

Designing a methodology framework for distance education modules

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Abstract—Current information and communication technologies, including the internet and its services (web 2.0, email, conferences at a distance, etc.) open new perspectives in the field of education, by promoting communication and interaction between all participants at a distance. It is not the technology itself that will define the quality of teaching and learning in distance education, but the methodological approach that supports it. This paper aims to propose a methodological framework to implement in distance education modules supported by online pedagogy elements linked to innovative teaching methodologies. Its goal is to bring some contributions to those who are in charge of course design, providing a useful framework to improve active and technology enhanced collaborative learning in similar environments.

Keywords—Methodological framework, Problem solving, Peer Assessment, active learning, collaborative learning, distance education.

I. INTRODUCTION

DISTANCE learning is a mode that facilitates the reconciliation of individual study needs and qualifications, providing the mediation of interactions between student and teacher. Thus, more and more institutions of higher education have added distance learning courses in their curricula, supported by virtual learning environments [1].

The literature indicates that online discussion and interaction is a key issue in online contexts. Distance education modules allow the interaction of learners with peers, teachers and contents through the use of computer mediated communication tools, that entails the learner interaction with the technology in use. Since this mode of education is relatively recent, for many students, teachers, and researchers, interaction using online tools is an innovation, with only short developmental history, upon which online learning quality can be based.

According to the Association for the Promotion and Development of the Information Society/APDSI [3], the use of multimedia combined with the use of the Internet, to design

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and make educational contents available and to develop competencies at a distance (eLearning) is one of the big challenges in the next years.

One of the approaches that can make the above-mentioned challenges possible is eLearning defined by Graham [2] as the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based upon three fundamental criteria: (i) networked; (ii) delivered to the end-user via a computer using standard internet technology; and (iii) focuses on the broadest view of learning.

The use of Information and Communication Technologies (ICT) has been changing the teaching and learning process, namely concerning the distance learning modes, where communication among stakeholders (teacher/student and student/student) is mediated by technologies. Those technologies may provide high interaction and communication in the educational process, expanding and reaching several areas of training and professional development. The teaching and learning methodology should accompany this technological evolution, and also should be in line with the pedagogical principles for effective learning [4]. Therefore, two concepts are implied. One is the e-learning, which regards the teacher as an instruction provider who is assisted by advanced computer techniques to deliver the information. The other is the workflow learning. This is related especially to the instruction receiver, the student who can manage the learning activity, according to his own needs, skills and individual organizational models [5].

Whilst this fits a ‘consumer’ orientation of education, some questions remain: what methodologies should be adopted?... and based in what principles?, and how to plan the assessment strategies?

The constructivist perspective aligned to the distance education mode is structured mainly on the following principles: i) active learning; ii) participation and collaboration; iii) co-construction of knowledge and iv) interactions among peers and teacher-student [6]. Thus the planning of teaching and learning situations, the assessment strategies as well as the methodology adopted by the teacher need to be consistent and somehow integrate these principles.

Piaget [7] is one of the main keynote of the constructivist line, by the theory of cognitive development, which states that learning occurs when it results in new mental assimilation schemes. Thus, learning supported by ICT is based on a constructivist and interaction conception of education. In this

perspective, knowledge is not part of the subject nor the object, but is the result of the interaction that occurs between them. The student has an active role in the learning process and in building his/her own knowledge. This learning diversity highlights two important elements: i) the effectiveness of learning and ii) the autonomy of individuals in the perception of the fundamental elements for their own learning.

Students and teachers can interact in different ways, since the interaction tools vary from environment to environment, enhancing the development of learning and the construction of "know-how". The teacher thereby retains a role in the success of collaborative learning. This role is more important as the size of the group increases, and is often named 'facilitator' instead of 'tutor', because the point is not to provide the right answer, but to perform a minimal pedagogical intervention in order to redirect the group work in a productive direction. In the context of technology enhanced collaborative learning, the external regulator needs specific tools for monitoring the interactions occurring in different places and/or at different times. An alternative is to provide the peers themselves with tools for self-regulation of their interaction [8].

Technology is constantly changing, but it is not the technology itself that will define the quality of distance education, but the methodological approach that support its use. Thus, it is important to discuss the pedagogical theories that underlie the creation, implementation and development of distance learning courses. The collaborative learning discussed by Dillenbourg [8] is one much appropriated approach. As far as the integration of ICT is concerned, the benefits of collaborative learning have long been studied by those who believe learning is essentially a social endeavor that needs to be situated in authentic human activity [9]. Collaborative learning also provides opportunity for students to learn the skills of working in teams and to negotiate, discuss and constructively criticize solutions to problems [10]. Collaborative work sometimes aims at providing extended opportunity to produce a product and to reflect on its quality and consequently the effectiveness of the process that led towards its construction [8].

Self and peer assessment opportunities that arise from collaboration can also benefit learning. Draper [11] points out three different but mutually reinforcing reasons to include self- and peer-assessment when designing a module: (i) to develop students' autonomy and, consequently, to develop lifelong learning; (ii) to enlarge sources of information and of feedback, like peers; (iii) to engage students in working things out for themselves and ask for peer explanations, which can sometimes be better understood than those from the teaching staff.

According to the above mentioned, a pedagogical and scientific approach will be proposed that aims to be innovative, while enhancing learning in distance education contexts. The innovative nature lies in the emphasis that is given to education by problem solving and a perspective of integrative and authentic assessment, where students are

actively engaged in assessment activities in distributed environments while enhancing collaborative learning. This methodology strives for an effective blend of assignments and assessments, which is a key aspect of an integrative approach to assessment, ie one in which the many and various strands of assessment come together in a coherent way that addresses the desired goals [12]. This approach intends to achieve a high degree of match or alignment between the assessment and the learning outcomes being pursued [13] focusing on sharing and reflection on the work in progress, as well as the skills developed in synchronous and asynchronous sessions and peer assessment, based on transparency of feedback processes and constant aim of improving knowledge.

It is expected that the proposed methodological approach bring some contributions to those who are in charge of course design or to institutions that are promoting courses at a distance, providing a useful framework to improve active and technology enhanced collaborative learning in similar environments.

II. ONLINE PEDAGOGY ELEMENTS AND TEACHING METHODOLOGIES

In terms of teaching strategies and learning, as referred Pombo & Loureiro [14], there has been increasing focus on personal learning and collaborative learning as strategies that promote the development of personal and professional competence (Fig. 1) involving initiative, responsibility and creativity, among others, as well as social skills necessary for the co- construction of knowledge, which could be developed proactively in social settings and/or in the workplace [15].

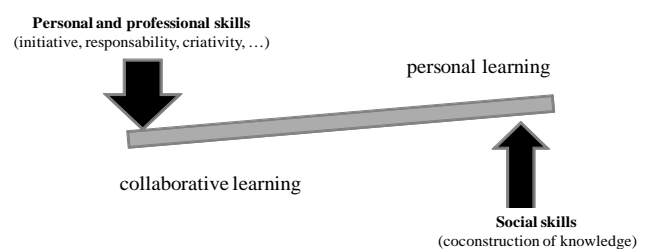


Fig. 1 Schematic representation of the balance between personal learning and collaborative learning.

Independently of the privileged teaching and learning strategies, it is important to consider the online pedagogy elements that underlie a pedagogical and scientific approach. Those key critical elements [6] in distance learning modes are, namely:

- knowledge is constructed;
- learning is more effective if students take responsibility for their own learning;
- student motivation is crucial for the learning outcomes and for the learning success;
- learning at a higher level of cognition requires reflection;

- learning is unique to each individual;
- learning is experimental;
- learning is permanent and uses a rich and diverse set of strategies, in particular the communication and collaboration among the participants;
- support materials are to a significant learning service.

Considering these basic online pedagogy elements to distance learning modes, the pedagogical framework proposed in this paper focuses on two methodologies, which should be articulated and aligned between them: i) teaching based on problem solving, ii) integrative and authentic assessment (see Fig. 2), which will be described below.

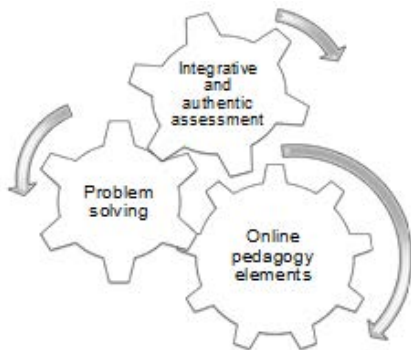


Fig. 2 Schematic representation of the articulation between the teaching methodologies and the online pedagogy elements.

Teaching based on problem solving is the use of methods to find solutions to specific problems. Problem solving is a mental process that involves discovering, analyzing and solving problems. The ultimate goal of problem-solving is to overcome obstacles and find a solution that best resolves the issue [10].

When simulations or experiments are used to simulate the reality, a contextualized learning is being promoted, from real learning situations which promote the development of high-level skills (critical thinking, evaluation, among others). Whereas problem solving are supposed to be done in small groups, the collaboration will be encouraged in order to promote learning by the co-construction of knowledge, where the groups will be involved in brainstorming around a problem.

Van Merriënboer [17] discusses problem solving as a goal, a method, and a skill (see Fig. 3).

As a goal, problem solving should not be limited to well-structured problem solving but be extended to real-life problem solving. As a method, problem solving has clear limitations for novice learners; requiring help to support learners to develop problem-solving skills. As a skill, problem solving should not be seen as something that only occurs in the early phases of a process of expertise development but as a lifelong process.

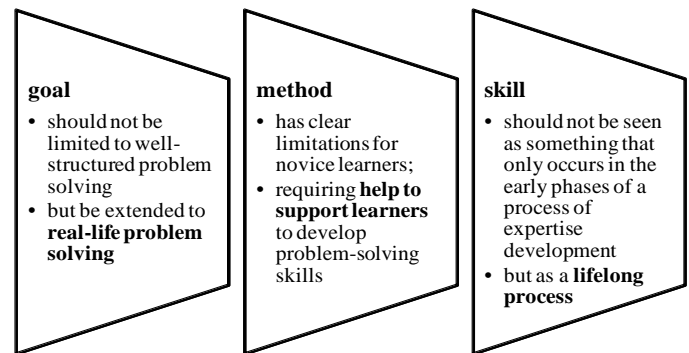


Fig. 3 Teaching based on problem solving seen as a goal, as a method and as a skill.

This methodology favors a diverse interaction both between student-teacher, student-student, or even between the student and the learning resources and should be socially contextualized. It is based on the flexibility of pathways, since the problems may have different ways of solving and also based on the flexibility of syllabus, allowing adjustments of contents resulting from the identified needs and the dynamics created throughout the process.

The teaching is student-centered, which means that the student is active and responsible for the construction of his/her own knowledge and their peers, for the management of learning processes, including setting goals and learning aims, the timing of learning, the choice of peers, ... thus, it's required to give time to students so that they feel comfortable with the proposed strategy, which means that students have to become aware that to reach a deep and meaningful learning is crucial to be actively involved, resulting in conscious and reflected knowledge contributing to their personal and professional development [6].

Exploring strategies of integrative and authentic assessment, where assessment is seen as a facilitator of learning [18] advocating the involvement of students in the evaluation of the work done by their peers [19] as well as developing instruments for formative and summative assessment.

Peer assessment is considered an innovative assessment strategy that enables an authentic assessment that has adopted other names as alternative assessment as to integrative different perspectives on the work in progress. Thus, in a simple way, the formative peer assessment is understood as a process in which students evaluate and are evaluated by their peers [20]. Topping [20] defines peer assessment as a mechanism for learners aimed at determining and examining the level, value or quality of a product or of the performances of other learners at the same level. The author states that peer assessment activities can be applied in different module domains and subjects.

Assessment for learning focuses on learning tasks and includes learning in assessment [19], [21]. According to these authors, in this perspective, three main elements should be considered in the design of the assessment process: i) the

assessment tasks are focused on the learning aims; ii) the active participation of students in the assessment process is essential; and iii) the provided feedback is supposed to increase learning.

In the process of teaching and learning, integrative assessment, more than a mean to check - as a check list - often associated with verification of externally imposed standards, should be a mean to enhance, where the primary beneficiary of assessment should be the student. Fig. 4 intends to metaphor the Enhancement Paradigm as a sculptor who is gradually carving the piece until it reaches its maximum quality, considering it completed.

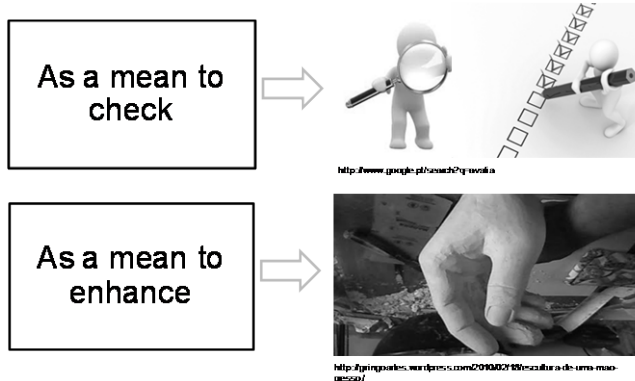


Fig. 4 The perspectives of integrative and authentic assessment.

With this perspective of assessment, learning focuses on the usage of assessment strategies which might increase students' learning as it intends to make students plan their own learning, define their weaknesses and strengths and improve their transferable skills [22].

Several authors [15], [20], [23] argue that students can benefit from peer assessment, since it implies the active involvement of learners in shaping their own learning processes, while it promotes an authentic assessment and increases the autonomy and collaboration among students. To achieve this, students and tutors must engage in a fruitful process of dialogue and feedback [24].

According to Strijbos and Sluijsmans [25], summative assessment focuses only on the cognitive aspect of learning, generally includes only one performance grade and is designed and applied by the teacher. On the other hand, formative assessment is an integral part of the learning process and should take place not only at the end of a program but also throughout the entire program [26].

Formative assessment can focus on cognitive, social and affective aspects. At a cognitive level, since the peer assessment can result in learning gains. As pointed out by Joordens, Desa & Paré [27] peer assessment enhance "deep, critical and creative learning" (p.11), which is not common when using traditional tests. At an affective level, as it may increase the motivation to learn, as well as feelings of efficacy and satisfaction. At the level of the learning process, formative peer assessment can trigger self-regulation of learning processes; e.g. processes of reflection on what has been

learned. Peer assessment can improve the efficiency and quality of learning, particularly when it is formative [28].

In summary, with the use of these teaching methodologies, where problem solving and integrative and authentic assessment are privileged, it is intended to:

- promote processes of metacognition and develop key competences for lifelong learning, such as critical thinking, communication, problem solving and creativity;
- provide more diverse feedback;
- increase the sense of ownership and motivation of students, if they consider that the provided feedback is useful;
- support the active and autonomous learning;
- avoid that some students do not engage for collaborative work (free-riders) as the use of technologies allow the identification of contributions from different elements of a group;
- explore subjectivity issues of peer assessment, creating opportunities for dialogue between teachers and students and between them [29].

III. THE METHODOLOGICAL FRAMEWORK FOR DISTANCE EDUCATION MODULES

The methodological framework that is presented in this section is based on the pedagogical principals described above and also on the author's experience as teacher, since 2008, of the "Distance Education" post-graduation module, which is part of the doctoral program on Multimedia in Education, offered at the University of Aveiro (Portugal). The PhD program is organized in a four weeks blended learning context, with two face to face sessions (one at the beginning and the other at the end of the module for presentation and discussion of group works) and the rest is done at a distance in group works, with extensive online elements, including feedback.

Results based on this experience have been showing favorable attitudes to formative peer assessment and that, according to the students, the proposed activities (including integrative and authentic assessment) are considered useful and intellectually challenging, despite their high degree of difficulty [30], [31], [32].

Based on professional experience and the literature, it is important to consider several factors to create a pedagogical and scientific framework that intends to be innovative, as it is shown in the Fig. 5.

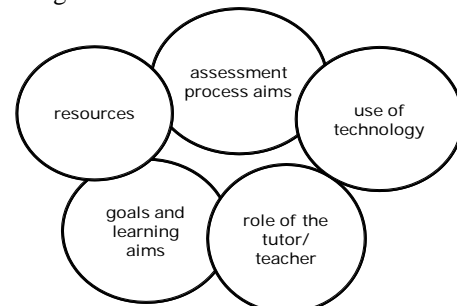


Fig. 5 Various factors to consider when designing a methodology framework.

Those factors are, namely:

- goals and learning aims of the module;
- the role of the tutor/teacher - asynchronous and synchronous interaction with students;
- design of online activities based on real problem solving - description of how students will develop the activities;
- assessment process and its high degree of match or alignment with the module's aims;
- resources, such as online library, texts set in audio, video;
- use of technology - definition of tools and software requirements.

For the organization of the module, it is important to start it with short tasks in order to facilitate: i) icebreaking among participants by creating a forum for personal presentation; ii) exposing the expectations of students regarding the module, and iii) recognizing the personal perspectives on the topic under study. Besides that, it is important to discuss the whole structure and organization of the course with the students. The flexibility to be implemented since the very beginning of the module enables students to be part of the whole process, including choosing activities instead of having them imposed by the teachers, which might hinder students' motivation. The groups should also be established according to student interests.

Another essential aspect to consider is the quality of the proposed activities, which include problems and challenges extended to real-life problem solving, providing situations in which students can develop effective, autonomous and self-directed learning. In addition, the proposed activities should take place in a common structure that allows the creation of the virtual class identity while enclosing an intuitive navigation. Web 2.0 tools will be essential for the development of collaborative work throughout the module.

As for working strategy, and as mentioned above, it is proposed a special focus on education by problem solving exploring integrative and authentic assessment strategies, based on diversity of materials, interaction between participants, collaborative work with private moments of self-reflection and peer formative assessment, in order to develop the students' own learning. The big challenge is to address problems to the class concerning distance education issues, as well as synthesis and critical analysis to be carried out in groups, collaboratively. The idea is to enhance individual students' knowledge on the proposed issue, so that at the end, they could richly contribute to the solution of the problem.

In what concerns the involvement of students in assessment activities, various products and outputs, including a writing essay, a portfolio, an oral presentation, a test performance and other skills, can be assessed by peers. The assessment framework, used to assess the quality of peer assessment intends to be shared and discussed with the students at the beginning of the module. With this strategy it is expected to deepen the familiarity and engagement of the students with assessment tasks and to show them the importance of fruitful

dialogue and 'good' feedback [24],[33] as well as that the primary beneficiary of assessment is the student.

Fig. 6 intends to illustrate the process of the proposed methodology in distance education modules. The procedures begin with a problem, e.g., a challenge negotiated between students and teachers (step 1). At step 2, students start solving it collaboratively. After peer assessment, students will be able to improve the preliminary problem solving (step 3). Other peer assessment task takes place again, so that students have the opportunity to become familiar with the process, in order to improve the problem solving, and the group reaches a possible solution (step 4). All the constructive feedback provided by peers and teachers should be available to all, as a true transparent formative assessment.

At the end of the unit, at step 5, students will be able to better contribute to a reasoned proposal related to distance education (the big challenge of course). Afterwards, it is expected a final self-reflection to any individual work, detailing the skills that were developed throughout the process, and also formative assessment within the elements of the group.

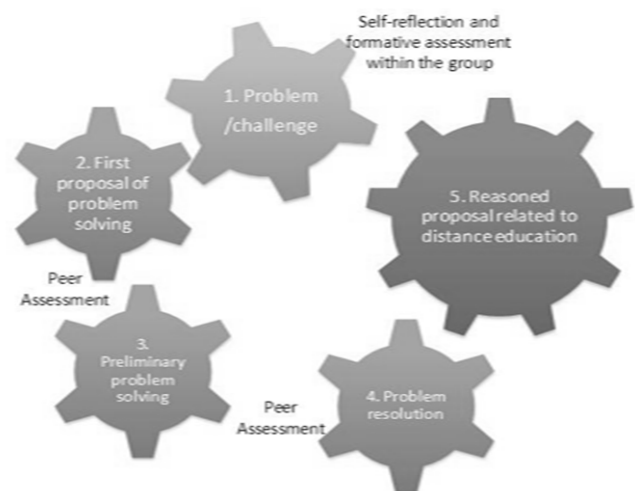


Fig. 6 The proposed methodology framework in distance education modules.

The communication between students takes place using forums of a learning management system (LMS) platform, enabling asynchronous interaction and collaboration with colleagues about the work in progress. It is also provided moments of synchronous communication, using 'skype', for students to ask questions or clarify some points.

The assessment includes a formative component that comprises special importance. For the final classification it will be considered the following items and weights:

- pedagogical and scientific proposal of a module developed according to specific methodologies of distance education - 50 % (teacher);
- problem resolution process taking into account the feedback of peer assessment and the teacher - 20 % (teacher);
- self-reflection and peer assessment of working groups dynamics (intragroup) - 20% (peers);

- participation in class discussion forums - 10 % (teacher).

IV. FINAL THOUGHTS

The change of working conditions, and the high-speed evolution of information and communication technologies, peoples' knowledge and skills need continuous updating and distance education modes seems to be a good alternative by allowing to overcome physical and temporal barriers. Learning based on collaborative working, creativity, multidisciplinary, adaptiveness, intercultural communication, and problem solving has taken on an important role in everyday life [34]. Technology enhanced learning facilitates the efficiency of learning for individuals and groups, providing the transfer and sharing of knowledge in organizations, and understanding of the learning process by exploring links among human learning, cognition, and technologies. The teacher's role becomes one of coach rather than instructor. The teacher facilitates at the metacognitive level, rather than providing solutions to students' problems [35].

The proposal presented here intends to be innovative in the context of distance education, once problem solving and authentic assessment strategies have been mainly used to support face to face learning. In fact, there are few published empirical studies that addresses problem solving and peer assessment, particularly in online environment [36]. Furthermore, Waycott, Gray, Thompson, Sheard, Clerehan, Richardson & Hamilton [37], p. 104, state that "there has been little guidance in the published literature on what constitutes good assessment practices when students are asked to create and publish content, or participate in networking activities, using social web technologies".

The underlying pedagogies used to improve active and technology enhanced collaborative learning, according to Herrington, Reeves & Oliver, [38] and Pombo, Loureiro, Balula & Moreira [35] should include:

- authentic tasks that reflect the way in which the knowledge will be used in real life settings;
- opportunities for collaboration, where students collaborate to create products that could not be produced individually;
- learner-centred environments, the focus is on student learning rather than teaching;
- engaging, where learning environments and tasks challenge and motivate learners;
- meaningful assessment, where authentic assessment is used to evaluate students' achievements.

Above all, it is intended to contribute to an innovative and quality enhanced learning approach in distance education contexts.

In conclusion, the paper provides several contributions to the field of distance education (see Fig. 7), privileging problem solving and integrative and authentic assessment as strategies to enhance active and collaborative learning with the use of technology that supports it.

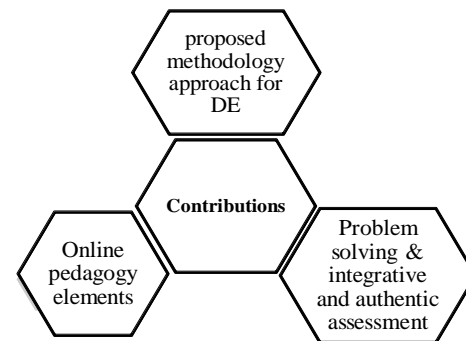


Fig. 7 Summary of contributions of the paper.

Fig. 7 attempts to summarize the main contributions of the study: the proposed framework for distance education modules in line with the online pedagogy elements and the teaching methodologies that might be very useful for those who are in charge of designing distance education modules, since it can be applied in similar contexts.

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