TRACING STUDENTS' QUALITY OF ARGUMNENTATION IN SIMULATED PARLIAMENT ACTIVITIES

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The present research study reports the use of Toulmin's Argument Pattern (TAP) approach as a tool for tracing the quality of argumentation in science teaching and exploring its effective application in enhancing students' cognitive knowledge. The study is part of the European Student Parliaments project which aims at strengthening the dialogue between students and scientists throughout Europe. The context of simulated parliament procedures provides the ground for the teaching and learning of argumentation in an authentic context. In addition, it provides a structured frame for the informed and guided implementation of argumentation methodologies in science teaching. To address the research objectives analytical tools for evaluating the quality of argumentation and students' cognitive enhancement were developed based on TAP. The research findings show that there was significant improvement in the quality of students' argumentation and cognitive development regarding their critical approach to scientific concepts.

Keywords: Argumentation, EUSP, TAP

INTRODUCTION

Over the last decades at the heart of contemporary reform actions in science education is the tendency to focus on the effective teaching of science and promotion of scientific literacy (SL) in a way that authentically engages students rather than focus on the content of science teaching (Eurydice Network, 2011; Karisan & Zeidler, 2017). In this context of valuing and promoting scientific literacy, the argumentation approach has come in the foreground as a core feature accommodating the epistemology of science (Smyrnaiou, et al., 2015) and enhancing the acquisition of scientific knowledge (Erduran, et al., 2004; Sandoval, 2003). In Science teaching the argumentation approach is valued as a mainstream process in enhancing students' conceptual understanding (Mc Neil & Pimentel, 2010), highlighting the way scientific theories and concepts are created and tracking the way we come to acquire this knowledge (Jimenez-Aleixandre, et al., 2000). Through argumentation students can understand the tentative nature of science (Smyrnaiou, et al., 2015) and are empowered to acquire higher order skills related to analytical thinking, problem-solving and scientific reasoning (Sandoval, 2003).

However, argumentation should rely on certain conditions and criteria that guide its methodology and assure its contribution to effective learning. Although shaping an argument may lie on personal beliefs and attitudes it should follow and align to structured regulations and norms in terms of scientific accuracy (grounded on the scientific inquiry process), rational development within a scientific interaction and dynamism in its degree of irrefutability. In this context instructors should ground and inform their teaching on argument models since they project the analytical purpose of an argument and examine the validity, credibility and quality of the argument as a whole and of each of its components (Nussbaum, 2011). Therefore, the argumentation discourse needs to be applied not in an arbitrary way in the learning process but explicitly taught through task structuring and modeling (Scholinaki, et al., 2012; Erduran, et. al., 2004). In addition, to assure individual engagement in an argumentative process the application of authentic context is required since it manages to raise questions of ongoing inquiry and high complexity that enhance cognitive reasoning and reflective judgement (Jiménez-Aleixandre, Erduran, 2007).

In this paper our main objective is to assess students' argumentation discourse and cognitive development on applying Toulmin's model of argument (Toulmin, 2003) in structuring reasoning principles

that lead to a clear outcome and the effectiveness of the argumentation approach in enhancing students' knowledge construction. Towards this aim we have investigated the case study of the European Student Parliaments (EUSP) project in Greece which encompasses adequate features of Responsible Research and Innovation and can accommodate and promote the argumentation approach. The Greek Student Parliament is part of the project 'Debate Science! European Student Parliaments', initiated by Wissenschaft im Dialog in Berlin. This project aims at strengthening the dialogue between students and the scientific community in Europe. In the simulated parliaments students are highly engaged in parliamentary decision-making and argumentation processes as well as scientific research.

METHOD -THE PROJECT 'EUROPEAN STUDENT PARLIAMENTS'

In 2016, Greece had taken part for the second time in the EUSP project. The project was locally organized by Science View, an organization that promotes science communication activities between the scientific community and the wider public, and the Pedagogical Department of the National Kapodistrian University of Athens. The project was under the auspices of the Greek Ministry of Education and was addressed at students between 15 and 19 years old with interest in the functioning of democratic systems, science and learning about new topics. A significant number of schools had volunteered to participate from all over the country (16 local regions), and finally 433 students from 31 schools had participated in the final debate event. Students participated both in person as well as via the web through a specific web platform.

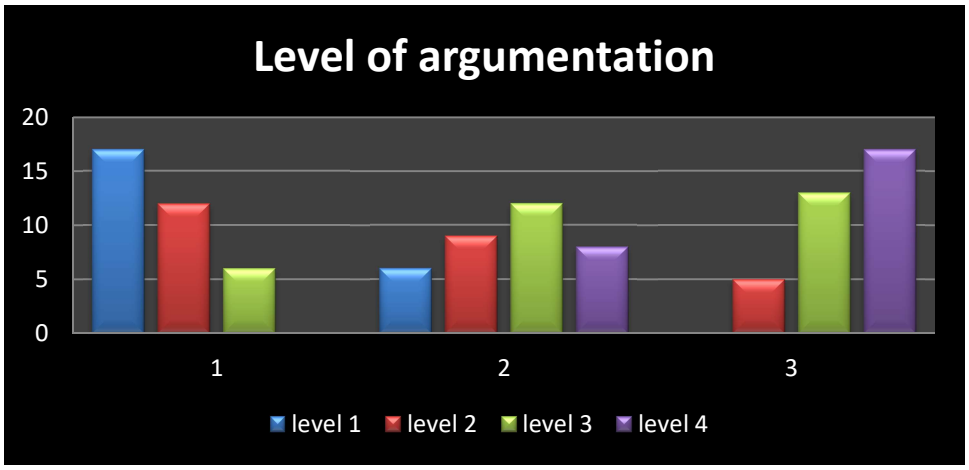
The methodological approach we have applied in our study was designed to provide us with both qualitative and quantitative measures of argumentation. That was accomplished by (1) tracing the distribution of TAPs in class discussions as an indication of the learning performance and (2) focusing on the nature of rebuttals in large-groups; assessing students' argumentation discourse and cognitive development. The teachers who were involved in the project supported their students in the inquiry phase and preparation for the national held debate event, guiding students on the key principles of the argumentation process following Toulmin's model of argument: claim, data, warrant, backing, rebuttal (Toulmin, 2003: 96). The teachers recorded the evolution of student argumentation in standardized reports throughout three time periods. During the Student Parliament process, there were five researchers responsible for tracking and evaluating students' working process and argumentation methodology and they also analysed the data from the teachers' progress reports. In addition to schoolteachers and researchers' regular reports, a process evaluation questionnaire was created to address students' beliefs about the argumentation approach as an effective educational practice in acquiring scientific knowledge.

RESULTS

The main objective of this research study is to explore the use of TAP as a tool for tracing the quality of argumentation in science teaching and explore its effective application in enhancing students' cognitive knowledge. In our research, TAP has been applied as a qualitative indicator of students' argumentation discourse and cognitive development both in class interactions among teachers and students and in large – group discussions occurring in simulated parliament debates among student groups from different school units. TAP projects the main features of an argument in terms of claims, data, warrants, backings, and rebuttals. To measure and explore the frequency in the use of an argument's features we indicated four levels of argumentation: (1) a claim versus a counter-claim/claim, (2) a claim versus a claim with either data, warrants, or backings, (3) a series of claims or counter-claims with either data, warrants, or backings and (4) a claim with a rebuttal/rebuttals.

Our research findings have indicated an improvement in students' development of argumentation discourse since there was registered a gradual rise in frequency of all argument principles (claim, data, warrant, backings) and extensive use of the fourth level of argumentation (Table 1).

Table 1. Chart showing frequency of each level of argumentation throughout the 3 time periods.



In addition, during the simulated parliament event, there was also a progress in the quality of rebuttals applied in students' argumentation discourse.

DISCUSSION AND CONCLUSIONS

In our research study we have explored though the framing of science teaching in the form of a simulated parliament the quality of argumentation in science teaching and its effective application in enhancing students' cognitive knowledge. Students were enabled to understand and experience in an authentic context the value of formulating valid arguments and correlating data with claims while controlling the credibility of their arguments and rebutting claims guided by concrete knowledge they had acquired. This way they managed to interpret their observations, reinforce their knowledge (Smyrnaiou, et al., 2015) and produce new frameworks as they were epistemically challenged.

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