Integrating a Peer Evaluation Module in a Social Learning Platform

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Abstract. Peer review is a valuable educational activity, especially in social learning settings, group work and project-based learning scenarios. It has the potential to foster critical thinking and reflection, expand students' perspectives and understanding and increase engagement and interactivity. Several software tools for supporting the student peer review process have been proposed so far, but few of them are integrated in an all-encompassing learning environment. Therefore, our proposal is to extend an existing fully-fledged social learning platform, called eMUSE, with a peer evaluation module; the tool offers a wide range of functionalities, both for the student and the instructor. The peer evaluation is closely integrated with the educational social media tools and the project-based learning scenario; rather than focusing on a single written assignment, the module supports a more in-depth monitoring and assessment of peers' work. The platform has been successfully used in practice and preliminary evaluation results are reported in the paper.

Keywords: Peer assessment · Social learning environment · Project-based learning

1 Introduction

Peer evaluation is gaining increasing popularity in recent years, especially in the context of collaborative learning [12]. Also known as peer review or peer assessment, it refers to the involvement of students in the process of evaluating the work of fellow learners and providing feedback and sometimes grades [18].

Peer review has several benefits, both for the provider and the receiver of the assessment. Students who play the role of evaluators are exposed to peers' work and ideas, which offers them new perspectives on the field [11] and helps them extend their own knowledge and understanding [7, 17]. Furthermore, performing an evaluation contributes to the development of advanced critical thinking, reflection and meta-cognitive skills [10]. It also improves evaluators' motivation and responsibility [5] and fosters self-confidence [4]. Students who receive their peers' reviews benefit from timely and more detailed feedback, as compared to the

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limited formative assessment which can be provided by the instructor, especially in large classes [10].

Nevertheless, peer review also has potential pitfalls, such as validity, reliability and fairness issues, especially in case of peer grading [12]. Some students may resent evaluating their peers' work [2], find it too time consuming or lack confidence in their evaluation ability [12]; other students may not take the peer review process seriously, unless it is monitored and graded by the instructor [9].

However, on the whole, students' engagement is increased by means of peer evaluation, since their motivation for learning has a strong social dimension [20] and they pay more attention to peers' opinions and feedback [6]. Furthermore, an increased interactivity level between students and a more active role in learning are achieved [12].

Therefore, peer review is especially appropriate in social learning settings, in group work and project-based learning scenarios [19]. In this context, what we propose in this paper is the integration of a peer review module in an existing social learning platform. Several online tools for peer review are already available, but they are generally stand-alone platforms, having peer evaluation as their exclusive purpose. By contrast, our goal is to offer a broader learning environment, which integrates formative peer assessment alongside educational social media tools.

The rest of the paper is structured as follows: an overview of related work is included in the next section. Our solution for the peer evaluation module is described in section 3. Subsequently, an initial experimental validation of the tool is reported in section 4. Finally, some conclusions and future research directions are included in section 5.

2 Related Work

Several web-based tools for managing the student peer review process have been proposed so far, as summarized in [3, 12]. Some of the most recent systems include:

- CrowdGrader [1] – an online platform for collaborative evaluation of homework solutions
- CaptainTeach [13] – a peer review system for programming assignments
- Mechanical TA [22] – an automated peer review tool for essay grading.

All these systems are dedicated exclusively to peer review management, and require the explicit upload of student work for review. More closely related to our proposal are the all-encompassing educational systems, which integrate the peer review module among their other learning support functionalities. Such an example is the GRAASP social media platform, which offers support for communities of practice and collaborative learning activities. A simple extension for automating reviewer tasks was included in the platform, as described in [21]. Students can create a space in GRAASP to upload their work in it and the instructor invites

randomly assigned peers into that space to perform the review. A basic 5-point Likert-type scale is used for rating the work and an average score is computed by the platform [21].

Another example is MyProject, an adaptive educational system designed to support project-based learning [3]. The educational activities are organized in four different stages: Introduction, Generate Ideas, Multiple Perspectives & Research, and Solution & Evaluation. Various peer assessment functionalities are integrated throughout this learning cycle, including analytical reviews and grading, back-reviews or short agreement statements; students may also submit revised versions of the final deliverable, based on the reviews received.

Finally, some learning management systems also integrate modules for peer evaluation, such as *Workshop activity* in Moodle[1] or *Self and Peer Assessment* tool in Blackboard[2]. Similarly, MOOC platforms (such as Coursera[3] and EdX[4]) include some predefined spaces for peer review.

By contrast, the peer evaluation module that we propose is designed in the context of a social learning environment, in a close integration with the rest of the educational activities and the social media tools, as described in the next section.

3 Peer Evaluation Module in eMUSE 2.0

3.1 eMUSE Social Learning Environment

The social learning platform that we start from is eMUSE [15], which integrates several popular social media tools (such as Blogger, MediaWiki, Twitter, Delicious, YouTube or SlideShare) and also provides value-added services for both students and teachers. From the students' point of view, eMUSE offers the following main functionalities:

- Integrated learning space, with a common access point to all the social media tools selected by the instructor, including updates of the latest peer activity
- Summary of each student's involvement, including charts, comparisons with peers, as well as aggregated data
- Preliminary score computed based on the recorded student activity, following teacher-defined criteria [15].

As far as the instructor is concerned, eMUSE acts as a control panel, with the following main functionalities:

[1] https://docs.moodle.org/30/en/Workshop_activity
[2] http://www.niu.edu/blackboard/assess/spa.shtml
[3] https://learner.coursera.help/hc/en-us/sections/201895903-Peer-reviewed-assignments
[4] http://edx.readthedocs.io/projects/edx-guide-for-students/en/latest/SFD_ORA.html

- Configure the course, by setting up the associated learning scenario and selecting the social media tools to be used
- Student management (course enrolment, centralized access to students' accounts on each social media tool, grading information)
- Collect data on students' activity on the social media tools, search and browse students' actions, configure grading scheme, visualize course statistics, detailed charts of student involvement and comparative evaluations [15].

From a technical point of view, the integration of the social media tools into the platform was done by means of *mashups*, as reflected also in its name (**e**mpowering **M**ash**U**ps for **S**ocial **E**-learning). The first version of the platform was proposed in [14]; it was subsequently re-engineered, extended and improved, leading to a new version, eMUSE 2.0. A peer assessment module is one of the main functionalities added to the platform, with the goal to increase students' engagement and motivation; a continuous monitoring and evaluation of students' work and activity by their peers is thus facilitated. The module caters for the needs of the students, but also of the instructor, as detailed in the next subsections.

3.2 Functionalities for the Instructor

The peer evaluation module offers the instructor the possibility to easily create evaluation form templates, which include several types of review rubrics: open ended questions, single-choice questions, multiple choice questions. The interface is very simple, based on a drag-and-drop functionality, as illustrated in Fig. 1. The single-choice questions may include rating options, which can be thereafter used by the system for computing average grades.

Instructors can subsequently assign the review forms to the students, creating the desired evaluator / evaluated pairs. Team support is provided as well, since both individual students and whole teams can be the subject of evaluation. Once assigned, the status of evaluation forms (pending, completed, with feedback) can be monitored by the instructor, who can search and filter them accordingly. The instructor can also visualize all completed student evaluations and provide feedback to the evaluator as appropriate.

Finally, the module provides the instructor with various reports and statistics, e.g., average scores obtained by a student for each review rubric, charts with all ratings obtained by a student for a particular evaluation (as illustrated in Fig. 2).

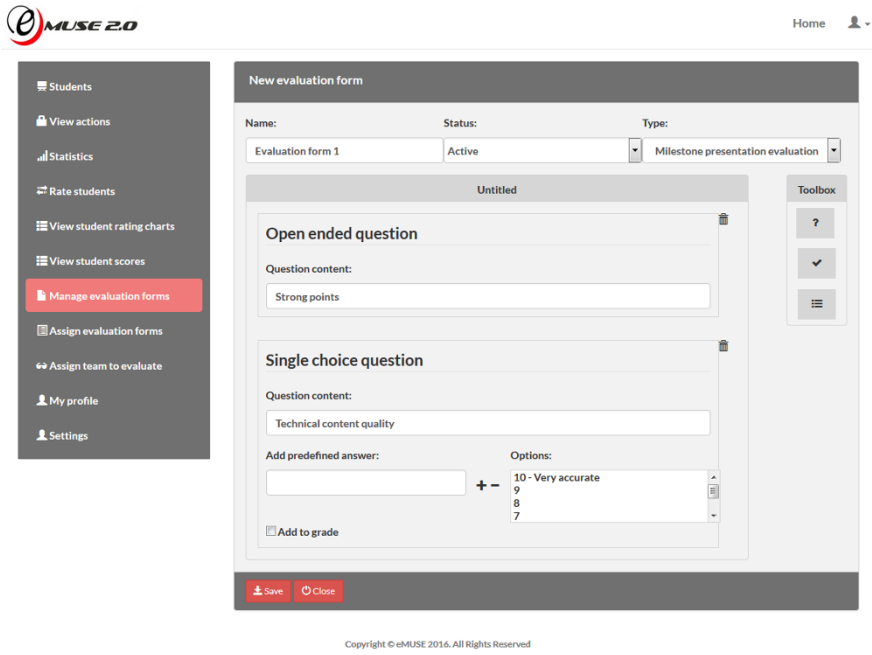

Fig. 1. eMUSE 2.0 evaluation module (instructor perspective) – review form creation

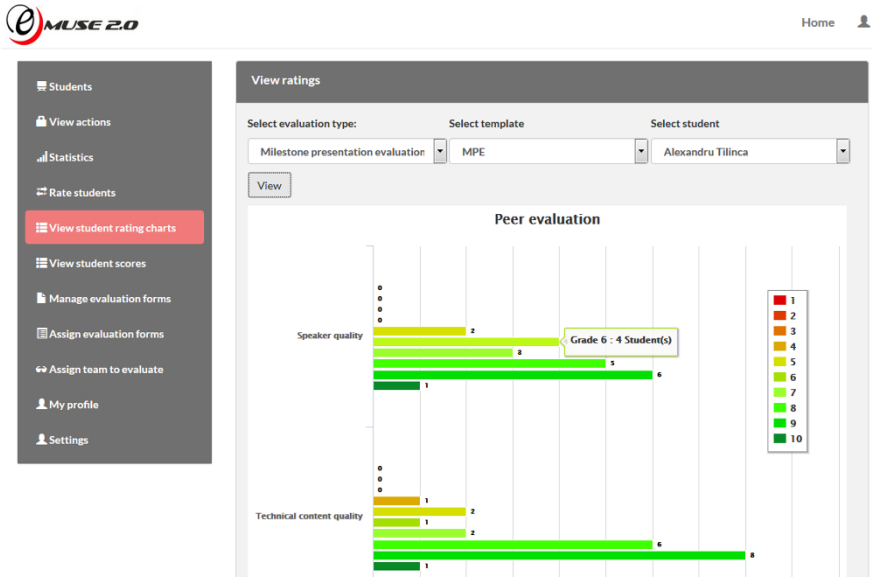

Fig. 2. eMUSE 2.0 evaluation module (instructor perspective) – graphical visualization of student scores

3.3 Functionalities for the Student

The peer evaluation module provides students with the possibility to visualize the evaluation forms assigned to them and fill them in (as shown in Fig. 3a). A single blind review approach is used, in which the evaluators remain anonymous. In order to help students monitor their peers' activity on the social media tools, a list of student actions with various filters and search options is made available to the evaluator; furthermore, various activity charts are provided, as illustrated in Fig. 3b. Notification emails are sent to evaluators with overdue review assignments, in order to increase participation.

Students can visualize the evaluations received from their peers and give a back-review (i.e., send feedback to the evaluator regarding the quality of the review received, including rebuttal or additional explanations). Students are automatically notified by email when they receive an evaluation response. This feedback can help learners improve their assessment skills and also better understand their peers' perspectives. At the same time, evaluators can visualize the reviews performed by others for the same student or team (in an anonymous way); this mechanism fosters critical thinking and helps students understand their evaluation shortcomings, by providing different points of view and comparison standards.

Just like in case of instructors, the module offers students various reports and statistics, such as average scores received for each evaluation rubric or charts with all the ratings obtained for a particular evaluation.

4 Initial Experimental Validation

The new eMUSE 2.0 platform was initially introduced to 75 undergraduate students from the University of Craiova, who were enrolled in a Web Applications Design course. A collaborative project-based learning scenario was implemented, following successful similar course runs in previous years [15, 16]. Students worked in teams of 3-4 peers to design and implement a web application of their choice (e.g., a virtual bookstore, an online auction website, a professional social network, an online travel agency, etc.).

A blended mode approach was used; in addition to face-to-face classes, students relied on eMUSE 2.0 and three integrated social media tools for communication and collaboration support. Thus, a wiki platform (i.e., MediaWiki) was used for collaborative writing tasks, for gathering and organizing knowledge and resources, and for documenting the project. A blogging tool (i.e., Blogger) was employed as a "learning diary", for reporting the progress of each project, for publishing ideas and resources, as well as for providing feedback and solutions to peer problems; each team had its own blog, but inter-team cooperation was encouraged as well. Finally, a microblogging tool (i.e., Twitter) was used for posting short news,

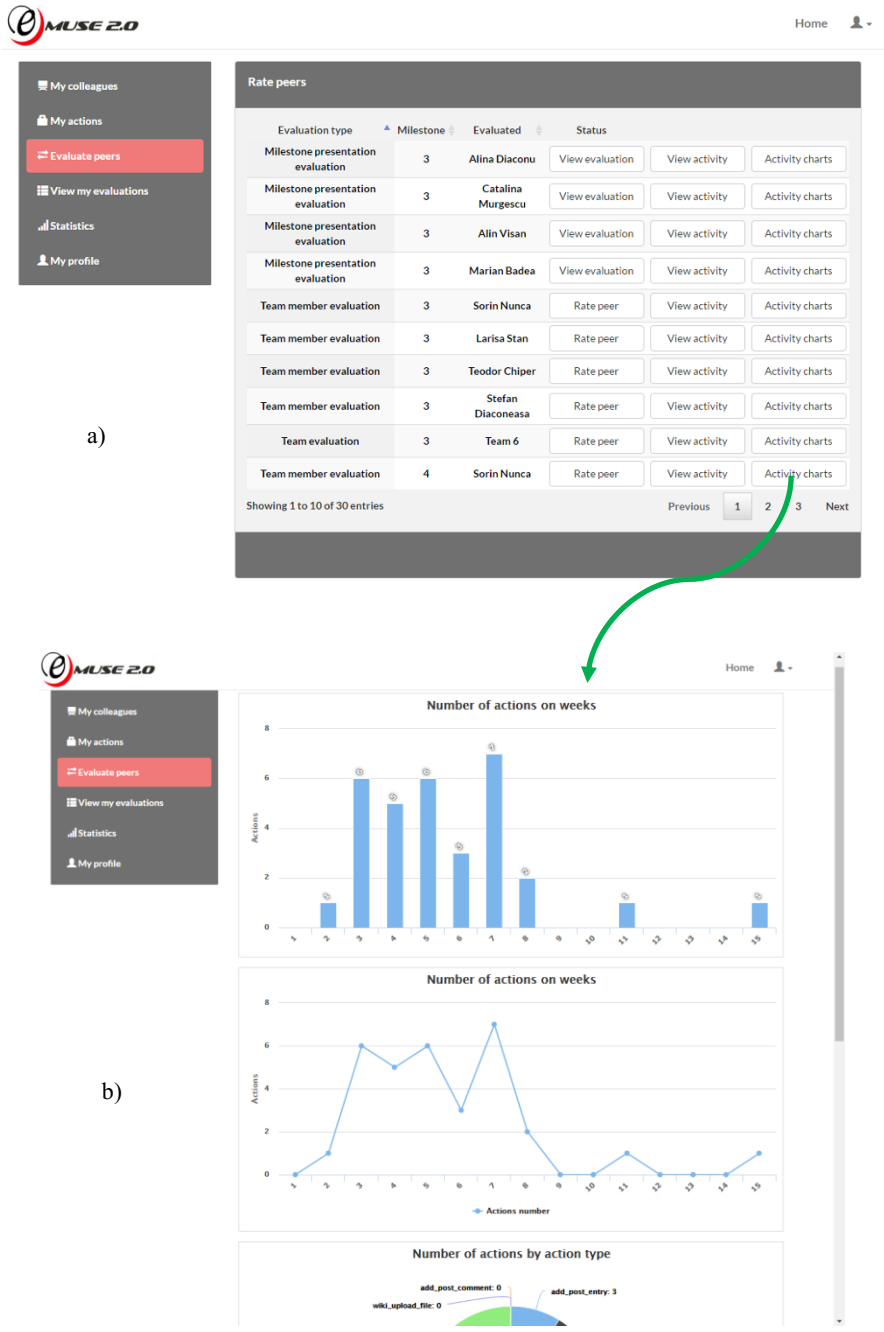

Fig. 3. eMUSE 2.0 evaluation module (student perspective) – (a) list of assigned evaluation forms; (b) activity charts for evaluated student

announcements, questions, and status updates regarding each project. There were also four intermediary project presentations that each team had to deliver during face-to-face classes; their goal was to engage students more and discourage the practice of activity peak at the end of the semester. Grading took into account both the final project and the collaborative work carried throughout the semester.

A formative peer evaluation activity was integrated in the learning scenario. Thus, students were asked to assess the quality of their peers' work and presentations, for each intermediary milestone, as well as for the final product. Furthermore, each student had one team assigned for evaluation, whose work they had to follow throughout the semester; both individual contributions and overall team activity were monitored and assessed. In the first part of the semester, Google Forms were used by the instructor for creating the evaluation forms. In the second part of the semester, eMUSE 2.0 was made available to the students, including the built-in peer evaluation module.

At the end of the semester, students were asked to fill in a survey regarding their overall learning experience. Fifty-nine students completed this questionnaire, and in what follows we summarize their opinions regarding the introduction of the eMUSE 2.0 peer evaluation module. When asked to compare this peer review mechanism with the one based on Google Forms, the majority of students reported an increased level of usefulness, ease of use, convenience and overall satisfaction. A summary of their answers is included in Table 1.

Table 1. Percentages of students' answers to the question: "Please compare the peer evaluation mechanism included in eMUSE 2.0 (that you used in the second part of the semester) with the one based on Google Forms (that you used in the first part of the semester)"

	A lot higher	Somewhat higher	The same	Somewhat lower	A lot lower
Ease of use	33.9 %	37.3 %	16.9 %	8.5 %	3.4 %
Usefulness	28.8 %	42.4 %	22.0 %	5.1 %	1.7 %
Convenience	35.6 %	39.0 %	20.3 %	3.4 %	1.7 %
Overall satisfaction	30.5 %	44.1 %	18.6 %	1.7 %	5.1 %

In addition, students pointed out several advantages of the eMUSE 2.0 peer evaluation module: i) possibility to monitor the evaluated peers' activity on the social media tools, with useful filter and graphical visualization options; ii) easier access to the evaluation forms from a centralized location; iii) more user-friendly visualization of received reviews; iv) possibility to give feedback for an evaluation; v) more efficient approach, due to the pre-filled data (evaluator name, milestone number, information regarding the evaluated student/team); vi) easier way to keep track of the pending evaluations. The main disadvantage mentioned by the students referred to eMUSE 2.0 minor bugs and server unavailability issues, caused by its beta release status.

Overall, the initial evaluation results are very encouraging; a large majority of students (over 80%) reported their preference to use the eMUSE 2.0 peer evaluation module in the future.

5 Conclusion

We designed and implemented a peer evaluation module integrated in the eMUSE social learning platform; the tool offers a wide range of functionalities, both for the student and the instructor. Unlike similar systems, the module supports a more in-depth monitoring and evaluation of peers' overall activity, not just of one output (e.g., an essay or open answer assignment). Furthermore, the evaluation can be closely integrated with the project-based learning scenario and the educational social media tools. In addition, the teacher can create and customize the desired evaluation forms, appropriate for each activity type (rather than use predefined ones); various graphical visualizations of student scores are also provided. The eMUSE 2.0 peer evaluation module has been used by 75 students in a pilot study, with promising results.

More extensive experimental studies are envisaged. Furthermore, we plan to conduct an in-depth analysis of the quality and usefulness of the peer reviews performed by the students. Finally, following the suggestions in [8], the peer evaluation module could be extended with various calibration, reputation and meta-reviewing mechanisms.

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