

APPLICATION OF FELTON AND KUHN'S FRAMEWORK FOR ANALYSING ARGUMENTATIVE SKILLS DURING A ROLE PLAY

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Argumentation has become important for understanding how people reason and make decisions about socioscientific issues. One challenge of science education is promoting argumentation practices in science classrooms and improving preservice teachers' argumentation skills, which is essential to reinforce their future teaching practices. In this paper, we analyse the preservice primary teachers' discursive processes when participating in a role play about nuclear power to identify their main limitations in argumentation practice. 28 preservice primary teachers from the University of Málaga participated in this study during the 2018/19 academic year. For data analysis, an adaptation of Felton and Kuhn's framework was applied. The results show that role play as a teaching strategy has favoured the use of counterarguments and counterarguments, although, at the same time, there is also a lack of use of dialogic resources to question the arguments of others.

Keywords: Argumentation, Socioscientific issues, Role play

THEORETICAL FRAMEWORK

In recent decades, thinking, argumentation and their relationship have become important topics in science education to understand how people make decisions and behave, to promote individuals' thinking skills (Chang & Chiu, 2008), increasing conceptual understanding of a science topic, improving understanding of the nature of science or developing citizenship values (Dawson & Carson, 2020). Promoting argumentative activities with preservice primary teachers (PPTs) is an important step to strengthen their future teaching practices, enabling the introduction of argumentation in basic education (Drumond-Vieira et al., 2015). In this sense, role-play games (RGP) are appropriate teaching strategies to engage PPTs in argumentation about socioscientific issues (SSI) during their training (Crujeiras-Pérez et al., 2020). However, it is not clear how students master argumentation skills (Chang & Chiu, 2008) and, in order to understand this, it is essential to analyse the argumentative processes that take place in a real argumentative context. Identifying the main difficulties faced by PPTs in argumentation is a key aspect to improve their training programmes, so that they can acquire the necessary skills for teaching argumentation in the classroom. Furthermore, the analysis of the oral argumentation skills of preservice teachers seems to have received less attention in the literature than other types of students.

AIM OF RESEARCH

This work examines the suitability of an adaptation of the dialogical analysis framework developed by Felton and Kuhn (2001) for the analysis in a multi-participant dialogical context, such as RPG, of the PPTs' main difficulties in arguing about a SSI about the use of nuclear power.

RESEARCH METHOD AND DESIGN

This study follows a mixed approach with a non-experimental design. 28 PPTs in year three of the Bachelor's in Primary Education at the University of Málaga participated in this study during the 2018/19 academic year. The RPG was about the debate on the agreement reached by the Spanish government and the country's major electricity companies to gradually phase out nuclear power production (RTVE, 2019). There were five roles against the use of nuclear power (ecologist, renewable energy scientist, member of the public, solar energy entrepreneur and politician from the opposition), five roles in favour (government politician, nuclear waste repository manager, nuclear scientist, manager of a nuclear plant and worker from a nuclear plant) and a role

of program presenter with a neutral position. The RPG consisted of three parts: 1) introduction to the RPG and assigning roles to PPTs; 2) preparation of the debate by PPTs from the perspective of the assigned roles; and 3) RPG staging. The RPG staging was video recorded and transcribed for further analysis. The data analysis consisted of identifying interactions between the participants by analysing their utterances (a piece of information provided by a person). For this purpose, we used an adaptation of the Felton and Kuhn's (2001) framework, which establishes three categories, each of them with different subcategories (not mutually exclusive): 1) Transactive questions (TQ), utterances that request a response from the partner; 2) Transactive statements (TS), expressions of the speaker's thoughts in response to the partner; and 3) Nontransactive statements (NTS), utterances that fail to connect to the partners' preceding utterances. For Kuhn and Udell (2003) TQ have a challenge function and TS an exposition function. This framework was chosen because it focuses on the analysis of dialogue at a high level of detail. Its use in situations involving large numbers of people and in SSI contexts is a novel aspect of the application of this framework. To this end, some modifications were carried out to adapt it to the context of this study that will be described in detail during the presentation. Finally, for the reliability analysis, three of the authors separately analysed a sample of 25% of the text transcribed (Wimmer & Dominick, 2011) from another RPG and the agreement percentages were higher than 71%. Disagreements were resolved through discussion among all authors.

FINDINGS

In Table 1 are shown the most relevant results. The PPTs show a high use of TS (111), followed by TQ (24) and, finally, NTS (23). Regarding the TQ, half of them are rhetorical questions, which the interlocutors are not always interpreted as questions to be answered. As for the TS, if we do not consider the subcategory Management, the subcategory Counter-A has the highest percentage of utterances. Given the high frequency of utterances in the subcategory Continue in NTS, the topics that these utterances addressed were analysed. The topics are not mutually exclusive and the system for analysing them can be found in Cruz-Lorite et al. (2022). The main topics of the ignored utterances are Waste and waste management (30%), Safety (25%), Pollution (20%), Employment (15%) and Politics (10%). The topics Energy supply, Reduced consumption, Continuous production and Resource depletion appear in 5% of the utterances.

Table 1. Frequencies equal to or greater than 3 of the subcategories of the dialogue building framework.

Category	Subcategory	Description	N
TQ	Clarify-?	A request for a partner to clarify his or her preceding utterance	4
	Question-?	A simple informational question that does not refer back to a partner's preceding utterance	3
	Rhetorical-?	A rhetorical question that does not necessarily expect a response.	12
	Others	Six subcategories with less than 3	5
TS	Add&Advance	An extension or elaboration of a partner's preceding utterance/An extension or elaboration that advances a partner's preceding argument	5
	Aside	A comment that does not extend or elaborate a partner's preceding utterance	7
	Clarify	A clarification of speaker's own argument in response to a partner's preceding utterance	5
	Counter-A	A disagreement with a partner's preceding utterance, accompanied by an alternate argument	34
	Counter-C	A disagreement with a partner's preceding utterance, accompanied by a critique	11
	Management	Management actions, e.g. giving a turn to speak, thanking the speaker, interrupting a participant, asking if it is possible to intervene, etc.	38
	Meta	An utterance regarding the dialogue itself (vs. its content)	5
	Others	Nine subcategories with less than 3	6
NTS	Continue	An utterance which is ignored by all the partners' next utterances	20
	Unconnected	An utterance having no apparent connection to the preceding utterances of either partners or speaker	3

DISCUSSION OF FINDINGS AND IMPLICATIONS

The use of Felton and Kuhn's (2001) framework, with the modifications included for this study, has proved to be useful in analyzing the different types of interactions that take place in a group discussion on the SSI of the use of nuclear power, extending the application that had been made of it in the research so far. The high number of utterances in the subcategories Counter-A and Counter-C point out that RPG is a good teaching strategy for PPTs show the highest levels in the learning progression in argumentation (Osborne et al., 2016). However, the low use of resources within the TQ category may indicate a certain inability of PPTs to question the others' arguments. Felton and Kuhn (2001) found that argumentative dialogues between teenagers were mainly expository (articulating and clarifying one's own position and perspective) while only a relatively small proportion challenged or tried to identify the weaknesses of the partner's statements. Therefore, the pedagogical implications of the results shown in this work would be directed "to effect a shift in the direction of an increasing proportion of dialogue devoted to challenge and a decreasing proportion devoted to exposition" (Kuhn & Udell, 2003, p. 1247). The most recurring topics ignored in the utterances were about environmental issues and it may also indicate that these are the most controversial topics, as the debate stops and restarts several times. They, therefore, reach a "dead end" at some point. These aspects will require further analysis to try to find out the reasons for these "dead end" points in what could be considered important aspects of this SSI. Finally, this study has focused on the analysis of the types of dialogic interactions, without assessing their quality from a structural point of view of the arguments, a task that is being carried out simultaneously (Cruz-Lorite et al., 2022). Other ongoing work focuses on the development of mobile applications for the practice and evaluation of argumentation in the context of role-play activities.

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REFERENCES

- Chang, S. N., & Chiu, M. H. (2008). Lakatos' scientific research programmes as a framework for analysing informal argumentation about socio-scientific issues. *International Journal of Science Education*, 30(13), 1753-1773. doi: 10.1080/09500690701534582
- Crujeiras-Pérez, B., Martín-Gámez, C., Díaz-Moreno, N., & Fernández-Oliveras, A. (2020). Trabajar la argumentación a través de un juego de rol: ¿debemos instalar un cementerio nuclear? [Teaching argumentation through role play: Should we create a nuclear cemetery?]. *Enseñanza de las Ciencias*, 38(3), 125-142. doi: 10.5565/rev/ensciencias.2888
- Cruz-Lorite, I.M., Evagorou, M., Cebrián-Robles, D., & Acebal-Expósito, M.C. (2022). Preservice primary teachers' argumentative skills during their participation in a role play on nuclear energy. In *30 Encuentros de Didáctica de las Ciencias Experimentales*. Melilla, Spain.
- Dawson, V., & Carson, K. (2020). Introducing argumentation about climate change socioscientific issues in a disadvantaged school. *Research in Science Education*, 50, 863-883. doi: 10.1007/s11165-018-9715-x
- Drumond-Vieira, R., Da Rocha-Bernardo, J. R., Evagorou, M., & Florentino-de Melo, V. (2015). Argumentation in Science Teacher Education: The simulated jury as a resource for teaching and learning. *International Journal of Science Education*, 37(7), 1113-1139. doi: 10.1080/09500693.2015.1022623

- Felton, M., & Kuhn, D. (2001). The development of argumentative discourse skill. *Discourse Processes*, 32(2&3), 135-153. doi: 10.1080/0163853X.2001.9651595
- Kuhn, D., & Udell, W. (2003). The development of argument skills. *Child Development*, 74(5), 1245-1260. doi: 10.1111/1467-8624.00605
- Osborne, J., Henderson, J. B., MacPherson, A., Szu, E., Wild, A., & Yao, S. (2016). The development and validation of a learning progression for argumentation in science. *Journal of Research in Science Teaching*, 53(6), 821-846. doi: 10.1002/tea.21316
- Wimmer, R.D., & Dominick, J.R. (2011). *Mass media research: An introduction*. Wadsworth.