INGENIERÍA EDUCATIVA
Revista electrónica sobre Innovación Docente
www.ingenieriaeducativa.com

Ingeniería Educativa, 9 (2015) 15-18

A case study: The Rubric

R. Maceiras (1), A. Suárez-García, M.E. Arce, C. Casqueiro
(1) Defense University Center at Spanish Naval Academy (Marin, Spain)
Correstponding author: rmaceiras@cud.uvigo.es (R. Maceiras)

Abstract

In the last decade, teachers have begun to use rubrics in the assessment of students' work because this tool is being considered very useful to engage students in assessing the quality of their own work. In this paper, an analytic rubric that can be used to assess the laboratory sessions in different subjects of an engineering degree is proposed. In the rubric, the academic performance is defined through items. It helps to student to know the most important aspects of an activity or work. Therefore, the student focuses in polishing those aspects. Finally, a questionnaire was carried out to know the students' opinion about the use of rubric in the assessment of the laboratory session.

Keywords: rubric, engineering, laboratory sessions

1.Introducción

In the last years, educators have begun to use rubrics for the assessment of student's work in higher education [1-3]. A rubric was defined by Mertler [4] as "scoring guides, consisting of specific pre-established performance criteria, used in evaluating student work on performance assessments", i.e., a rubric consist a set of scoring guidelines for evaluating a work.

Rubrics have been used by teachers to guide students' work but many authors have been reported the benefit of using them to involve the students in their assessment [5, 6, 7]. In the last years, teaching has changed forward to a more student-centered learning and following this line, rubrics allow to help students understand the aims for their learning and the way of assessment [8]. Moreover, rubrics can be used to assess a variety of assignments such as literature reviews, reflective writings, bibliographies, oral presentations, portfolios, projects, etc.

The rubrics are divided in two types: analytic or holistic [9]. A holistic rubric assesses the student work across multiple criteria as a whole while an analytic rubric assesses student work on each component of the assignment; whereas an analytic rubric is used to break down an assignment into component parts and evaluate each individually. In both cases, a rubric consists of the following elements: criteria of evaluation, definitions of quality and strategy of scoring [10]. The criteria of evaluation include the important factors to be taken into account to determine the student's work quality. The definitions of quality provide a brief explanation about the actions to the student must do to achieve the objective. And the strategy of scoring indicates the scale that is used to assess the work.

Recently, rubrics have been combined with radar charts to report self-assessed knowledge and competencies [11,12]. A radar chart is a graphical method of displaying different variables in the form of a two-dimensional chart where each axe represents a variable, the axes starting from the same point.

In this work, a radar chart combined with an analytic rubric has been designed to assess the laboratory sessions in different subjects of the Mechanical and their use was analyzed.

2. Method

The rubric was used with the students of 15-18 Mechanical Engineering degree from the Defense University Center (Marin) in ' ıbjects: "Environmental Technology" and ···'. The students attend to a laboratory session of 2 hours and after that they have to prepare a report that includes the results obtained during the presential class and their argumentation. The students are grouped in pairs to carry out the laboratory session and the report.

The typical structure of a rubric consists of: standards, indicators, elements and descriptors. Standards are the broad categories of knowledge, skills, and performance of effective practice detailed in the regulations. Indicators describe specific knowledge, skills, and performance for each standard. Elements are more specific descriptions of actions ıviors related to each indicator. The elements allow to divide the indicators into more specific aspects and provide an opportunity for evaluators to offer detailed feedback. Finally, descriptors are observable and measurable statements of educator actions and behaviors aligned to each element and serve as the basis for identifying the level of teaching or administrative performance.

Following this line a likert rubric was designed in bases of the following criteria of evaluation (Figure 1): laboratory, argumentation, calculus, structure and language. And the score was different for each criterion. The first criterion is related to the development of the laboratory class and the way of the students develops the session. Whereas, the other criteria of evaluation are related to the report of students have to present after carrying out the lab session. The different items have different score depending on their relative importance according to the teachers. The following aspects have been taken into account in each criterion:

-Laboratory: this item evaluates the behavior of the student during the laboratory session considering the correct use of materials and equipments as well as the cleaning of workstations.

-Argumentation: this aspect analyzes the explanation and justification of the obtained results during the laboratory session and if the students have acquired the concepts correctly.

-Calculus: the calculus presented in the report must be correct and include the units to acquire the higher score.

· -Language: this item considers if the language is correct, with an appropriated vocabulary and it is well written.

· -Structure: this aspect evaluates the organization and presentation of the report.

LIKERT SCALE RUBRIC
LABORATORY REPORTS

0%	25%	50%	75%	100%
POOR	AVERAGE	GOOD	VERY GOOD	EXCELLENT

ITEM	CRITERIA	0%	25%	50%	75%	100%
LABORATORY 2 points	METHOD					
	CLEANUP					
STRUCTURE 1 point	ORDER					
	APPEARANCE					
LANGUAGE 1 point	VOCABULARY					
	CLEARNESS					
ARGUMENTATION 3 points	ARGUE					
	CONCEPT					
CALCULUS 3 points	OPERATION					
	PHYSICAL UNIT					

Figure 1. Likert rubric.

Furthermore, this rubric was combined with a radar chart (Figure 2). This radar chart considers five items with a five-point scale for each. Thus, the chart shows a pentagon where the different aspects are located on the vertex. Each vertex is lined to the centre of pentagon and each line is subdivided using a rating scale from 1 (lowest)-5 (highest).

At the end of the course, the students' opinion about the rubric was analyzed using a questionnaire. The questionnaire consisted of a multiple-choice question about if they considered that the rubric was useful to do the lab session and prepare the report and two open questions about advantages and disadvantages of using a rubric. It is necessary to point out that the rubric was provided to the students that first day of the laboratory session, so they know the criteria of evaluation before the process. This allows them to reinforce the most important aspects considered by the lecturers.

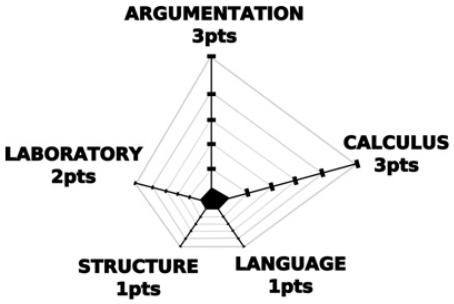

Figure 2. Brief scheme of the radar chart of the rubric.

3. Results and Discussion

The lecturers consider that the radar chart was useful in their assessment process since it provides a simplified presentation of multiple performance indicators.

For the authors, it was also important to know the students' opinion about the use of rubric in the assessment of the laboratory session. For this purpose, a questionnaire was made at the end to the course.

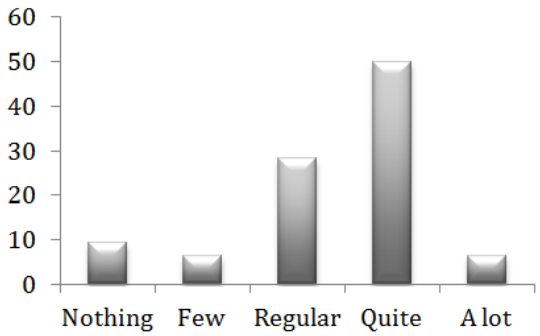

Figure 3. Students' opinion.

The obtained results of the multiple-choice question are collected in Figure 3. It is observed that more than 55 percentage of the students considered that the rubric could be quite useful. From the open question, the students indicated the following: "radar chart provides an idea of your weakness and your strengths", "easy to understand and read", "it is helpful to guide you when you make the report", "more time to make the report", "more effort". From all of question, two main ideas can be pointed out, one positive and one negative. On the one hand, the students know the main points considered by the teacher for giving a mark and this help them and; on the other hand, the students think that the use of rubric implies that they need more time to do the report of the memory.

4. Conclusions

This paper analyzes the use of a designed rubric designed to assess the laboratory sessions in Mechanical Engineering Degree. In this study, the authors have observed that the rubric ensures that all the works will be evaluated in a more objective manner. Moreover, the authors believe that the use of rubrics can make the assessment more effective. Taking into account the students opinion, it must be said that the rubric was well received among the students. The student knows the rules of the assessment correction before the laboratory report is done. A rubric minimizes the effect of subjective assessments. Using the rubric they can calculate their score accurately. Therefore, the discrepancies of the expected score with the obtained one are not reason for complaining. These results cannot be generalized; nevertheless, the authors believe that they can be useful for other teachers.

5. References

[1] N.E. Dunbar, C.F. Brooks, and T. Kubicka-Miller, Innov. Higher Educ. 31(2), (2006) p. 115.
[2] Y.M. Reddy and H. Andradeb. Assess. Eval. Higher Educ., 35(4), (2010) p. 435.
[3] E. Arce-Fariña, J.L. Miguez, and E. Granada, ICERI, 2013.
[4] C.A. Mertler, Prac. Assess. Res. Eval., 7, (2001) p.25.
[5] R.J. Stiggins. "Student-involved classroom assessment". Prentice-Hall, 2001.
[6] K. Wolf, and E. Stevens. J. Effective Teach., 7, (2007) p. 3.
[7] E. Panadero, and M. Romero. Assess. Educ.: Principles, Policy Prac., 21 (2), (2014) p. 133.
[8] Doug Atkinson, and Siew Leng Lim. Australasian J. Educ. Technol., 29(5), (2013) p. 651.
[9] D. Allen, and K. Tanner. Cell Biology Educ. 5, (2006) p. 197.
[10] W.J. Popham, Educ. Leadership, 55(2), (1997) p. 72.
[11] S. Colbran, In G. Williams, P. Statham, N. Brown, B. Cleland (Eds.), Changing Demands, Changing Directions. Proceedings ascilite Hobart 2011, pp.269, 2011.
[12] D. Kaczynski, L. Wood, and A. Harding, Active Learning Higher Educ. 9, (2008) p. 23