

Applying a Methodology for Collaborative Assessment in Learning Groups

Tatiana Escovedo
Computer Science Department
PUC-Rio
Rio de Janeiro, Brazil
tatiana@inf.puc-rio.br

Rubens Nascimento Melo
Computer Science Department
PUC-Rio
Rio de Janeiro, Brazil
rubens@inf.puc-rio.br

Abstract— Collaborative evaluation is still a less explored subject within the collaboration field. This paper proposes a methodology to collaborative evaluation based on the 3C collaboration model, which can be applied both in learning or working groups. This paper also presents two case studies run on graduate courses of the Computer Science Department of Catholic University of Rio de Janeiro for collaborative evaluation of the students work. The case studies suggest that the methodology is appropriate for this type of assessment. In addition, students participating in the experiment rated the experience as positive, confirming the premise that students value and miss the collaborative evaluation.

Keywords- Collaboration, Groupware, Collaborative Evaluation, Assessment

I. INTRODUCTION

Collaboration is a process by which individuals negotiate and share relevant insights to solve a problem. It is a coordinated and synchronous activity, result of a continuous attempt to construct and maintain a shared understanding of a problem [9].

In collaborative learning, the student is responsible for his/her own learning, and collaborates with the other group members' learning, constructing knowledge through reflection on group discussion [5]. The active information exchange instigates interest and critical thinking, allowing learners to reach better results than by studying alone. In collaborative learning, the teacher shifts his/her role from authority to supervisor.

Computer Supported Collaborative Learning (CSCL) studies how people can learn in groups using computers. This approach proposes the development of new software that allows group learning and offer creative activities of intellectual exploration and social interaction. CSCL is often combined with e-learning, which can be defined as organizing instruction using computer networks, like the Internet [10].

Due to the collaboration between participants, the traditional assessment methods-- in which the teacher prepares a written test and the student must answer the questions correctly-- are insufficient to measure the results of collaborative learning. Much like the learning process, the assessment should itself be collaborative, thus allowing the evaluated student and their colleagues to contribute to the

assessment process, which is no longer the sole responsibility of the teacher.

The research presented in [3] illustrates how the students consider and miss collaborative assessment when it is not used. In the words of the learner of an online course that suggested the proposal:

“Evaluating is a very interesting activity. We can reflect, analyze, consider... a lot of other reasons could be listed to justify this activity; to assess the other and yourself. I don't understand why this deliciously cognitive activity – to evaluate – is an aspect restricted to teachers (...) See how simple it would be if, at the end of each message, a field were available at the same site for you (the learner) to evaluate by giving a grade and commenting.”

[8] points out that, for teachers, student evaluation has always been challenging, and it is difficult to understand the real level of conjecture of the student learning. In addition, states that the evaluation is still a cause of anxiety in both teachers - because there is a concern about quality, loyalty, fairness, integrity, trustworthiness, privacy, efficiency and honesty of the evaluation - and in students - due to fear, insecurity, humiliation, distrust, anger, rage and tumult of the evaluation.

When students share the responsibility of evaluation, the comprehension and the utility of evaluation increase [7][6]. To the evaluated ones, having several assessments of their work increases confidence on the results of the evaluation. Additionally, the evaluators better understand the process and the objectives of the assessment, thus increasing their critical sense and ability to improve on their own work.

Despite the evidence of the benefits of collaborative evaluation, the literature still suffers from the lack of a methodology for conducting such assessment. To fill this gap, this paper proposes a methodology based on the 3C Collaboration Model. Section 2 presents a summary of the 3C model and section 3, the steps of the proposed methodology. Section 4 describes the application of the methodology in two case studies and Section 5 provides a analysis of the participants. Section 6 assesses the proposed methodology based on the results of case studies and finally section 7 presents the conclusions of the paper.

II. THE 3C COLLABORATION MODEL

To collaborate, individuals should exchange information (communication), organize themselves (coordination) and operate together on a shared space (cooperation). The exchanges that occur during communication generate commitments that are managed through coordination, which organizes and disposes of tasks that are executed in cooperation. When cooperating, individuals need to communicate in order to negotiate and decide about unexpected situations. Finally, through perception, the individual is informed about what is happening and obtains information necessary to his/her work. The diagram in Figure 1 summarizes the main concepts discussed. This diagram, proposed in [4], is a refinement of the 3C model originally presented in [1].

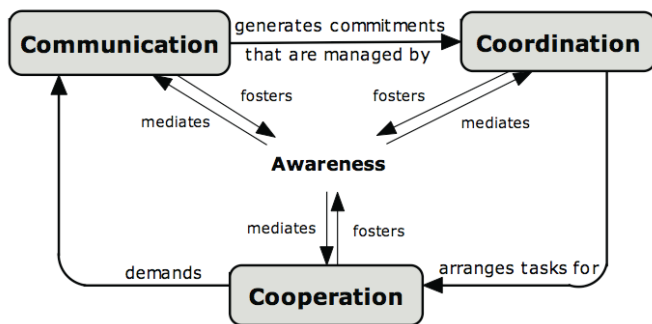


Figure 1. The 3C Collaboration Model

This section presented the theoretical concepts that were the basis for this research. The next section presents the proposed methodology for supporting collaborative evaluation in learning or working groups.

III. THE METHODOLOGY FOR COLLABORATIVE EVALUATION

The methodology for collaborative evaluation proposed as follows defines the necessary steps for the preparation, implementation and dissemination of evaluation results. It is important to emphasize that its use is not restricted only to the educational field. It can also be applied, for example, to evaluate scientific papers for publication at conferences or in the evaluation of corporate projects by coordinators, clients or stakeholders. The following are the steps of the methodology.

1. Definition of assessment sources

At this stage, should be defined according to the application scenario, what are going to be the sources of evaluation, i.e., which actors will effectively play the role of evaluators. These actors should be grouped according to their profile, for example, teachers and students, in the case of an assessment of scholar work in the classroom; or coordinators, peer developers and customers, in the case of an assessment of a corporate project to develop a system. At this stage, it should be determined if the self-evaluation is going to be included or not.

2. Defining the type of evaluation: Qualitative, Quantitative

In this step, we must determine whether the assessment will be qualitative (assessment through comments), Quantitative (assessment by assigning concepts or notes) or mixed.

3. Analyzing the domain for developing the evaluation criteria

The domain in which assessment will be applied needs to be analyzed to define the appropriate evaluation criteria. For example, should be considered if the assessment is in academic or corporate environment. When in an academic environment, for example, it should be considered the course level (undergraduate or graduate), the objective of the work to assess, if it is individual or in groups, and other factors. For each criterion must be chosen a type of evaluation among those defined in step 2.

4. Grouping the evaluation criteria in templates and associating evaluation sources

Defined the evaluation criteria, we must group them into templates that are associated with the assessment sources defined in step 1. A template is a set of criteria that can be represented by an evaluation form. Each source must have an evaluation template associated to assess a work, but the same template can be shared between more than one source of evaluation.

5. Defining the composition of the final grade

The next step is to define how the final grade is calculated: which criteria will be considered, and the weight of each one. We can also define weights for each of the sources of evaluation, according to the analysis of the field. This step is optional because in some cases a final grade is not the purpose of the evaluation.

6. Defining the mechanisms for conflict resolution

This step is focused on analyzing the assessments to check for possible conflicts, which means differences between assessments that may indicate that some of the two assessments was not done properly. The aim of this step is not necessarily reach a common assessment, but do evaluators consider the arguments of the conflicting evaluations to confirm that the reviews are really different or if there was any error in the judgment. This procedure aims that the final evaluations are most appropriate and consistent with reality. Thus, it should be set for each domain what characterizes a conflict, and how it will be resolved.

7. Defining the format of the final evaluation report

It must then be defined how the results of the evaluation will be presented to the assessed ones. It is recommended the use of a consolidated report showing the evaluation by criteria (you can choose to display all the evaluations received for each criterion, or just the average received on each criterion) and the final grade, if applicable. In this stage, the planning stage of the activity of collaborative evaluation is closed.

8. Presenting the work to be assessed

In this step, the implementation phase of the collaborative evaluation starts, according to the steps 1 through 7. According to the case, the work to be evaluated can be made both

synchronously (e.g. oral presentation with PowerPoint slides) or asynchronously (e.g. work submission via e-mail to the evaluators).

9. Assessment

After presenting the work to be evaluated, the evaluators should use the appropriate template to perform the evaluations. This step can be done through a paper or electronic, form or with the support of a system.

10. Disseminating Results

Then, the evaluation results should be disseminated as appropriate for each area. The evaluation report defined in step 7 should be submitted to the evaluated ones, and depending on the case also for evaluators too (for example, in the academic environment, for teachers and in the case of the corporate environment for leaders or coordinators).

For the conception of this methodology, it was considered as the theoretical basis the 3C model presented in section 2 of this article. The model shows the importance of communication, cooperation and coordination for effective collaboration. Next, we show how each element was considered in developing the methodology proposed in this paper:

Communication: should occur in the presentation of the work to be evaluated (step 8). It is also very important in the step of conflict resolution of the evaluation (step 6).

Cooperation: it is present in the process of collaborative evaluation in itself, in which a group of evaluators using a shared model assess the same work. Evaluators cooperate participating in the evaluation process, in order to reach a common goal - the end result of the evaluation.

Coordination: the whole process of collaborative evaluation can only occur if there is coordination between all parties. You must dictate the rules of the process for the assessed to present the work to be evaluated and for the evaluators to assess it properly. All participants must have a clear understanding of its role in the process. It is desirable to have a central figure in coordinating the process for best results.

IV. CASE STUDIES

To validate the application of the methodology proposed in this work in collaborative evaluation of academic work, 2 case studies were performed in graduate classes of the Pontifical Catholic University of Rio de Janeiro (PUC-Rio). For each case study, we used an instance of the framework IssueNet, described in detail in [2]. The main module of the system is a task manager that implements a workflow for creation, assignment and assessment of tasks. Thus, the system calculates the final grade of an activity from the tasks related to it, using specific criteria reported by the user. In the following subsections will present the case studies.

A. Case Study 1

The course "Project of Software Systems (PSS)" is offered by the Computer Science Department of PUC-Rio in the area of Software Engineering, and is attended by students in

undergraduate and graduate levels. This case study was conducted during the final work, in which students should develop a framework and implement an instance on an issue of free choice. The theoretical concepts learned in the course must be correctly applied to the work. Weekly, each student must present to the class the progress of his/her work. The presentation is in Power Point format and should address the scope defined by the teacher in the course schedule. The other students have only to attend to the presentation whereas the teachers have to evaluate it. At the end of the semester when each student presents the complete work, the grades of the weekly presentations are taken into account in calculating the student's final grade.

The case study was to examine the application of the methodology proposed in this paper to conduct collaborative evaluation with participation of students, and was used in a class of 11 graduate students. In subsection C, will detail how the methodology has been applied to this case study in particular.

B. Case Study 2

To confirm the results obtained in the case presented in subsection A, the methodology proposed in this paper was also applied in a case study conducted with 43 students and two teachers in a different graduate course in PUC-Rio.

Among the activities of the course, students must present orally and in groups of up to 5 members, a work about design patterns. The works are presented to the teacher and the whole class. In previous classes, the evaluation of the work was done exclusively by the teacher using her own criteria. In this case study, this assessment was made collaboratively, and more than one teacher participated in the evaluation.

C. Applying the Methodology

The methodology proposed in section 3 was used for the elaboration of the assessment activity of the two case studies. The following are detailed how each step of the methodology was applied to each case study.

1. Definition of assessment sources

For both case studies was determined the use of 2 sources of evaluation: evaluation of the professors and students (peer review). Specifically in the case study 2, one work was evaluated both by members of the group (self-evaluation) and by the other students in the class.

2. Defining the type of evaluation: Qualitative, Quantitative

In both case studies were used both qualitative and quantitative evaluation. In case study 1, for each criterion should be assigned a grade from 1 to 5 (quantitative assessment) and a comment (qualitative assessment). In the case study 2, it was determined that the evaluation would be primarily quantitative. For each criterion of quantitative evaluation, should be assigned one of the following concepts: Poor, Weak, Fair, Good, Excellent. These concepts have been mapped in grades from 1 to 5 to facilitate the calculation of the final grade. To complement and enrich the evaluation, a field

of general comments would be available with optional padding, representing the qualitative assessment.

3. Analyzing the domain for developing the evaluation criteria

In case study 1, the purpose of the work was to develop a complete framework, from modeling to programming. Each student presented his work in three phases of an hour each. In the first week (phase 1) should be presented the definition and application requirements. In the second week (phase 2), the goal was to present the computer modeling work. The third and last week (phase 3), the goal was to present the complete system, running. To this end, 5 criteria were developed for each phase such as Definition of the use case requirements (Stage 1) Formulation of Diagram of Classes and Sequence (Stage 2) and Integrated presentation of the various aspects of solving the problem (Phase 3).

In the case study 2, the purpose of the work was the creation, modeling and presentation of a social networking site using 3 design patterns seen in class, chosen by the group. The duration of the presentation should be a maximum of fifteen minutes. Five evaluation criteria have been developed: Adequacy of the presentation on the time available, Quality of slides and oral presentation, Creativity of the system and of the chosen patterns, Appropriateness of the patterns to the system and Correct application of the concepts.

It is important to say that in both case studies, it was established the criterion General Score, which represented the final evaluation of a work. This criterion will be further detailed in step 5.

4. Grouping the evaluation criteria in templates and associating evaluation sources

In case study 1, we decided to create a single template containing all the assessment criteria, and assign it to both students and teachers. In case study 2, were created 2 templates: one for teachers and one for students, the latter also used in self-evaluation. For the template of the students, we chose to use the criteria more focused on the presentation itself, and not in evaluating the theoretical knowledge presented. For the template of the teachers were used both criteria for evaluating the presentation and criteria for evaluating the application of theoretical concepts.

5. Defining the composition of the final grade

In both case studies, all the evaluators were asked to evaluate the criterion General Score with the grade that would effectively be taken into account in the calculation of the final evaluation of students. This value should not necessarily be the average of the grades awarded in other criteria (whose function is to enrich and detail evaluation), but the general score that the work should receive, in the opinion of the evaluator. The composition of the final grade of each job was also the same for the two case studies. It was calculated as $0.7 * \text{average of teachers grades} + 0.3 * \text{average of students' grades}$. We decided to use this formula because of the limited experience of evaluation that, in general, the students have.

6. Defining the mechanisms for conflict resolution

In both case studies, it was decided that a conflict would be characterized by a difference of 3 or more points in the evaluation of certain criteria. For example, if on the criterion C1 the Assessor A1 has assigned "Weak" (or grade 2) and the Assessor A2 has assigned "Excellent" (or grade 5), it would be characterized as a conflict. In case study 1, it was decided that the conflict would be resolved through tasks designed for conflicting evaluators inside the IssueNet. In the case study 2, it was decided that the conflicting evaluators would be called by e-mail to clarify their evaluations.

7. Defining the format of the final evaluation report

In case study 1, the final evaluation report of a work could be consulted through the system IssueNet. This report showed in detail all the grades and comments received at each stage of evaluation, and the final grade of the work. In the case study 2, because it had simpler templates, we chose to send a spreadsheet showing all the concepts, comments and the final grade of the work.

8. Presenting the work to be assessed

In both case studies, the work was presented orally and was used PowerPoint to present it. In case study 1, the work is individual and only one student made a presentation, while in case study 2, each group decided if would be one or more presenters.

9. Assessment

In case study 1, the evaluators conducted the evaluations directly in the IssueNet system. In case study 2, due to limitations in the classroom in which there were presentations, the evaluators conducted assessments on paper forms and then the teacher recorded the evaluation forms on the IssueNet system.

10. Disseminating Results

In case study 1, the final evaluation report was published on the IssueNet environment for consultation by both evaluated and evaluators. In the case study 2, the evaluated students received by e-mail the same report generated by IssueNet.

V. ANALYSIS OF PARTICIPANTS

In case study 1, when asked about the collaborative process of assessment, most students approved the experience. Most students (85%) said that compared with traditional evaluation, in which only the teacher evaluates, the collaborative evaluation is good or excellent, and they also agreed that to evaluate their colleagues helps to hold attention in class and learn the theoretical concepts of the discipline. While 70% of the evaluators agreed that the peer evaluation helps improve their work, 15% expressed as neutral. When asked whether to evaluate their colleagues causes the evaluator feels playing a more important role, 57% agreed, 15% were neutral and 28% disagreed. Students also pointed out that the collaborative evaluation facilitates interaction between students and allows direction of efforts in light of the weaknesses of each.

In case study 2, the majority of students also approved the experience of collaborative evaluation: 81% enjoyed the experience. When asked to compare this practice with the

traditional evaluation, 86% rated collaborative evaluation as good or excellent and 72% said that the evaluation of their colleagues helps to hold attention in class and learn the theoretical concepts of the discipline. When asked if to evaluate their colleagues causes the evaluator feels playing a larger role, 78% agreed, 6% were neutral and 16% disagreed. As in this case study only 45% of students enriched the assessment of colleagues with comments beyond the simple allocation of concepts, they were asked why, and most (75%) claimed that the evaluation criteria used were already sufficient for a proper evaluation.

VI. METHODOLOGY ASSESSMENT

After completion of two case studies, it was found that the collaborative assessment methodology was well accepted in both groups. Below some important points extracted from the evaluation of case studies are highlighted.

In case study 1, students said that by having to evaluate their colleagues they pay more attention to the presentations, what helps to identify improvements and best practices that can be applied to their own work. They also stressed that the collaborative evaluation facilitates interaction between students and allows the direction of efforts in the light of the weaknesses of each. Thus, the collaborative evaluation allowed students to add value to the work of colleagues, and in fact the progress of work using the contributions received during the ratings it was actually perceived. However, students stressed that they would like to have discussed the assessments more in order to share opinions, to understand better the rating received by colleagues, to establish better theoretical concepts of discipline and to enrich the learning of the group with the exchanged ideas. Thus, there are indications that a stage of discussion of the assessments should be included in the methodology to achieve greater use of collaborative evaluation.

In the case study 2, the collaborative evaluation was seen by students as a way to better understand the assessment process and thereby enable a self-assessment in order to improve their own work. They also stressed the advantages of being able to exercise the critical thinking of each one playing the role of assessors, increased interaction between students and an evaluation with different points of view and more complete than the traditionally received only from the teacher. In addition the students absorb better the concepts of discipline paying more attention to the presentations of the work. Although the students felt motivated by the responsibility to assess their colleagues in a fair, impartial and serious way, they were concerned in making sure that all colleagues would have this right feeling. Thus, strategies should be investigated to incorporate into the work a change in attitude on the part of

evaluators, emphasizing their responsibility to contribute to the grade of a task.

VII. CONCLUSION

This paper presented a methodology for collaborative assessment based on the 3C Collaboration model that can be applied both in working or learning groups. Two case studies taken in graduate courses of the Informatics Department of PUC-Rio for collaborative evaluation of academic works suggests that the methodology is appropriate for this type of assessment. In addition, students participating in the experiment rated the experience as positive, confirming the premise that students value and miss the collaborative evaluation. In future work, we intend to evaluate the application of this methodology in different scenarios, for example, in evaluating corporate projects, and investigate solutions to fill the gaps identified by case studies.

REFERENCES

- [1] Ellis, C.A., Gibbs, S.J., Rein, G.L., (1991). Groupware - Some Issues and Experiences. *Communications of the ACM* 34, (1), 38-58.
- [2] Escovedo, T. & Lucena, C. J. P., (2007). Um Framework para Avaliação Colaborativa de Tarefas em Grupos de Aprendizagem. *III Congresso Sul Catarinense de Computação*, Criciúma, SC, Brazil.
- [3] Escovedo, T., Pimentel, M., Fuks, H. & Lucena, C. J. P., (2006). Avaliei, Avaliei... Ensinei? Investigações Sobre Avaliação Nas Conferências de um Curso Online. *XII WIE - Workshop de Informática na Escola, Anais eletrônico do XXVI Congresso da SBC*. Campo Grande, MS, Brazil. pp. 94-101.
- [4] Fuks, H., Gerosa, M.A., Pimentel, M.G., (2003). Projeto de Comunicação em Groupware: Desenvolvimento, Interface e Utilização, *XXII Jornada de Atualização em Informática, Anais do XXIII Congresso da Sociedade Brasileira de Computação*, V2, Cap. 7.
- [5] Lucena, C. J. P. & Fuks, H. (2000). *Professores e Aprendizes na Web: A Educação na Era da Internet*. Clube do Futuro. Rio de Janeiro, Brazil.
- [6] McConnell, D., (2002). Collaborative Assessment as a Learning Event in E-learning Environments. *CSCS 2002*. Boulder, Colorado USA.
- [7] O'Sullivan, R.G., (2004). *Practicing evaluation: a collaborative approach*. SAGE, California, USA.
- [8] Prata, D. N., (2003). Estratégias para o Desenvolvimento de um Framework de Avaliação da Aprendizagem a Distância. *XIV Simpósio Brasileiro de Informática na Educação*, Rio de Janeiro, Brazil. pp. 150-159.
- [9] Roschelle, J., & Teasley, S., (1995). The construction of shared knowledge in collaborative problem solving. *C. O'Malley (Ed.), Computer-supported collaborative learning*. Berlin, Germany, pp. 69-197.
- [10] Stahl, G., Koschmann, T. & Suthers, D., (2006). Computer-supported collaborative learning: An historical perspective. *R. K. Sawyer (Ed.), Cambridge handbook of the learning sciences*. Cambridge, UK. pp. 409-426.

