Factor Analysis</li> </ul>	<p>Secondary Education</p>

Table 1 : Descriptive analysis of all Online Learning Surveys studied.

Considering now, only the Online Learning Environment Surveys primarily designed for Higher Education, we summarize below the relation between the scales in each survey and the Core Dimensions identified by Carrol (1963) Reeves (1997), Clayton (2004) and Siragusa (2005)

Scales	Core Dimensions	WEBLEI	COLLES	OLLES
Relevance for the professional practice				
Reflecting upon learning	Student Reflection Activities.			
Students interaction	Student - Student Relationships			
Student-teacher interaction	Student - Tutor Relationships			
Tutor Support	Student - Tutor Relationships			
Peer Support	Student - Student Relationships			
Design structure and activities	Student- Media interaction			
Frustration, trust and success upon completion of activities				
Convenience and autonomy	Student - Interface Interaction			
Computer competence	Student- Media interaction			

Table 2: Comparative analysis of assessed dimensions in the Online Learning Surveys directed to Higher Education

## Discussion

With the ever-increasing integration of online learning (or e-learning) into university courses, there is strong need for practical guidelines and recommendations to facilitate the development and delivery of pedagogically effective e-learning environments. Ally (2004) argued that in order to promote higher-order thinking through technology-based learning environments, instructional strategies which promote learners to make connections with new information to old, acquire meaningful knowledge, and employ metacognitive thinking skills are required within the elearning environment. This requires an analysis of the learner, the learning context and the learners' specific learning needs. Investigations by Carrol (1963) Reeves (1997), Clayton (2004) and Siragusa (2005) examined factors which make for effective instructional design principles and learning strategies for higher education students, studying within these learning environments. Each and every investigator has its own perception, based on prior knowledge and developed work, on the dimensions that should be considered crucial for the success of the learning environment and for the student during the learning process in the online learning environment. We can point out several aspects/dimensions, that are common to the previous investigations (Clayton, 2004):

1. Student - Interface Interaction (What are the features of the interface created that enhance / inhibit student learning and navigation?)
2. Student - Student Relationships (How, why and when students communicate with each other and what is the nature of this communication?)
3. Student - Tutor Relationships (How, why and when students communicate with their tutor and what is the nature of this communication?)
4. Student - Media Interaction (How is the student engaged with digitally stored information and how do they relate to the information presented?)
5. Student Reflection Activities (How are students encouraged to reflect on their learning, are they satisfied with the environment and how do they relate to the environment created?)

According to these data, we can firmly assume that any online learning environment survey, should address the previous dimensions, but not be limited by them. A closer look at table 1 can summarize the main characteristics of each instrument.

The *Distance and Open Learning Environment Scale* (DOLES) (Jegede, Fraser, & Fisher, 1995) was the pioneering investigation bringing learning environments research and distance education research together into one cohesive body of study (Walker, 2003). The DOLES considered participants' perspectives of salient scales of the environment primarily in distance education science classes originating from Queensland and Western Australian universities. This instrument, was paper-based and was initially validated on 660 responses to five core scales. The core scales were: **1) student cohesiveness, 2) teacher support, 3) personal involvement and flexibility, 4) task orientation and material environment, and 5) home environment.** (Jegede, Fraser, & Fisher, 1998). The DOLES was the first of its kind, being continuously cited in all other surveys developed and here analyzed. Bearing this in consideration, and since no statistical validation procedure was applied, we will not considerate the DOLES for the next phase of the project.

The *Constructivist On-Line Learning Environment Survey* (COLLES) was developed from its three-scale predecessor, the *Constructivist Virtual Learning Environment Survey* (CVLES) (Taylor & Maor, 1998), to measure questions about the quality of online learning environments from a social constructivist perspective (Taylor & Maor, 2000). The COLLES, arranged in six scales of: **1) relevance, 2) reflection, 3) interactivity, 4) tutor support, 5) peer support, and 6) interpretation.** The COLLES was core designed for Higher education, and some statistical procedures were implemented. When confronted with the Core Dimensions, we can however verify that none of the original scales correlates with Student- Interface Interaction and Student- Media Interaction.

Another recent distance education learning environment instrument is *the Web Based Learning Environment Instrument* (WEBLEI) that considers Web-based learning effectiveness in terms of a cycle that includes access to materials, interaction, students' perceptions of the environment, and students' determinations of what they have learned (Chang & Fisher, 2001). These factors are summarized by four scales, **1) emancipatory activities** (viz., convenience, efficiency, autonomy), **2)**

**co-participatory activities** (viz., flexibility, reflection, interaction, feedback, collaboration), **3) information structure and design activities** (viz., clear objectives, planned activities, appropriate content, material design and layout, logical structure), and **4) qualia**, a scale of attitude (viz., enjoyment, confidence accomplishment, success, frustration, tedium). Besides strong statistical validation procedures, the WEBLEI contemplates all Core Dimensions previously mentioned.

Adding to the recent advances in distance education learning environments research is the *Distance Education Learning Environment Survey* (DELES) that considers post-secondary student and instructor perceptions of their learning environment in six psychosocial scales of: **1) instructor support, 2) student interaction and collaboration, 3) personal relevance, 4) authentic learning, 5) active learning, and 6) student autonomy** (Walker, 2005). However, the DELES takes its investigative properties further by including a student satisfaction scale focused on enjoyment of distance education, thus allowing researchers to investigate associations between student satisfaction and the psychosocial learning environment. The DELES, has recently been refined from the responses of 680 post-secondary students mainly from the United States, Canada, and Australia. The initial study demonstrates that the strongest association between student enjoyment of distance education and the psychosocial environment rests on the scale of Personal Relevance (Walker, 2005). There are also reports of DELES being successfully tested in Turkey (Özkök, Walker, & Büyüköztürk, 2009).

*The Online Learning Environment Survey* (OLLES) was developed in New Zealand by Clayton (2004). The OLLES considers eight scales, **1) reflective thinking** (extent to which reflective activities are encouraged and how students enjoyed learning and participating in this environment), **2) information design and appeal** (extent to which class materials are clear, stimulating and visually pleasing to the student), **3) tutor support** (extent to which the tutor guides students in their learning and provides sensitive, ongoing and encouraging support), **4) active learning** (extent to which the computer activities support students in their learning and provide ongoing and relevant feedback), **5) order and organization** (extent to which class activities are well organized and assist student comprehension), **6) student collaboration** (extent to which students work together, know, help, support and are friendly to each other), **7) computer anxiety and competence** (extent to which the student feels comfortable and enjoys using computers in the online environment), and **8) material environment** (extent to which the computer hardware and software are adequate and user friendly) (Clayton, 2004). The OLLES was conveniently validated, designed for Higher Education and addresses all Core Dimensions previously mentioned.

The *Computer-Facilitated Learning* (CFL) environments instrument was developed for use in technology rich university courses (Bain, McNaught, Mills & Luedkenhausen, 1998). This instrument was based in five qualitative dimensions: **1) learning framework; 2) origin of the knowledge; 3) Learning; 4) Knowledge and 5) The learning process**. Unfortunately we found no records regarding application and validation of this instrument. Moreover, this instrument was design for secondary education.

*The Constructivist Multimedia Learning Environment Survey* (CMLES) questionnaire assesses teachers' and students' perceptions of the learning environment when students use online multimedia programs while teachers use constructivism as a referent for their teaching (Maor & Fraser, 2005). The design of the questionnaire was based on a constructivist approach to learning and focused on the process of learning with the multimedia program and on the nature of that program. The CMLES was based on 6 dimensions: **Negotiation; Inquiry Learning; Reflective Thinking; Relevance; Complexity and Challenge** (Maor & Fraser, 2005). Factor analysis and reliability were ascertained, however, the CMLES was design for secondary education.

Considering now, the only instruments that have been strongly validated by convenient statistical procedures, and core designed for Higher Education application (Table 2), we can observe that the WEBLEI and the OLLES respond to the five core dimensions previously mentioned, and by doing so; can be considered reliable Survey Instruments for Online Learning environments in Higher Education.

### **Conclusions and Future Work**

All these instruments, with their different variations, are leading to promising knowledge development in terms of assessment of online distance education learning environments. Now that we have identified the most reliable instruments, it is time to adapt them to Portuguese setting. To do so, a translation and cultural adaptation is needed. For this purpose, we will pursue this objective considering, guidelines proposed by Almeida e Freire (2000), as follows:

- a) translation from English into Portuguese by a translator specializing in teaching English;
- b) applying the translated version of a test sample, using the method spoken of reflection (thinking aloud);
- c) review and back-translation into English;
- d) assessing the equivalence of backtranslation and the original version by an expert in the field of translation and native English

For the statistical procedures the authors suggest a test to internal consistency whit Cronbach Alpha. This index the verification that the items that comprise each of the subscales of the test or are not correlated, i.e., do they represent the same construct (Almeida & Freire, 2000). Beyond internal consistency we shall conduct a validity analysis. In this sense, we should evaluate the congruence between the items and their inclusion in dimensions or subscales (Almeida & Freire, 2000) according to the authors, this should be done with exploratory and confirmatory factorial analysis. At this point, we have received authorization from the developers of the WEBLEI, and have started the Cross Cultural Validation procedure. Initial translation, and "thinking aloud" session was already set to motion. Back translation is currently in process. Final results are expected until the end of the present year.

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