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HOW CAN WE USE ICT TO ASSESS COMPETENCES IN HIGHER EDUCATION: THE CASE OF AUTHENTICITY

Alda Pereira[1], Isolina Oliveira[1], Lúcia Amante[1], Maria Carmo Pinto[1]

[1]*Laboratório de Educação a Distância e eLearning, Universidade Aberta (Portugal)*
amp@uab.pt, isolina@uab.pt, lamante@uab.pt, mctp@uab.pt

Abstract

The assessment of competences requires an approach where knowledge, abilities and attitudes are integrated, naturally implying the resource to a variety of assessment strategies. Within this context we have seen the emergence of what has been called by several authors the *Assessment Culture*. Necessarily, it should make use of a variety of different assessment strategies and tools, so as to better assess performance in authentic activities that should be as similar as possible to the contexts in which the competences will be implemented.

This new learning landscape has promoted the implementation of new alternative assessment strategies aligned with the most recent paradigms of assessment design [1]. These alternative assessment strategies are characterized by an integration of assessment into the learning process, a high level of student participation, the development of tasks leading to the production of artifacts, and contextualization in real world applications [2].

Moreover , with the development of new ICT and the emergence of web 2.0, teaching and learning resource ever more to new technological enabled content production and distribution media, as well as computer mediated communication.

In this landscape, the use of ICT to assess competences is a new challenge for the formal higher education. To clarify these issues, it's fundamental to be more precise when we talk about assessing competences using ICT. For this reason, it is important to define a concept of e-assessment that includes tasks specifically designed for competence assessment with the support of digital technologies. In this way, we propose the concept of alternative digital assessment strategy that refers to all technology-enabled assessment tasks where the design, performance, and feedback must be mediated by technologies. Moreover, in order to assure quality assessment in Higher Education, we developed a theoretical framework supported by four dimensions – authenticity, consistency, transparency and practicability – each composed by a set of parameters, aimed at promoting the quality of the assessment strategies being used [3].

In this paper, we discuss in detail the criteria of authenticity, one of those dimensions, and we present four examples of alternative authentic assessment strategies, embedded in instructional design, used by different teachers in different academic contexts of Portuguese universities.

Keywords: alternative digital assessment, assessment culture, competence, authenticity, Higher Education.

1 INTRODUCTION

Presently it is demanded from Institutions of Higher Education (IHE) to integrate the complex needs of a labor market characterized by a variety of diverse contexts and contribute to the development of active and autonomous citizens and professionals. It is expected that the students will develop complex problem solving competences, strategies to cope with frequent changes and innovations, and be able to reflect about their own learning (metacognition) and so engage in a variety of contexts and situations. Moreover, in this setting, IHE are being confronted with the fast growing use information and communication technologies (ICT) and the exponential development of distance education and elearning.

This challenge requires not only a shift in the perceived goals of Higher Education, but also in the selection of the methodologies to be used, as well as a drastic change in the assessment strategies to implement in order to foster a competence based curriculum.

In this new context, new roles are demanded from both teachers and students, where students are empowered to actively develop their knowledge and competences, and teachers are responsible for creating learning environments that nurture deep learning anchored in real contexts. Taking into account this new context, "assessment will have to go beyond measuring the reproduction of knowledge" [4] requiring the development of a new kind of assessment design. This new approach towards assessment has been labeled as an "assessment culture" (as opposed to a "testing culture") and is characterized essentially by: (i) Emphasis in the integration of assessment and teaching [5];(ii) Student engagement in the development of his own assessment in a continuous dialogue with the instructor [6]; (iii) Assessment of both product and process of learning [7]; (iv) Assessment in a variety of non-standardized formats associated with the experienced instructional practices [1]; (v) Using assessment tasks close to real life contexts [8], [9]; (vi) Complex challenges and an emphasis on research [10]; (vii) Supporting student reflection about their learning [6]; (viii) Valuing qualitative feedback over a bland quantitative classification [5].

Dierick and Dochy [4] discussed this new assessment culture through the analysis of several assessment strategies (portfolios, OverAll tests, and assessments in which students have a role) supported by an edumetric perspective of assessment. According to these authors, the current societal and technological context requires education to change, stressing that "the explicit objective is to interweave assessment and instruction in order to improve education" (p. 321).

In this paper, we start by discussing the concepts of assessment culture, competence, as well as the changes introduced by technology into assessment. Moving forward we clarify the concept of e-assessment, introduce the new concept of alternative digital assessment and present a new conceptual framework for e-assessment in Higher Education. This conceptual framework introduces a set of four quality dimensions – authenticity, consistency, transparency, practicability - for the development and use of alternative assessment in Higher Education virtual environments supported by the technologies.

2 BACKGROUND

2.1 Assessment culture

With the development of new ICT and the emergence of web 2.0, teaching and learning resource ever more to new technological enabled content production and distribution media, as well as computer mediated communication (CMC). Among such media are virtual learning environments with tools such as blogs, wikis, Learning Management Systems (LMSs), online forums, immersive virtual worlds, and e-portfolios. In teaching and learning contexts these different digital tools can be used to transform student centred instructional practices, adding value to the learning process; or alternatively only reproduce traditional teaching practices under a cover of modernity. On the other hand the simple application of computers for automatic traditional tests, the use of educational software to support classical lectures, or even the use of LMSs as online repositories, can reinforce traditional practices. We are therefore confronted with a variety of new perspectives towards teaching and learning, but not necessarily transformative of current practices.

These new scenarios, where elearning and the emergences of new technologically enhanced environments are cornerstone, urge the need to rethink the teaching and learning process. Moreover, it is crucial to reconsider how assessment can be conceptualized, in order to be aligned with these new environments and how it can incorporate and also be improved with the resource to ICT.

What is more, the psychometric paradigm that for decades has supported assessment practices was appropriate during an industrial era where learning was based on constant drill and practice. Assessment was based on a quantitative paradigm where "differentiating among students and ranking them according to their achievement" [1] (p. 15). The testing culture where instruction was always followed by assessment, as disjoint activities, was based on decontextualized tests, where the quality and validity of the items was the main concern and guided by psychometric theory.

Given the recognition of traditional assessment forms inability to promote learning, as a consequence of their focus on measurement and ranking of the participants, the last two decades have seen the emergence of a variety of alternative assessment strategies. Dierick and Dochy [4] label this new culture as the assessment culture as opposed to the testing culture. Brown, Bull and Pendlebury [11] illustrate the change in the assessment paradigm as a change from written examinations to

coursework, from tutor-led to student-led assessment, from implicit to explicit criteria, from product to process assessment, from objectives to outcomes, and from content to competences. As Sainsbury and Walker [12] emphasize, it is necessary to take an approach which incorporates collaboration into a wider range of assessments, and which provides useful timely feedback, and thus has the potential to harness the motivating force of assessment into the effective promotion of learning during the assessment process itself. Moreover, given the complexity of the concept of competence, one single assessment mode is recognized as insufficient to assess the development of competences, being therefore necessary to employ a variety of assessment strategies [13], [14],[15], [16].

This raises the question of how to design an assessment system that warrants the quality of these new assessment strategies. Specially, because the methods, techniques and criteria traditionally used in psychometrics are recognized as insufficient to assess learning in competence based programs framed by contexts strongly influenced by technology use. Dissatisfaction with these criteria, which were originally developed to evaluate indirect measures of performance, is attributed to their insensitivity to the characteristics of a direct assessment of performance [7]. So being, we have watched the emergence of a new concept – edumetrics [4], targeted at redefining the concepts of validity and reliability and so assuring the fairness of the current assessment strategies. For this reason, new criteria have been proposed in order to measure and promote the quality of these new assessment strategies, and so contribute to the implementation of quality control and establish new lines in edumetrics based in the "assessment culture" [4]. The main difference between psychometrics and edumetrics is that while the first is targeted at measuring the differences between individuals, the second aims to measure the learning and development of each individual [17].

According to Dierick and Dochy [4], edumetrics criteria are recognized as more valid and fair for competence based assessment, given their emphasis in flexibility and authenticity, as well as their integration into the learning process valuing the formative function of assessment. With this goal, have emerged several theoretical frameworks, from within which we headline the works of Gielen, Dochy and Dierick [18], Baartman, Bastiaens, Kirschner, and Vleuten [13] and Brinke [17], aimed at creating new quality assessment criteria sustained by an edumetric approach. Baartman, Bastiaens, Kirschner and Vleuten [13] suggest a framework for a competence assessment program based on ten quality criteria: authenticity, cognitive complexity, fairness, meaningfulness, directness, transparency, educational consequences, reproducibility of decisions, comparability, and costs & efficiency. This new paradigm has been present in traditional face-to-face contexts but, in our opinion, is even more crucial with the current emergence and expansion of distance education and elearning.

2.2 Defining competence

This new learning culture stresses the importance of developing competences such as identifying, selecting, argument, information management, critical thinking, making sustained judgments, innovating and communicating (both written and orally). Even though the concept of competence is still subject to different interpretations, Gijbels [19] points out that it can be interpreted from broad or narrow perspective. According to this author, competence refers to "knowledge, attitudes, skills social and motivational aspects in authentic, work-related contexts" (p. 382); moreover in a more restrict sense it refers to "the result of an individual learning process including cognitive skills and knowledge" (p. 382). The diversity on the interpretation of the concept of competence can be illustrated on the more functionalistic approach to a fragmented and narrow set of tasks used in England, or the more multidimensional approach relying on the integration both practical and theoretical knowledge, and both personal and social skills, common in France and the rest of western Europe [20]. In this context it becomes important not only to conceptualize the concept of competence, but also to operationalize strategies for competence assessment in digitally supported learning environments.

Competence is defined as the capacity to respond to individual, or societal, demands in order to perform an activity or complete a given task [20],[22],[23]. Competences are observed as a result of individual's actions in a given context. They are developed through acting and interacting in both formal and informal educational or professional contexts, and require going beyond the mere reproduction of acquired knowledge. At its highest level, this conceptualization of competence implies to choose and adapt from within the acquired processes those ones necessary to solve an unknown complex task or problem [24]. Competences represent a complex web of knowledge, capacities and attitudes that need to be used in order to solve a problem [22].

The agreed, ongoing, construct for competence in use presents competence as the capacity to successfully respond to individual, and societal, solicitations or to successfully perform a task or

activity, requiring the mobilization of knowledge (both implicitly and explicitly), abilities, attitudes, emotions and values.

The assessment of competences also requires a renewed approach where knowledge, abilities and attitudes are integrated [13]. Necessarily, it should make use of a variety of different assessment strategies and tools [25], [4], [6], [14], so as to better assess performance in authentic activities that should be as similar as possible to the contexts in which the competences will be implemented. Furthermore, a strong emphasis to the diagnostic and formative characteristics of assessment should be given, so as to better promote the participants reflection and competence development.

These new assessment strategies introduced the need of taking into account not only the competences required by real life practices, either professional or daily life. As a matter of fact, competences are manifested in a particular context, where learning and doing are related as in a situated learning context. If we consider that learning and doing are inseparable actions, then students should learn in a relevant context whit authentic and significative tasks for their everyday life [26].

In particular, the metacompetences related to metacognition and fluency in ICT use are especially important in this new landscape characterized by the emergence of new technologies. Learners are expected to be able to reflect about their own learning process mediated by new ICT technologies. Moreover, in these new learning technology embedded scenarios, learners must develop their ability to use ICT tools to promote their learning, using and adapting them to their personal learning needs. The text included in the sections or subsections must begin one line after the section or subsection title. Do not use hard tabs and limit the use of hard returns to one return at the end of a paragraph. Please, do not number manually the sections and subsections; the template will do it automatically.

2.3 Alternative digital assessment

In online education e-assessment strategies, independently of their formative or summative approach, are mediated by technologies. Several expressions have been used to describe assessment mediated by technologies, such as: e-assessment, online assessment, and digital assessment. Clearly, concepts related to e-assessment have not yet reached a consensus. For example, according to the e-Assessment Association (eAA) [27], “e-assessment occurs when there is an automated marking/response to student input on-screen in a test, informing on the process of answering a question and providing feedback to learners and their teachers through well-crafted advice and reports” (p. 2). This definition, even though recognizing the importance of feedback is still very much centered in the use of automated response tests. Previously, the Joint Information Systems Committee (JISC) in the Effective Practice with e-Assessment guide [28], computer-based assessment is used to refer to “assessments delivered and marked by computer” (p.6), and computer-assisted assessment to refer to “practice that relies in part on computers – for example, use of online discussion forums for peer-assessment, audience response systems in group work, completion and submission of work electronically, or storage of work in an e-portfolio” (p.6). In fact, as far as assessment tools for e-assessment are concerned, it is common to find a variety of examples, ranging from multiple choice online tests and quizzes, the participation in online discussion forums and online group work, to blogs and eportfolios [29], [30], [31], [32], [33]. This dispersion in the types of assessment tools for e-assessment further emphasizes the necessity to clarify what counts as alternative e-assessment given its relationship with competence assessment.

To clarify these issues, it’s fundamental to be more precise when we talk about assessing competences using ICT. For this reason, it is important to define a concept of e-assessment that includes tasks specifically designed for competence assessment with the support of digital technologies. In this way, we propose the concept of alternative digital assessment strategy that refers to all technology-enabled assessment tasks where the design, performance, and feedback must be mediated by technologies.

The design includes the definition of competences to be assessed, as well as instructions about the task to be completed, including the use of electronic devices for its accomplishment. Ultimately, this always the instructors’ responsibility, but it may include contributions of the students on the selection of competences to be assessed or the tasks to be completed. In this context the student performance must be completed using digital technologies and requiring the students to participate in technologically mediated activities (such as eportfolios, digital reports, digital forums, etc.) either on a personal computer, on the web, or using the web as a resource, or on any other electronic device

(tablets, cell phones, digital cameras, etc.). The feedback component includes not only the professors comments but also the student´s self and peer assessment.

This concept does not include as a task traditional tests done on computers with automatic feedback. As a matter of fact, such tests allow for the assessment of knowledge but, given their decontextualized nature, can hardly be considered appropriate to assess competences that are enacted in an integrated and holistic manner, and in a specific context with a range of levels of achievement [34], [26]. Competence assessment requires, from the student, active participation and production [34], [26].

In figure 1 we present an alternative e-assessment strategy, and the participants involved in this strategy. This figure illustrates the 3 components present during an alternative digital assessment strategy.

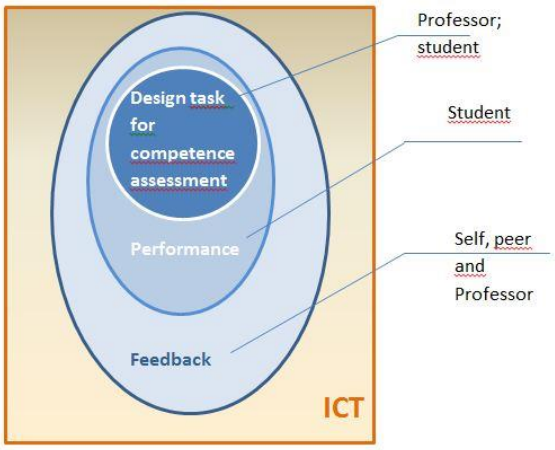

Fig. 1: Alternative digital assessment strategy

2.4 A framework for alternative digital assessment

Based on the literature review and in our practice as professors in online higher education programs we propose four dimensions for the assessment culture to be considered in the definition of competence based assessment strategies: authenticity, consistency, transparency, practicability (see figure 2). These dimensions represent the main domains for the characteristics of the assessment strategies to be developed, contributing in this way to the definition of the implemented assessment culture, and its impact in the educational process. it is also important to notice, that these dimensions are articulated, representing several degrees of reciprocal interdependence. The dimension of practicability, for example, frequently neglected, may have a decisive influence in the level of implementation of the remaining dimensions.

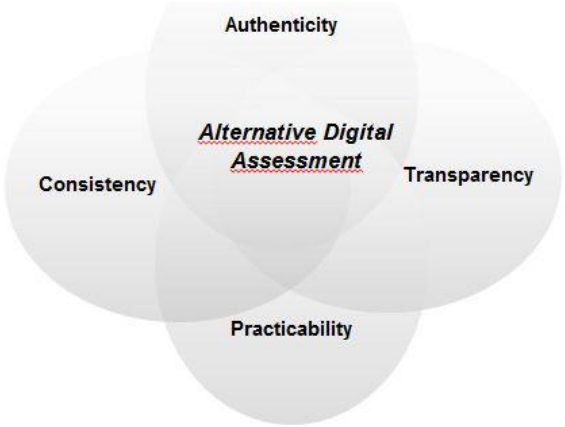

Fig. 2: Dimensions for a Competency e-Assessment Program

The authenticity domain emphasizes the need to warrant that online assessment tasks are complex, related to real life context, and recognized as significant by students, teachers and employers. Consistency stresses the importance of aligning the competences being assessed with the e-assessment strategies being used and the assessment criteria, as well as the need to use a variety of indicators. The transparency dimension promotes student engagement in online tasks through the democratization and visibility of the e-assessment strategies being used. Finally, practicability is particularly important in online contexts given their specificities considering resources, time and training costs, as well as their efficiency and sustainability.

We now present the main criteria contributing to the definition of authenticity dimension. These criteria are important not as contributors to the characterization of each of the dimensions, but also to illustrate their degree of implementation.

The concept of **authenticity** is related to the degree of similarity between the competencies being assessed by a competency assessment program and the ones required in real/Professional life. In this dimension are included four reference criteria contributing to the degree of assessment authenticity:

1. **Similarity** – refers to the way in which the assessment strategy is related to the real life context (physical and social), meaning that assessment should reflect the competencies needed in real/professional life [13], [4], [10]. The physical context refers to the type and number of available resources, while the social context is supposed to be aligned with the equivalent social processes in a real/professional situation.
2. **Complexity** – refers to the nature of the assessment tasks, more specifically, to the cognitive challenges that are imposed by its resolution/development, similar to real/professional, daily life challenges often ill-structured and with a variety of possible solutions [10], [9], [35].
3. **Adequacy** – is connected with the need to provide adequate performing conditions (time, resources, etc.) for the assessment tasks, in accordance with their complexity. This often implies the removal of unrealistic restrains imposed by formal educational contexts [10], [9].
4. **Significance** – includes the significative value of the assessment task for students, instructors and employers [13], [10]. McDowell [36] considers that the connection between the assessment tasks and the learning needs should be clear and perceived by the students/learners.

3 METHODOLOGY AND RESULTS

3.1 Methodology

Based on this conceptual framework, we conducted several case studies in Portuguese universities. After an initial phase for identifying higher education teachers who practiced modes of digital assessment by implementing an online questionnaire, we identified several examples of courses which adopted these strategies. We used as sources of information: i) official documents published on the websites of each institution, with the skills, objectives, content and resources and evaluation instruments adopted ii) interviews semi structured to the teacher responsible for each of these courses iii) questionnaires to the students that had attended these courses in the last year.

The interviews, based on an interview guide, were conducted in a flexible manner, aiming to clarify how the assessment strategy had been implemented by the teacher in charge. The interview guide was based on the criteria developed for each of the constituent dimensions of the framework outlined in the previous paragraph. The student questionnaire contained a set of questions organized according to the same criteria and dimensions, intending to objectify the experiences of the students about the digital assessment practiced. The data from these sources have been triangulated to obtain a picture of the digital evaluation strategies used.

3.2 Results

Four of the cases studied were particularly interesting by the use of alternative digital assessment strategies, which were embedded in the very model of instruction, assuming different modes of authenticity. Two of them were delivered in undergraduate programs, one in the Health area and the other in the Education area. Both the courses were developed in a face-to-face teaching environment

enhanced by technologies. The other two were included in graduate programs, both of them in the area of Education, but with a slightly different regime: one was hybrid or blended-learning and the other was online learning.

In case A, corresponding to the course in the context of Health, enrolled in the first year of the study program, the assessment has a mixed character, because it is intended to assess knowledge and competences developed in contexts of practice. For the assessment of competences, the students describe and reflect about practical activities, and organize their digital portfolio, that present to the teachers team that is in charge the teaching and assessment of students. The teacher responsible for the course, with this strategy assessment aims to assess the extent to which the students will be able to address and solve problems in the future context of the real / professional situation. In table 1 we present the authenticity criteria, and the indicators for the case A.

Table 1: Authenticity criteria - case A

Authenticity Criteria	**Indicators**
Similarity	Assessed activities are carried out in a real context - activities internship focused on operating a health institution.
Complexity	Given the diversity of situations in which students are presented in health centers, the analysis and possible solutions for improvement.
Significance	Articulation of assessment strategies and learning needs, meaningful for teachers, students and employers.
Adequacy	The use of the digital portfolio corresponds to the concern for constructing learning situations and assessment in real/professional life context.

The case B corresponds to a degree study program in the field of Educational Sciences, 2nd cycle, this course focuses on the use of technology. Assessment tasks are related with the situations posed to students for learning and have different characteristics, such as: require reflection on research and activities, the presentation of syntheses of papers, participation in online discussions, and a construction of digital artefact by a team. we emphasized, in the context of these activities, the realization of the project team, by the evidence of the authenticity criteria implicit in them.

Considering the development of the competences, the teacher intend to the students to be able to develop an artefact using some technologies that they explore and select. In table 2 we present the authenticity criteria, and the indicators for the case B.

Table 2: Authenticity criteria of - case B

Authenticity criteria	**Indicators**
Similarity	The goal of the task lies in preparing students for a future professional situation, embedded in work teams, performing various tasks for the production of multimedia applications.
Complexity	The students perform and execute the project responding a challenge similar to what they would in a real/profissional life situation, in which the problems to solve are often poorly structured and involving several possible solutions. The students have to define the best solution, because the specific information about the final product are not given.
Significance	All the students considered that the assessment tasks in this course are themselves significant moments of learning.
Adequacy	The students manage the project in its own way with formative feedback by the two teachers of the course.

The third case, case C, refers to a course of a Master's degree in the field of Science Education. The teacher in charge, J. P., aims to develop skills of critical analysis of information and of academic writing, since in the following year the students should prepare a dissertation. In this context, the majority of assessment activities overlap on the tasks to be undertaken by the students during the course. In addition to bibliographical research and individual critical analysis on reference articles, students, organized in small teams, must write collaborative papers, simulating scientific articles on the topics under discussion, related educational applications of information technologies and

communication. This course was developed in a LMS platform, being half of the activities made online. We highlight, in terms of assessment, formative objectives along the course, associated to the summative objectives focusing on the process and product. See in table 3, the approach to the dimension of authenticity.

Table 3: Authenticity criteria of– case C

Authenticity Criteria	**Indicators**
Similarity	It is reflected in the proposals made to the students for reading and critical analysis of major works in the field and in simulating an article, miming a researcher's work. We should also note the concern to have students analyse real situations technology application in education.
Complexity	The students are required to face different situations, corresponding to different cognitive challenges regarding their complexity, with emphasis on content production.
Significance	Students recognize the importance of the performed tasks, perceive the evaluation as learning moments and consider that digital evaluation tasks bring about essential and useful learning for professional performance.
Adequacy	As there are interdependencies between individual tasks and team tasks, the students themselves have to practice self-regulation that can meet deadlines and achieve the targets set.

Finally, case D also relates to a course of a Masters in Education. According to information provided by the teacher in charge, Joana Alves, students who attend this master are teachers in primary and secondary education, which justifies their purpose in addressing the issues being studied, so that they can, in their teaching activity, change and innovate their teaching practices. Like the previous case C, this course focuses on educational applications of information technologies and communication. However, it is slightly different in that this course developed almost exclusively online, except for two classroom sessions, one in the beginning and one at the end.

J. A. emphasizes the importance of students developing their critical attitude, combining theoretical perspectives with reality, while seeking to develop collaborative skills required to team work. Like the previous case, C, the activities undertaken in the course are the focus of assessment, both with formative and summative purposes.Table 4 summarizes authenticity aspects in case D

Table 4: Authenticity criteria of - case D

Authenticity criteria	**Indicators**
Similarity	Proposals of activities with educational potential to be applied in classrooms; so, several activities undertaken and evaluated in the course, are experimented by the students themselves as classroom activities at basic and secondary level.
Complexity	Requested activities were undertaken, step by step, with growing complexity and scope. Mixing approach of Individual and team tasks.
Significance	Almost all students indicated that the performed tasks have allowed important and useful learning for professional performance and had occurred significant moments of learning.
Adequacy	Articulation and structuring of various tasks depended on the students who had to manage time and work organization within the teams.

4 SYNTHESIS

This article presents part of a study that analyzed alternative digital assessment strategies of various courses of the Portuguese Universities. This study intends to contribute to promote quality of assessment strategies digital. So, we developed a theoretical framework supported by four dimensions - authenticity, consistency, transparency and practicability - each composed by a set of parameters. The present findings concerned to four course units of the 1st and 2nd cycles, corresponding to the four case studies that we investigated. The authenticity dimension is related to the complexity of the assessment tasks, its real /professional context and the value assigned to it by

students and teachers. The results indicate that, although in several degrees, this dimension is present in all digital assessment strategies, for any course unit and the learning environment, when the teacher wants to assess competencies. Indeed, in each case emerge, through analysis and triangulation of the various sources, the authenticity criteria – similarity, complexity, adequacy and significance. It is the aim of the authors to extend this research to other course unit developed in different learning environments.

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