APPLYING ARGUMENTATION IN PRIMARY PRE-SERVICE STUDENTS – A TEACHING-LEARNING INNOVATION SEQUENCE USING ONLINE COLLABORATIVE VIDEO ANNOTATIONS AS DIGITAL RESOURCE

Jose M. Hierrezuelo Osorio[1], Teresa Lupión Cobos[2] and Cristina García-Ruiz[2]
[1,2] Department of Didactics of Mathematics, Social Science and Experimental Science, University of Málaga, Campus de Teatinos s/n, 29071 Málaga, Spain

Argumentation process not only helps to promote the construction of new knowledge but also gives the students the possibility of participating in socio-scientific debates, approaching real science to the scholar environment. As related argumentation skills are therefore fundamental for the professional profile of science educators, in this communication, we would like to introduce a short sequence addressed to improve the argumentative competence in primary pre-service students through the use of collaborative video annotations. In a subsequent analysis, comparisons of the pre/post-test profiles together with the productions of the students will provide a complete view of the degree of argumentation at this educational level and the improvements that should be implemented.

INTRODUCTION

In recent years, argumentation has played an essential role in the curriculum for developing scientific thinking and critical citizens, with an increasing number of publications focused on the analysis of the argumentation discourse in science learning contexts (Jiménez-Aleixandre & Erduran, 2008).From a practical point of view, argumentation also aims to promote knowledge about the nature of science, approaching socio-scientific contexts to students and connecting social concerns with their everyday life (Simonneaux, 2008). As argumentation is used by scientists to relate evidence and claims through use of warrants and backings (Toulmin, 2003), it represents a central role in the construction of explanations, models and theories (Siegel, 1995), being therefore necessary to promote it in the science classroom. Although different authors have contributed to argumentation proposing a variety of models and strategies to practice it, we can envision three main skills common in scientific argumentation: i) to identify the relevant elements of the argumentation process; ii) to interpret the argumentative processes that appears in the classroom practice and to make decisions based on practice for the improvement of argumentative processes (Ruiz-Ortega, Márquez, Badillo, & Rodas-Rodríguez, 2018). Additionally, a broad range of technologies has lately arisen to facilitate and support the learning of argumentation (Roschelle & Pea, 1999), with the video annotations emerging as a useful tool to identify problems and unexpected situations that can be analysed in the science classroom.

METHODOLOGY

With the aim of promoting scientific argumentation skills in pre-service primary students at University of Málaga, we propose a teaching-learning sequence based on the use of the digital tool CoAnnotation (https://coannotation.com), that helps to create online collaborative annotations. As scientific context for the design, we have chosen Climate Change Education (CCE), which affects all components of the education system (policy, legislation and curricula, among others) and promotes problem-solving skills in a collaborative way from a multidisciplinary perspective (UNITAR, 2013).

Design proposal

The complete sequence comprises six sessions, structured as indicated in Figure 1. The first session includes the pre-test, involving two main goals: to detect students' preconceptions about argumentation and to analyse the initial level of practice as well as the identification of the principal terms of arguments (forms, strategies or goals). During the second session, a teaching explanation of the different elements of the argumentation process, including Toulmin's model of argument and some practical examples are shown. Sessions third and fourth commit to the practice and auto-evaluation of argumentation through online collaborative video annotation and rubrics. After explaining the main features of CoAnnotation, students visualise a video about climate change and proceed to register their arguments in the online programme, together with an individual and collective reflexion, answering the critical question: *what is the foundation of a good argument essay?* Finally, each student completes the auto-evaluation process through CoRubric (http://corubric.com), an online tool that allows to create and register collaborative rubrics and analyse the results. In the fifth session, teachers provide students with their feedback about the practical activity and invite them to create an argumentation activity in the teacher role, following their recent knowledge on the topic. Students will select a video related to CCE and design the activity using CoAnnotation. Finally, the last session is devoted to the completion of the post-test and a final review about the evaluation.

SI	PRE-TEST	Students' preconceptions about argumentation	SV	FEEDBACK	Teaching feedback about the application of the argumentation process
SII	EXPLANATION	Elements of argumentation / Toulmin's model		APPLICATION	Selection of CCE video and design of activity (teacher role)
SIII	APPLICATION	Online collaborative video annotation with Coannotation© / Reflexions	SVI	POST-TEST	Students' postconceptions about argumentation
SIV	AUTO-EVALUATION	Online collaborative auto-evaluation with Corubric©		EVALUATION	Final outcomes about the evaluation of the sequence

Figure 1. Main schedule of the teaching-learning argumentation sequence.

PRELIMINARY RESULTS

Here we would like to present a short insight into student's perceptions about argumentation as well as the level and quality of its practice prior to their instruction, outlining the difficulties they found and giving a general impression of the challenge to face in pre-service education. The preliminary results were collected from a semi-structured pre-test adapted from (García-Romano, 2017), (Romano & Condat, 2016) and (Felton, García-Mila, & Gilabert, 2009). The sample was composed by 80 preservice students in their third year of undergraduate studies for primary school teachers.

First results about students' preconceptions (Figure 2) show that 31,3 % of pre-service students consider that subjects or contents to promote argumentation in science class should be related to the student environment, focusing on the importance of contextualized situations for an efficient learning, while only 10% regard socio-scientific issues as suitable topics. Concerning the advantages of working argumentation, most students agree that it helps to promote critical thinking (52,5%), but also contributes to scientific literacy (12,5%). One of the main problems seems to be the low level of students to implement argumentation (55%), follow by other related problems such as the time required to practice it, the data management or the challenge for the teacher (Figure 2).
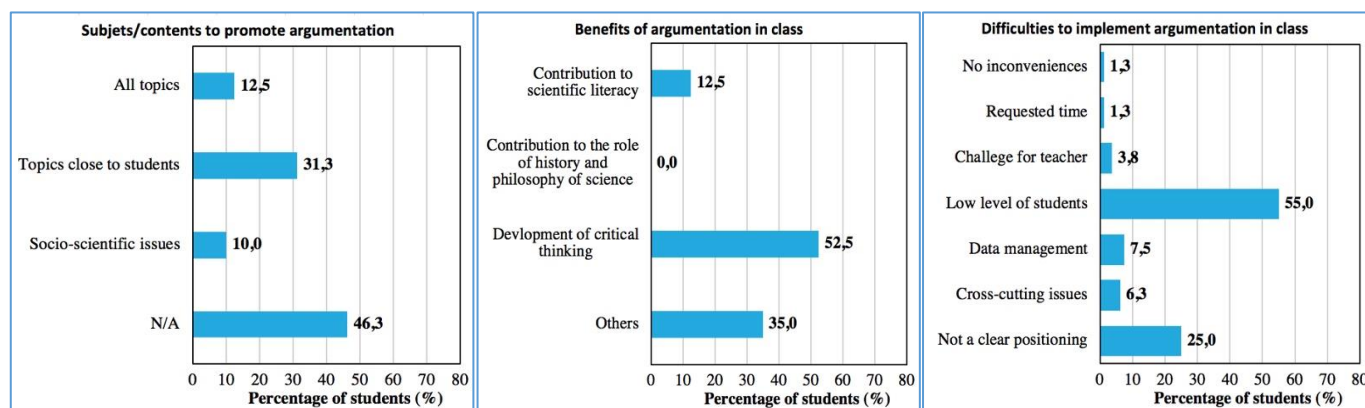
Figure 2. Preliminary results on pre-service students' preconceptions about argumentation.

Results about the quality of argumentative discourse (Figure 3) were evaluated through an environmental theme proposal based on energy sources, using the rubric published by Felton, García-Mila, & Gilabert (2009). While 67.5% of the students formulated a proposal for an energy source, establishing up to 50% the advantages of the selected source, only 25% listed the possible limitations of their choice. Although these results may be acceptable in a sample that has not yet worked on argumentative competence, the low percentages that have listed the advantages and limitations of the discarded energy sources (less than 5% in both cases) stand out negatively. More alarming may be the lack of coherence in the discourse, with only 6% making a reasoned conclusion. Regarding the contribution of relevant or additional information, the percentages are again low, with less than 10% of students in both cases.
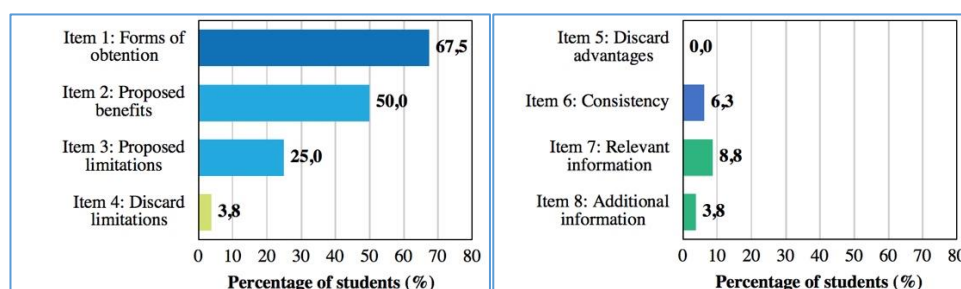

Figure 3. Preliminary results on the quality of argumentative discourse of pre-service students.

CONCLUSIONS

The argumentative dimension analyses with the preliminary results of the pre-test highlight the necessity of the application of learning opportunities in primary pre-service education in the context of argumentation, to improve the perception about the methodology and the quality itself. The next step in this research would be the implementation of the established innovation sequence, that we hope it will contribute to our purpose and will provide us with enough results to analyse and evaluate the relevance of the proposal regarding advantages and improvements of the online video annotations.

{BIBLIOGRAPHY}

Felton, M., García-Mila, M., & Gilabert, S. (2009). Deliberation versus Dispute : The Impact of Argumentative Discourse Goals on Learning and Reasoning in the Science Classroom. *Informal Logic*, *29*(4), 417–446.

García-Romano, L. (2017). Concepciones sobre argumentación de futuros docentes de biología. In *X Congreso Internacional sobre Investigación en Didáctica de las Ciencias*.

Jiménez-Aleixandre, M. P., & Erduran, S. (2008). Argumentation in science education: an overview. In S. Erduran & M. P. Jiménez-Aleixandre (Eds.), *Argumentation in science education: perspectives from classroom-based research* (pp. 3–27). Dordrecht, Netherlands: Springer.

Romano, L. G., & Condat, M. E. (2016). La dimensión argumentativa y tecnológica en la formación de docentes de ciencias Argumentative and technological dimensions in science teacher training. *Ciência & Educaçâo*, *22*, 895–912.

Roschelle, J., & Pea, R. D. (1999). Trajectories from today's WWW to a powerful educational infrastructure. *Educational Researcher, Research News and Comment*, *28*, 22–25. https://doi.org/https://doi.org/10.3102/0013189X028005022

Ruiz-Ortega, F. J., Márquez, C., Badillo, E., & Rodas-Rodríguez, J. J. (2018). Desarrollo de la mirada profesional sobre la argumentación científica en el aula de secundaria. *Revista Complutense de Educación*, *29*, 559–576. https://doi.org/10.5209/RCED.53452

Siegel, H. (1995). Why should educators care about argumentation? *Informal Logic*, *17*, 159–176. https://doi.org/10.22329/il.v17i2.2405

Simonneaux, L. (2008). Argumentation in socio-scientific contexts. In S. Erduran & M. P. Jiménez-Aleixandre (Eds.), *Argumentation in science education: perspectives from classroom-based research* (pp. 179–199). Dordrecht, Netherlands: Springer.

Toulmin, S. E. (2003). *The uses of argument: Updated edition*. Cambridge, England: Cambridge University Press.

UNITAR. (2013). *UN CC:Learn - Resource guide for advanced learning on integrating climate change in education at primary and secondary level*. Geneve, Switzerland. https://doi.org/10.1109/50.588673