

Measuring collaboration and creativity skills through rubrics

Experience from UTPL Collaborative Social Networks Course

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Abstract—In this paper, we introduce several rubrics to measure a set of collaborative and creativity grading. Rubrics are powerful tools for both teaching - learning and assessment. Rubrics improve communication between teachers and students. This work relates the general criteria to measure the complexity levels in the development of creativity and collaborative work competences with concrete indicators associated with the use of Social Web tools and concepts. These indicators have been used in the assessment of competences in a particular course related with the use of collaborative networks.

Keywords-component, Rubrics, Social Software, Assessment

I. INTRODUCTION

Engineer employers affirm that some competences in certain non-technical areas such as communication ability, economics, leadership, teamwork or creativity are not practically being considered in their formation. Accreditation Boards, Engineering Associations, are also demanding the incorporation of the called generic or transferable competences for the actual and the future engineering degrees. Generic competences constitute the basis for the ability to develop discipline-specific competences. At present, faculty and staff are developing and articulating these important linkages to create strong curricula plans. Firstly, it is needed to define competency mapping as the process of identifying key competences for a particular degree. This process involves supporting and enabling staff to fully reflect upon potential competences, conducting formal research to identify the most important competences, and reaching consensus. Finally, this approach supposed important changes in the current teaching-learning processes of many Institutions.

Key competences should be acquired by pass from a hierarchic model (where teachers are considered as knowledge dispensers), descendent and focused on the teachers toward a collaborative model/horizontal where the student is in the centre of the model and teachers fulfill their role of guides in the teaching - learning process. These key competences are all interdependent, and the uses of social web tools are potential facilitators of that change, especially with the creativity and collaborative work competences.

Creativity is considered as the ability to provide novel answers to a proposal or problem given, or to discover new relations and give them new mental structures, respectively. Rubrics are evaluation instruments that can be applied to assess these competences. But they require the identification of new indicators that can be directly assessed. This work relates the general criteria to measure the complexity levels in the development of this competence with concrete indicators associated with the use of Social Web tools and concepts. These indicators have been used in the assessment of competences in a particular course related with the use of collaborative networks.

II. BENEFITS OF RUBRICS ASSESSMENT

Rubric assessment of competences and skills results in a number of benefits to students and teachers in Universities [1,2,3].

Rubrics allow students to understand the expectations of their instructors. They provide direct feedback to students about what they have learned and what they have yet to learn. Second, students can use rubrics for self-evaluation. Finally, rubrics emphasize “understanding rather than memorization, ‘deep’ learning rather than ‘surface’ learning” [5].

Teachers also can benefit from rubric assessment in two important ways [6]. First, the rubric creation process provides an opportunity to discuss and determine agreed upon values of student learning. Rubrics “make public key criteria that students can use in developing, revising, and judging their own work”. They also noted that once rubrics are developed, they could be used to norm teacher expectations and bring them in line with the vision for student learning.

Second, rubric assessment offers university manager and faculty assessment data full of rich description that can be used to document how to improve courses. Rubrics provide “detailed descriptions of what is being learned and what is not” [11].

"Rubrics improve communication between teachers and students," said *Andi Stix*, an educational consultant whose book *A Rubrics Bank for Teachers* will be published by Teacher

Created Materials. Stix noted that rubrics help students understand exactly "what is expected of them when they are writing a paper or designing a project.

Rubrics can be deceptively difficult to write. After carefully developing a rubric, it is worthwhile to test it on five or ten samples of student work to see how the rubric works.

III. RUBRICS FOR EVALUATING COLLABORATIVE SOCIAL NETWORKS COURSE

Today we see an enormous use of Web 2.0 / Social Software tools and services outside the educational sector. A stronger use in the educational sector could have a considerable impact in terms of changes in educational practices. UTPL understands the necessity of shift towards practices that promote learner-centered as well as collaborative approaches. Social Software tools allow for easy publishing and sharing of ideas, content, experiences, opinions and links ("user-generated content").

The developed of skills and competences for the knowledge society require decisive shift away from teacher-centered knowledge-transfer: a) students: active, constructive and collaborative engagement of students – as close as possible to "real world" problems, content and expertise, b) teachers: facilitators of learning processes – requires change in educational culture/mind-set and new professional understanding

Social Software or Web 2.0 provides a new window of opportunity for initiatives with focus on developing competences and skills for the knowledge society. Blogosphere and Wikipedia, has made possible that any person can participate actively in the society of knowledge. Social

software allow collaborative filtering, discovery of "most interesting" web resources through social filtering techniques, also through ongoing conversations, recommendations and cross-linking of resources in social networks Weblogs, Wikis, content and bookmarks sharing, social networking, etc.

A. Defining Criteria for Evaluation of Student Performance

The purpose of use Web 2.0 in education is considerer the benefits from the collective intelligence, the positive effects of networks, and collaborative tasks through Internet. Specifically: Tools where every participant had the opportunity to participate in the elaboration, publications, consult, provision, improvement, and debugging of its contents.

Three rubrics based on Bloom's learning taxonomy [4,8] (knowledge, comprehension, application, analysis, synthesis, and evaluation) were created to evaluate the students' activities on the co-curricular activities of Social Web [13], *rubrics for evaluate wiki editing, blogging and social bookmarking.*

The use of social web wiki, blogs and social bookmarking enhanced learning, with these social tools, the knowledge is viewed as a social construct, facilitated by peer interaction, evaluation and cooperation.

B. Rubrics for assessment wiki editing

This is a rubric for the wiki editing, see table I. Wiki is a collaborative environment. Collaborative environments allow using tools for co-authoring and debating. The use of wikis is a good example of transition from static and restricted web to social and collaborative participation (co-authors). The wikis enable to create, modify, and delete content in collaborative way.

TABLE I. RUBRICS FOR WIKI EDITING

Dimension (rubric criteria)	Levels of performance			
	Poor	Regular	Good	Very good
Intellectual Engagement with Key Concepts.	The wiki pages make no reference to issues and key concepts raised through readings and/or module activities.	The wiki pages make some reference to issues and key concepts raised through readings and/or module activities.	The wiki pages demonstrate awareness of most of the key concepts raised through readings and/or module activities.	The wiki pages demonstrate engagement with the important concepts raised through readings and/or module activities.
Structure, spelling and grammatical errors	The wiki pages have poor spelling and grammatical errors.	The wiki pages have some spelling and grammatical errors. Text entered with limited enhancements	The wiki pages have few spelling and grammatical errors. Text is enhanced.	Spelling and grammatical errors are rare. The wiki pages have structure and are formatted and enhanced to increase readability.
Content and Understanding	The wiki pages are superficial, lacks of insight and depth.	The wiki pages show some insight and depth, and are some connected with topics and activities. The wiki pages attempts to address the learning objectives pages	The wiki pages show insight and depth are connected with topics and activities. The wiki pages address the learning objectives pages.	The wiki pages are relevants and show a high level of understanding and knowledge. The wiki pages clearly address the learning objectives pages.
Creative construction	Show no ability to incorporate creativity techniques throughout the wiki project. The content of wiki pages don't meet the basic requirements of the wiki project. No creativity shown. Content has no imagination or surprises, is lacking information or is not creative.	Participants show some ability to incorporate creativity techniques during the wiki project with occasionally demonstrating awareness. Participant has created exactly what was required of him or her and nothing more.	Participants show a good ability to incorporate creativity techniques throughout most of the project.	Participants show a high ability of incorporate creativity throughout the wiki project. Content is filled with surprises and creativity. The content of wiki pages show that participant was thinking outside of the box - going beyond what participant would normally create. (Thinking differently or from a new perspective).

Wiki facilitates collaboration and sharing and enables the development of shared resources in a controllable environment. Mistakes are solved by social correction and with the support of content configuration management (version control).

Performance Criteria:

- Intellectual engagement with key concepts.
- Structure, spelling and grammatical errors
- Content and Understanding
- Creative construction

C. Rubrics for assessment Blogging

This is a rubric for Blogging, see table II. From an educational perspective, the blogging is autonomous, constructive and inherently conversational. Teachers or students can create a blog individually or in groups, they form

their ideas about specific topics, gather, evaluate and interpret data and information, they assume positions, train in elaboration of arguments and evidence, and acquire abilities to express their thinking in the right way and style. Blogging allow creating, evaluating, analyzing, applying and understanding knowledge.

Rubric performance criteria:

- Intellectual engagement with key concepts;
- Structure, spelling and grammatical errors
- Linkage and cohesion among posts and use of external resources
- Timeliness and replies comments
- Understanding
- Creative construction

TABLE II. RUBRICS FOR BLOGGING

Dimension (rubric criteria)	Levels of performance			
	Poor	Regular	Good	Very good
Intellectual Engagement with Key Concepts.	The blog entries make no reference to issues and key concepts raised through readings and/or module activities. No comments are made on blogs of others participants.	The blog entries make some reference to issues and key concepts raised through readings and/or module activities. Comments have been made on blogs of others participants.	The blog entries demonstrate awareness of most of the key concepts raised through readings and/or module activities. Comments have been submitted, though not all of them may give evidence of a substantial contribution.	The blog entries demonstrate engagement with the important concepts raised through readings and/or module activities. Blog includes many reflections. Comments have been submitted, all of which are substantial contribution.
Structure, spelling and grammatical errors	The posts and opinions are short and irrelevant. The entries have poor spelling and contain grammatical errors. The entries lacks of structure and connection with topics and activities.	The posts and opinion are short and may contain some irrelevant information. Some of the entries have poor spelling and contain grammatical errors. The entries have some structure	The posts and opinions are expressed in an appropriate style and entries show a good depth of understanding. There are few spelling and grammatical errors. The posts have structure.	The posts and opinions are expressed in an appropriate style and are connected with topics and activities. The entries have rare spelling and grammatical errors. The posts have structure and are formatted to enhance readability.
Linkage and cohesion among posts and use of external resources	The posts don't have linkage and cohesion among themselves. The entries don't contain external links.	The posts have some linkage and cohesion among themselves. The entries may contain links to external digital resources.	The posts have linkage and cohesion among themselves. The entries contain links/images referred within posts.	The posts have linkage and cohesion among themselves. Each external link is referenced.
Timeliness and replies comments	The blog entries are irregular, typically 1 to 2 for month	The blog entries have some timeliness. Some comments are replied to.	The blog entries are regular. Most comments are replied to in a timely manner. The reply shows understanding.	The blog entries are regular and timely. The replies show a depth of understanding and relationship to the comments.
Understanding	The posts are superficials, lacks of insight and depth. They don't express opinion clearly and show little understanding.	The posts show some insight and depth. The post have some connection with other topics and course activities.	The post shows insight and depth. The posts are connected with topics and course activities .	The blog entries are relevant and show a high level of understanding and knowledge. The posts show insight, depth and understanding, and are connected with topics and activities.
Creative construction	Show no ability to incorporate creativity techniques throughout the blog. The content of entries don't meet the basic requirements of the project. No creativity shown. Content has no imagination or surprises, is lacking information or is not creative.	Participants show some ability to incorporate creativity techniques during the project with occasionally demonstrating awareness. Participant has created exactly what was required of him or her and nothing more.	Participants show a good ability to incorporate creativity techniques throughout most of the project.	Participants show a high ability of incorporate creativity throughout the wiki project. Content is filled with surprises and creativity. The content of wiki pages show that participant was thinking outside of the box - going beyond what participant would normally create. (Think differently or from a new perspective).

D. Rubrics for assessment Bookmarking

This is a rubric for the Social Bookmarking, see table III. This is examining the process of recording and remembering key sites and URL's.

Delicious is a social bookmarking service that allows users to tag, save, manage and share web pages from a centralized source. With emphasis on the power of the community, Delicious greatly improves how people discover, remember and share on the Internet.

Instead of having different bookmarks on every computer, Delicious makes it easy to have a single set of bookmarks kept in sync between all of your computers.

Performance criteria:

- Storage and organization of bookmarks
- Tagging and comments
- Collaboration and relevance of bookmarks

TABLE III. RUBRICS FOR SOCIAL BOOKMARKING

Dimension (rubric criteria)	Levels of performance			
	Poor	Regular	Good	Very good
Storage and organization of bookmarks	Bookmarks are locally stored, lack of structure or organisation.	Participant add site favorites to Browser. Bookmarks are organised into folders with appropriate name.	Participant add web sites to a social bookmarking service (i.e. del.icio.us).	Favorites web sites are add to a social bookmarking service (i.e. del.icio.us).
Tagging and comments	Participant does not add tags or comments to bookmarks.	Participant sometimes adds either tags and/or comments.	Participant adds tags and/or comments. Tags are mostly well constructed.	Participant adds appropriate tags and/or detailed comments. Comments summaries the resource.
Collaborations and Relevance of bookmarks	Participant rarely shows any cooperation during the course. Exhibited little to no positive attitude. The bookmarks are personals.	Participant shows some level of cooperation throughout parts of the course. Occasionally exhibited a positive attitude. The bookmarks are irrelevant and don't be validates.	Participant shows a good level of cooperation throughout most of the course. Usually, maintaining a high level of commitment to a positive attitude. The bookmarks have some importance and exist attempts of validation. The student shares the bookmark with all members of their network.	Participant shows an very good level of cooperation throughout the entire course maintaining a high level of commitment to a positive attitude. The sites are bookmarked on the basis of relevance and validity. The student shares the bookmark with appropriate members of their network.

IV. RUBRICS APPLICATION

A. Context Of Application

Competences and learning outcomes have acquired renewed relevance for the *Universidad Tecnica Particular de Loja* (UTPL) process of curricular reform. UTPL are considered a key aspect for answering to the fast technological change in the Knowledge society and to the gap between the education and the labor market requirements. Although learning outcomes are concepts very used in United States and some European countries (United Kingdom, Denmark, Finland, France), in the Ecuador case they are in the early stages of developing and planning.

For UTPL, inspired in Bologna process, the official degrees will have to provide a higher education formation in which the generic competences are integrated harmonically with basic ones; transversal competences related to the integral formation of the student and specific competences than make possible a professional profile that allows the graduates integration in the work market.

The rubric discussed in this paper, was used within Computer Science School offered the Collaborative Social Networks Course (CSNC) as an elective course in 2008-2009. Collaboration and creativity are 21st Century competences of increasing importance and that are used throughout the learning

process. CSNC has the following modules: blogs, wikis, RSS, social networking, and social tagging.

Course enrollment a total of 214 students and four tutors experts in Web 2.0 tools and evaluation in higher education. Given their practice nature, all modules were organized to assist students in their development and mastery of social software tools and services.

B. Purpose of study

This course explores the use of social software technologies as channels of conversation (and information) as well as how web 2.0's underlying principles change the way people communicate and interact in the knowledge society. Of particular interest in this study is how university students use social software to generate collaborative intelligence with partners, engage in discussion (and debate) and how they use tools to deliver innovative services.

The study objective is assessing and crediting the results of CSNC based at collaborative activities before and after.

Because rubrics are easy to use and to explain, they generate data that are easy to understand, defend, and convey [12].

C. Process

The first step in designing a rubric was to define the criteria that will be used to evaluate the assignment activities of participation and use of Social Web tools and services [7,9]. CSNC teachers have considered the assignment carefully and determine which aspects of the modules (Wiki editing, blogging and social bookmarking) should be evaluated. The second step was test rubrics with samples of student work to see how the rubric works.

The third step was to record academic performance prior to rubrics. The four step was to make public key criteria that students can use in developing and self-assess their work. Then, apply rubrics, record academic after rubrics and then provide those who have been assessed with clear information about how well they performed your work.

D. Performance levels

Making a rubric takes time in our case several days. Coming up with criteria and descriptors for a final product or assignment takes detailed thinking on what the product should like. Then, a teacher needs to think of what poor, regular, good and very good quality work should look like to conform to the university approved grading scale:

By making teachers expectations clear, rubrics make rankings, ratings, and grades more meaningful [10]. In this specific context, the performance levels, or anchors, are labeled:

- 0 - Absent—component is missing
- 1 - Poor, unsatisfactory: needs significant improvement
- 2 - Regular, somewhat satisfactory: needs targeted improvements
- 3 - Good, satisfactory: discretionary improvement needed
- 4 - Very good, very satisfactory: no improvement needed

The criteria are: Structure spelling and grammatical errors, linkage/cohesion among entries, use of external resources, timeliness, creativity, collaboration, understanding, scope, accuracy, coherence, and depth. These criteria are commonly applied to social web tools, as are other attributes such as clarity, rigor, appeal, and strength of argument.

E. Application of Rubrics for wiki editing

The procedures followed in this study can be divided into four parts. First, the teachers prepared the artifacts of student learning and study materials (modules: wiki editing, blogging, social bookmarking). Then, the students were trained in CSNC contents - without they know about rubrics score - its performance was evaluated and the results were registered. Third, students participated in training about scoring rubrics session, then, UTPL faculty evaluators scored and returned students works. Finally, the score sheets were prepared for statistical analysis. At the close of the study, all evaluators returned their rubric score sheets. The rubric score sheets were organized for data entry and analysis (see table IV).

Data for Table IV:

- Participant’s number: 214
- Faculty evaluators: 4
- Quantity of wiki pages revised (*without rubrics*): 428 (two contributions per participant)
- Quantity of wiki pages revised (*with rubrics*): 428 (two contributions per participant)

The table IV shows academic performance before rubrics and academic performance after rubrics. We estimate the location of the statistical mode, the accumulate percentage in order to determine the number of students who shows academic performance above and below the Good category.

TABLE IV. TABULATION - RUBRICS FOR WIKI EDITIG

Dimension	Before/after rubrics	Very good	Good	Regular	Poor	Mode in category:
	Without rubrics	34	137	197	60	Regular
Intellectual Engagement with Key Concepts.	Accumulated	8%	40%	86%	100%	
	With rubrics	90	175	141	21	Good
	Accumulated	21%	62%	95%	100%	
	Variation	56	39	-56	-39	
Structure, spelling and grammatical errors	Without rubrics	30	141	210	47	Regular
	Accumulated	7%	40%	89%	100%	
	With rubrics	64	197	154	13	Good
	Accumulated	15%	61%	97%	100%	
Content and Understanding	Variation	34	56	-56	-34	
	Without rubrics	39	146	193	51	Regular
	Accumulated	9%	43%	88%	100%	
	With rubrics	120	158	133	17	Good
Creative construction	Accumulated	28%	65%	96%	100%	
	Variation	81	13	-60	-34	
	Without rubrics	26	94	223	86	Regular
	Accumulated	6%	28%	80%	100%	
Mean without rubrics	With rubrics	47	137	201	43	Regular
	Accumulated	11%	43%	90%	100%	
	Variation	21	43	-21	-43	
	Mean with rubrics	32	129	205	61	Regular
% Accumulated	8%	38%	86%	100%		
Mean with rubrics	80	167	157	24	Good	
% Accumulated	19%	58%	95%	100%		
Variation in means	48	37	-48	-37		

The right column of Table IV shows the statistical mode, the mode is the value that occurs the most frequently in the each rubric dimension. Before rubrics, the statistical mode is located in the *Regular* performance level. After rubrics the statistical mode shifts to the *Good* grading scale. The benefits of rubrics far outweigh the time and effort that goes into them. They force us to carefully consider what we are doing in the classroom, how that leads to student achievement of our course, program, and university, and how we will know when students have achieved those outcomes.

On average, without using rubrics the 39% of students (83 persons) have a good and very good performance at wiki editing. With rubrics there is an improvement in performance, in this case 58% of participants (124 people) is located in the range of good and very good performance.

F. Advantages of using rubrics in CSNC

According to the tables IV, the advantages of using rubrics in CSNC assessment are that they:

- Allow assessment to be reasonably more objective and consistent from activity to activity and from student to student, especially in our situations that involve collaboration among four teachers.
- The level of detail found in three rubrics: wiki editing, blogging and social bookmarking helps prevent inaccurate, clearly show the student how their work was evaluated and what was expected.
- Three rubrics promoted student awareness of about the criteria to use in assessing peer performance. In addition, provide useful feedback regarding the effectiveness of the instruction.
- Focus to our teachers to clarify his/her criteria in specific terms. Because rubrics clarify schemes for assessment ahead of time, they reduce subjectivity in grading.
- The rubrics provide benchmarks against which to measure and document progress.

V. CONCLUSIONS

Teachers and students exhibit a level of proficiency in the use of rubrics, this study demonstrates that teaching of Web 2.0 tools may be empowered through evaluation based on rubrics.

CSNC Teachers appreciate rubrics because their “accordion” nature allows them to accommodate heterogeneous social tools:

- With Rubrics, the writing from blogging and wiki editing is clear, concise, and easy to understand. Ideas and responses are communicated clearly and coherently. Timeliness, the responses are submitted on or before the due date.
- Rubrics reduce the amount of time teachers spend evaluating student work. Rubrics provide CSNC students with more informative feedback about their strengths and areas in need of improvement.

- Integration and synthesis of concepts and principles: The blogging and wiki editing responses demonstrate an integration of concepts and principals from classroom discussions and reflect an understanding of fundamental principles.

Critical Thinking: The interaction through of Web 2.0 tools demonstrate use of upper level thinking, analysis, synthesis, and evaluation and illustrate a thoughtful approach to the content.

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