Enhancing Computer Assisted Assessment Using Rubrics in a QTI Editor

Patricia Santos, Xavier Colina, Davinia Hernández-Leo, Javier Melero, Josep Blat
Barcelona Media Research Center, Barcelona, Spain
Department of ICT, Universitat Pompeu Fabra, Barcelona, Spain
{patricia.santos, davinia.hernandez, javier.melero, josep.blat}@upf.edu,
javier.colina01@campus.upf.edu

Abstract

With the aim of facilitating teachers the use of good techniques in computer assisted assessment, this paper proposes the integration of rubric functionalities in an editor compliant with the IMS Question and Test Interoperability specification (QTI). Teachers can organize the information of an eQuestionnaire using the QTI-rubric approach. They can use (and reuse) QTI elements without having a technical background or knowledge of the specification. The QTI-rubric enables automatic formative feedback for learners and the results can serve them as a personal evidence of their knowledge and capabilities.

1. Introduction

Rubrics are used in assessment as a good technique to improve communication and feedback between teachers and students. Teachers use rubrics to relate the contents that they want to evaluate with some feedback, taking into account the possible results of the students in an exam, work or exercise. Learners use rubrics to know which topics they have to improve and why [6,8].

One research line of interest in technology enhanced learning is focused on integrating good assessment techniques [1] in Computer Assisted Assessment (CAA) [7]. CAA enables the provision of formative feedback to students in a more efficient way than with traditional assessment [6]. A user-friendly assessment editor can help teachers in the design of eQuestionnaires, and rubrics can be a good enhancement. Brinke et al. [5] propose an educational model for CAA where rubrics are used in the response stage of assessment. We propose a novel more interoperable solution supporting interoperability through the IMS QTI specification [10], using rubrics more extensively, and enhancing user support through an editor implementation.

In this paper, we add an editable rubric functionality into our previously implemented QTI compliant eQuestionnaires CAA editor [4,13]. By means of this functionality, teachers can create a rubric using QTI questionItems ((re)using existing items or creating new ones), and relate them with the competences they want to evaluate and the grades and feedback they have to assign depending on the students’ results (which are facilitated by the use of QTI). The editor manages the QTI information and creates a personal rubric when a student finishes her/his exam.

We explain our proposal for integrating a rubric in a QTI editor in section 2, providing details of the interface design and general issues of the technical implementation. Section 3 describes the main advantages of our proposal. Finally we conclude presenting the future work derived from the contribution introduced in this paper.

2. Enhancing use of rubrics within a QTI compliant editor

Rubrics relate the list of “what counts” in an assessable exercise and the description of different levels of quality which depend on the results of the students [8]. The use of a QTI editor enables us to create more complex and richer rubrics. QTI has different elements to create interoperable eQuestionnaires, the most relevant in this case are the questionItems and the Score, which can be used when we create a rubric to provide automatically contextualized feedback. We can reuse eQuestionnaires created with any QTI compliant editor. The type of rubrics which we propose can be especially useful in distance education or self-assessment scenarios where the student cannot have direct contact with the teacher after completing an exam (summative or formative assessment). In face to face situations teachers can also benefit from the use of rubrics to organize the assessment information in an automatic way.
2.1 Prototype functionality and user interface

We added the rubric functionality benefiting from the use of the QTI questionItems and Score within our existing editor. This functionality can be illustrated by our prototype interface shown in Figure 1. Teachers can select from the Exams Repository the QTI questionItems and relate them to a specific Competence. The following columns are related to the Gradations of Quality. These are editable feedback suggestions which depend on the students’ results when answering the set of questions related to the corresponding competence. After Saving, the rubric-based questionnaire (Figure 1(a)) would be automatically available to the students.

When a test is finished, the QTI editor automatically manages the Score of each question and computes which grade of quality has to be assigned to a student. Good levels will be marked in green, and bad levels in red (Figure 1 (b)). These rubric results can be used as a formative feedback for students to know which competences they still need to develop or as an evidence of the competences that they have developed.

2.2 Technical Architecture Prototype

To manage all the information necessary for the rubric, the QTI editor has to communicate with other components. For managing the information contained in a QTI questionnaire we use the engine called newAPIS [3], developed by the GTI group. This is an extended version of APIS [2]. Information such as the Score of each question is saved in the database of newAPIS. The QTI editor stores the information related to the users and the content of the test: the questionItems. To manage all the information of the QTI-rubric, we added a new table called Rubric Information in this database. It contains the information introduced by the teacher (such as the description of the competences and the gradations of quality) and the references to other elements (the users, questionItems and Scores) (see Figure 2).

3. Benefits of Using Rubrics in Combination with QTI

1) The proposed solution is based on the interoperability of QTI. Teachers can re-use questions or tests which are compliant with it, specifically in the context of rubrics.

2) QTI-Rubrics provide automatically and quickly significant feedback with different level of granularity. Students can know which are their worst or best competences, and if they have the sufficient competences to pass an examination (figure 1 (b)).

3) The QTI engine allows saving the students results in its database, which can be provided (in raw form or with further analysis) to the teacher. The powerful simplicity of a rubric should be very helpful to
organize the questions and tests around the common features of rubrics.

4) In a similar way as we have included services such as Google Maps in the past [13], or rubrics as in this case, our “add-value” approach promotes to innovate and build on top of the specification and related tooling in such a way that new functionalities are provided.

4. Conclusion and future work

This paper proposes the use of rubrics in combination with QTI as an useful method to organize assessment information and to provide automatic formative feedback. The integration of a rubric in a QTI editor and the (re)use of elements, is mainly thanks to its interoperability. The design of the QTI-rubric editor aims at providing a user-friendly tool for teachers, without advanced knowledge of the specification. Future work includes implementing the prototype of this QTI-rubric editor and evaluating it with real users in authentic educational scenarios.

The work proposed in this paper can also represent a preliminary approach towards an extension of the QTI data model. In this sense we are studying the possibilities of IMS Rubric [11] to interoperate with QTI and analyze how it can be integrated in our approach. The interoperability of both specifications would allow teachers to have the possibility of exchanging rubrics with other colleagues, using the QTI and IMS Rubric specifications.

We also plan to research the interoperability opportunities between QTI and IMS Learning Design (LD) [12]. We are currently working on the integration of new APIS into an LD player so that QTI assessment activities can be meaningfully embedded in learning flows.

Acknowledgments

This work has been partially sponsored by the TENCompetence Project, priority IST/Technology Enhanced Learning, contract 027087; and by the Spanish Ministry of Science and Innovation Learn 3 project, TIN2008-05163/TSI. The authors would also like to thank other members of the GTI group.

References


