

# Development of a laboratory practice for physics introductory courses using a rubric for evaluation by competences

Enrique ARRIBAS, Raquel RAMIREZ-VAZQUEZ, Isabel ESCOBAR, Jesus GONZALEZ-RUBIO

*Universidad de Castilla-La Mancha, Albacete (Spain)*

Augusto BELENDEZ

*Universidad de Alicante, San Vicente del Raspeig, Alicante (Spain)*

Josefina BARRERA

*Universidade do Estado do Amazonas, Manaus (Brazil)*

**Abstract.** Competency-based education is oriented towards an evaluation model linked to student training, in order to foster the development of abilities to identify, project, solve problems and make decisions. In this context, the rubrics allow obtaining evidence of the acquisition of competences and application of knowledge outside the classroom.

In this work, we present a proposal for the development of a Physics laboratory practice with the use of a rubric for the evaluation by Competences in the university field. We want to introduce new assessment methods and identify opportunities to develop skills and evaluate learning through indicators of progress.

## 1 Introduction

The first rubric dates back to 1912, derived from a study carried out by Noyes, called Scale for the Measurement of Quality in English composition by Young People emerges [1].

The rubric is an instrument that shares with teachers and students the required criteria to carry out learning and evaluation tasks. Is a task guide that shows the expectations that students and faculty have and share about an activity or several activities, organized in different levels of compliance: from the least acceptable to the exemplary resolution, from what is considered insufficient to excellent [2].

## 2 Methodology

The Physics laboratory practice "Measurement of the magnetic field of a small magnet" [3] is being made since 2015 by students of the bachelor degree in computer engineering degree of the Faculty of Computer Science Engineering at University of Castilla-La Mancha (UCLM), located in the campus of Albacete, Spain. In figure 1 we show the implementation process and in figure 2 the evaluation of this implementation.

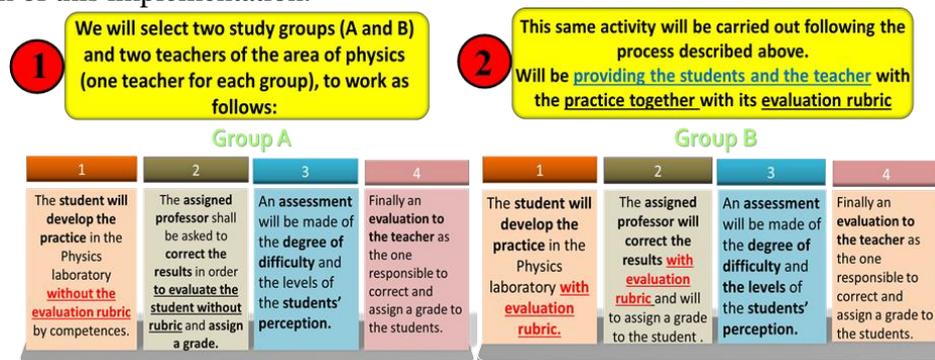


Fig. 1 Implementation process.

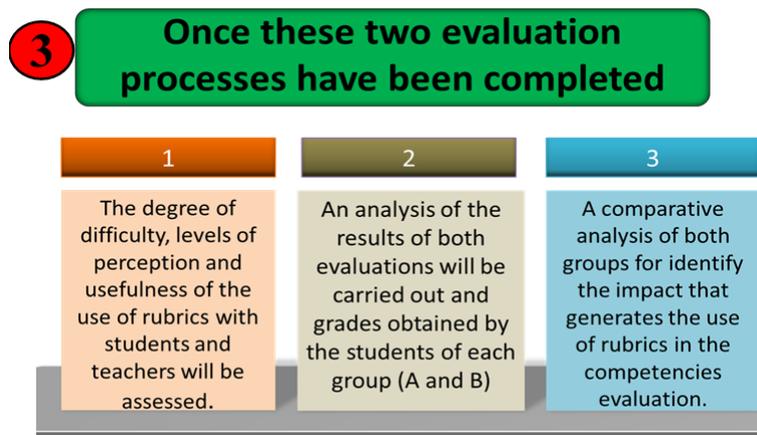


Fig. 2 Evaluation of implementation.

### 3 Result

We have designed the laboratory practice and we have developed the evaluation rubric aimed at students and then its impact will be assessed.

In this phase, we have designed the laboratory practice and the evaluation rubric; at the end of the next course we will have data to evaluate the usefulness of this rubric.

### 4 Conclusion

With the implementation of the competencies approach, the aim is to contribute to the improvement of the educational quality, ensuring that the student is competent in his/her area of study and able to solve the problems that arise in the field of employment; it is a student-centered education [4], in which the student integrates five understandings linked with knowledge (*know*), skills (*know-how to do*), attitudes (*know-how to act*), values (*know-how to be*) and transference (*know-how to teach and/or apply*).

The use of rubrics benefits teachers and students, but the results depend on the people involved in this process. Is considered necessary to evaluate its implementation and results obtained when they are used, as it is proposed in this work.

### References

- [1] M.P. Garcia-Sanz, "La evaluación de competencias en Educación Superior mediante rúbricas: un caso práctico". Revista Electrónica Interuniversitaria de Formación del Profesorado, 17 (1), 87-06. DOI: <http://dx.doi.org/10.6018/reifop.17.1.198861>, 2014.
- [2] J. Alsina, (Coord.), "Rúbricas para la evaluación de competencias". Barcelona: ICE Octaedro, 2013.
- [3] E. Arribas, I. Escobar, C.P. Suarez, A. Najera and A. Belendez, "Measurement of the magnetic field of small magnets with a smartphone: a very economical laboratory practice for introductory physics courses". European Journal of Physics, 36(6) 065002. doi: 10.1088/01430807/36/6/065002, 2015.
- [4] G. Le Boterf, "Ingeniería de las competencias". Barcelona: Ediciones Gestión 2000, 2001