

Aligning assessment methods with different types of competences in Engineering

Alfredo Soeiro¹, Rita Falcao²

¹Universidade Porto (Portugal)

²Universidade Nova Lisboa (Portugal)

Abstract

The TALOE (Time to Assess Learning Outcomes in E-learning) EU-funded project approaches the e-assessment concept by using technology for assessing students' learning. The project is building on the foundations of previous developments on this issue, an existing tool for the Alignment of Learning Outcomes and Assessment, the ALOA model, which uses the revised version of Bloom's Taxonomy to establish the link between the LOs and general assessment methods. The TALOE project uses the same methodology but adapted to the specific context of e-learning and e-assessment. The main goal of TALOE is to develop a web-based platform to help teachers and trainers decide on the e-assessment strategies to use in their online courses. This tool is aimed to raise teachers' awareness about the variety of e-assessment strategies in order to achieve better quality of the learning process. TALOE assumes that a teacher/trainer will describe the learning outcomes of the course or module and then use the TALOE web tool online to analyse them and provide the most appropriated e-assessment strategy that is consistent with the set of intended learning outcomes. In order to achieve this, the TALOE consortium has:

- conducted desk research and selected innovative e-assessment practices that take advantage of the use of technology;
- developed a web-based tool that is easy to use by the stakeholders;
- tested the implementation of the tool with real case studies;
- promoted the TALOE tool among the communities of stakeholders who have accepted to test the web tool and give feedback.

During the EDULEARN session, the TALOE web tool will be presented and demonstrated, so participants can see how it works.

Keywords: Assessment, learning outcomes, web tool, alignment, Bloom's taxonomy, quality assurance

ALIGNING LEARNING OUTCOMES AND ASSESSMENT MODES

Effective assessment drives learning efficiency as the growth of e-learning technologies drives e-assessment. This growth of using e-learning reinforces the need to improve learning and support the idea that is important to define a strategy to ensure that the selection of assessment methods responds positively to the objectives and outcomes of the course programme. This will facilitate a clear evaluation of competencies, skills and knowledge acquired during the learning or training.

Learning outcomes (LO) have been widely adopted in education with different roles. Their early adoption in Europe is associated with vocational training. LOs were used to describe the competences of the individual after the training, with the goal of improving the dialogue with potential employers. The adoption of LO in higher education (HE), in Europe, is associated with European policies with impact on national policies and on higher education institutions (HEI) and are usually interpreted as what a student is expected to be able to do as a result of a learning activity [1].

Concerning e-assessment, it is considered that is a critical part of e-learning, the same way assessment is critical to traditional learning. The general concept of e-assessment is herein broadly defined as using technology for assessing students learning [2].

Learning outcomes are also becoming fundamental for structuring the standards and guidelines of quality assessment of HE and continuing education (CE) institutions in Europe and worldwide. In this context, the assessment of learning outcomes becomes a crucial process for the educational system. It should be a major concern of educational institutions to ensure that assessment of student learning is being guided by what they should be learning, i.e. assessment should be consistent with the intended learning outcomes [3].

Furthermore, the impact of information and communication technologies (ICT) on education has to be taken into account. The use of ICT applied to education, e-learning etc. has been increasing and its use creates new opportunities for teaching, learning and assessment and has huge potential as an answer to some of the current challenges of education. The change to the digital media has impact on the availability, reusability, accessibility and cost of learning resources, complemented by the communication and networking potential of the Internet that takes education to a global level. The application of ICT in education and in particular in assessment is a subject of great discussion. Some of the issues related with the use of e-learning in assessment are related with validity and reliability of the process [4], [5].

Learning outcomes have been widely adopted in education with different roles. The early adoption in Europe is associated with vocational training. LOs were used to describe the competences of the individual after the training, with the goal of improving the dialogue with potential employers [6]. The adoption of LO in HE in Europe is associated with European policies with impact on national policies and on HEI. These define different roles or applications for the LOs:

- a) A descriptor of the qualifications acquired for improving mobility and employability of individuals
- b) A descriptor in processes of recognition of prior learning for improving access to education institutions and validation of competences
- c) A criteria for quality assurance systems and accreditation processes of HEI
- d) A structuring role in educational systems, used as descriptor used in qualification frameworks at international, national and sector levels
- e) A structuring role at the institutional level, used as a multi-level descriptor in programmes inside the institutions
- f) A communication tool between teachers and learners, as a descriptor of the goals of a course or unit

Concerning e-assessment, it is considered that it is a critical part of e-learning the same way assessment is critical to traditional learning. In terms of linking LOs and assessment, it is believed that this should be explicit. Several authors defend that students tend to determine what they learn by looking at the assessment tasks. If there is no consistency between the LOs and the assessment, the students will learn the wrong things.

ALOA CONCEPTUAL MODEL

The model for the alignment of intended LO was developed from the concept of alignment defended by different authors [7], [8]. In terms the alignment component, what is defended is that the LO of a course or unit should be used to define the teaching and learning activities, ensuring these will address the same LO. The same applies to the assessment tasks. To ensure the validity of assessment in relation to what is intended from the course, it is necessary that the outcomes measured by the assessment tasks are the same as the intended ones. The initial step to approach the problem was to identify and define the different components of the problem: the two variables, intended LO and assessment methods; and the link between them that is the alignment question.

The main tool used for developing this conceptual model was the revised version of Bloom's Taxonomy. This tool, designated in this paper as matrix rBloom, is in fact an alignment matrix for LO, teaching and learning activities and assessment. However, for the current research project the adopted matrix assumed distinct functions: describe and classify the LO in a way that facilitates comparison between different levels and different sources; describe the assessment methods and e-assessment tasks; align the LO with the assessment methods.

The conceptual model suffered several iterations resulting from small implementations. The final version of the ALOA model was defined as a sequence of operations. The LO at the qualification level are transduced to the program level using the rBloom approach. From the program level the LO at course level are defined using the same method. Finally the assessment tasks are aligned with the LO of the course level using the rBloom based method.

It is clear in this sequence of operations that the revised version of Bloom's taxonomy is the main tool that will be used to achieve the stated goals of this work. Each LO from the courses that were part of the case studies was described using the same tool. Also, an rBloom matrix was produced for each assessment method, mapping assessment to the cognitive processes and types of knowledge, based on the description of the methods found in literature research. A total of forty matrixes were produced for categories and general assessment methods. This set of matrixes is the actual alignment instrument of the conceptual model. They represent the standard against which the LO matrixes of the case studies were compared to produce aligned assessment strategies or to verify current alignment.

TALOE PROJECT

Facing this scenario a project, Time to Assess Learning Outcomes in E-learning – TALOE (<http://taloe.up.pt/>), intends to promote the internal consistency of online courses in terms of correct assessment for each type of LO. The project is financed by the European Commission for the years of 2014-15 (Ref. 543097-LLP-1-2013-1-PT-KA3-KA3MP). It uses the existing ALOA model (Aligning Learning Outcomes and Assessment). This model highlights the connection between the intended learning outcomes and the assessment strategy used during a course or module. It uses the revised version of Bloom's Taxonomy to establish the link between the LOs and general assessment methods. The ALOA model also proposes different scenarios of application that allow the model to be used to verify the consistency of the courses or to propose new assessment strategies that are linked with the LOs statements of the course or module.

It is a fact that not all assessment methods are valid for each type of the learning outcomes. The ALOA model provides tools for linking learning outcomes and assessment tasks [9]. The TALOE project implemented the application of the ALOA model to the specific context of e-learning. The main goal of TALOE was to develop a web-based platform to help teachers and trainers decide on the e-assessment strategies to use in their online courses. The rationale of TALOE is that a teacher/trainer will describe the learning outcomes of the course or module and the TALOE platform will analyse them and provide an e-assessment set of methods that is consistent with the set of intended learning outcomes.

To develop the practical tool the TALOE consortium has developed and achieved the following specific goals:

- a) Research and select innovative e-assessment practices that take advantage of the use of technology;
- b) Develop a web-based tool that is easy to use by the stakeholders;
- c) To test the implementation of the tool with real case studies and stakeholders involvement;
- d) To distribute and disseminate the TALOE tool among the communities of stakeholders.

CONCLUSIONS

Assessment of student learning is a complex field of research and consequent implications in teaching and training. Assessment and learning are deeply contextualized processes and it is not possible to have a solution that fits every case. The model ALOA intends to provide a flexible way to guide teachers and institutions the achievement of a better alignment at course and at program level. ALOA is by no means a closed system. It is possible, and even expected, to add or improve the model in terms of assessment methods and of learning outcomes in education. Professional qualification frameworks may be added allowing testing for alignment to those specific LO. Also, by including the LO of a program and of the corresponding courses it is possible to test the internal alignment of the full program. This could be useful and relevant for accreditation processes and quality evaluation activities of teaching and training online.

In terms of the teacher activities the ALOA model can provide support at the two levels when preparing the course teaching activities and planning. The first level of influence is related with the definition of a file for each LO or competence that students need to acquire. The ALOA model can provide options for assessment tasks that can help the evaluation of the student for that particular LO. That can also be provided to the student allowing a clear perception by the student of the usefulness of each evaluation activity. The second level of support for the teacher is the definition of learning activities that will foster the acquisition of that particular competence. That may be helpful to compare with other similar courses in terms of solutions aiming at similar competences. That can provide useful benchmarking when comparing final and partial grades of the students in different courses and contexts.

The TALOE project, funded by the European Commission Lifelong Learning program, is an organized and structured attempt of providing a tool to define an understandable and rational mode of evaluation learning given a desired goal in terms of LO. Content provision has been in the past the main rationale for ensuring proper education and training. The TALOE tool is independent of the content but it is related with the outputs of the learning activities. That is difficult but may be the proper approach to progress in terms of quality and of reliability of education and training. All interested stakeholders are welcome to test the web tool, provide improvement suggestions, discuss with peers and be involved in the TALOE community.

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