

Argumentation at the table-talk level of middle school students participating in scientific cafés

Gerald P. Niccolai, Zeynab Badreddine, Christian Buty, UMR ICAR (Interactions, Corpus, Learning, Representations), CNRS - University of Lyon, 15 parvis René Descartes - 69342 Lyon cedex 07 - France,
Email: gerald.niccolai@ens-lsh.fr, zeynab_badreddine@yahoo.fr, christian.buty@inrp.fr

Abstract: "Scientific café" refers to the public discussion of socially pertinent questions which have scientific content in an informal setting, typically a bar. This scheme has been adapted to middle and high school class settings. This paper presents an experimental organizational scheme which uses electronic voting. The scheme is evaluated with respect to student engagement and participation, as well as the relationship between the preliminary, private discussion in the small groups and students' public space interventions.

Current practice

Beginning in 1997, scientific cafés have been developed as a means of engaging the general public in discussion and debate of scientific research. Stated goals of the organizers include not only the advancement of general scientific literacy with regards to current trends in research and technology, but also the reunion of individuals having widely different experiences and attitudes to discuss the social consequences of recent advances in technology. Stated otherwise, the scientific café has the objective of forming better informed, more engaged citizens by providing a context for rational discussion and debate of science related social issues. French curriculum standards echo this objective: starting at the middle school level an accent is placed on pluridisciplinary approaches (including social sciences) to the examination of complex issues such as global warming, genetically modified organisms in agriculture or sustainable development. Indeed, argumentation in class has been widely studied as a practice for building students' ability to make explicit their representation of facts and phenomena, validate common representations and articulate them to everyday experience. (For reviews of the study of argumentation in school setting facilitate a variety of teaching goals, see von Andriessen 2006 and Aufschnaiter 2008) For this reason, the format has been transposed to middle and high school settings with varying results ("café junior").

Under the classical organizational scheme of a junior scientific café, the organizer will invite two or three experts who answer questions which have been prepared by some of the students. Most often, an attempt is made to reproduce the café setting, and so the students are often arranged in a disordered fashion, in groups of 4-6 around tables, and they may actually be served refreshments. The basic interactional scheme of the scientific café is maintained: there is a public debate/discussion which is organized by a neutral leader who gives the floor in turn to experts and students and guides the advancement of the subject. There is however a second level of discussion in the scientific café, that is the small discussions held *sotto voce* around the tables. It is assumed that this private discussion space should enrich the public discourse.

Research-based development

The authors have been leading an action research project in collaboration with several nonprofit associations which aims at the adaptation of the scientific café format so as to better engender the engagement of the students in discussion and facilitate their participation in the public debate. A preliminary observation of current practice in café junior organization based on the scheme described above found a general lack of engagement on the part of the students in the subject. In short, the interaction was often reduced to simple question-response between confident students and the experts. This fell short of the organizers' ambitions (and the teachers' objectives) for the café format. We found that the presence of identified experts under this scheme was a major factor limiting student participation. We also observed the tendency of the students to discuss among themselves, and the tension that exists between the desire to foster discussion with the need for classroom order in order to have the public debate.

We proposed and developed a novel organizational scheme designed to relieve some of these obstacles. In the experimental, the scientific café revolves around the results of real-time polling of the students rather than interactions with experts. One subject has been fully developed and has been deployed (in six 8th grade classes, two hours of café each) using this organizational scheme. The title question of this café is "Why do people drink bottled water?" and the café is organized around four thematic phases: water on earth, water in your body, water in the city, water pollution. The café is run by a discussion leader who has some expertise in the subject of the café (but is not announced as an expert) who poses a series of multiple choice questions to the students using the presentation software included in the ActiVote (1) public response system. After reading each question, the leader explicitly allows time for small group discussion around the table before calling for a vote on the question. The collective results of the vote are immediately displayed. The discussion leader incites discussion,

particularly for opinion questions (see below), by asking for justification for both majority and minority responses.

Depending on the nature of the question, a public discussion of the result may ensue. After a question for which a single valid response is possible (e.g. “What percentage of your body weight is water?”), discussion is limited to resolving any misunderstanding on the part of students. In a typical thematic phase, four such knowledge questions will be followed by an opinion question, for which there is no single valid response (e.g. “In your opinion, which of these waste water sources is the most polluting.” – “bath water”, “toilet”, “car washing”, “dish washing”, “cleaning the floors”, “watering crops”). The students are given more time for private discussion before voting these opinion questions, and the public discussion of the results of the opinion polls represents nearly half of the time spent in the café junior.

Methodology

The scientific café corpus analyzed consists of three major elements: the questionnaire together with the individual responses of each student to each question as recorded by the ActivStudio software; the public debate as recorded by minimally guided video camera placed behind the students; and a sample of private space student discussion, recorded by unmanned hidden cameras and body microphones on each student at two tables. Primary analysis of the audiovisual corpus focused on identifying each phase of the event, notably the private space interactions. Independent schemes are used to code group leader and student verbalizations, each of which are evaluated quantitatively as indicators for the evaluation of the efficiency of the new debate organizational format (see below). Systematic transcription is limited to the short private space discussions. Cross analysis identifies relationships between most notable between private space utterances with not only the student’s anonymous electronic vote, but also with his eventual public space interventions.

Results and perspectives

As stated, the action research goal for this study is stated as greater student engagement and participation. We have developed criteria for the evaluation of these aspects. Engagement is evaluated by measuring the time that the students’ stay “on topic” during private space discussion versus time spent talking about extraneous subjects. Student participation is evaluated in terms of public space discussion: organizational schemes are thus compared through the actions of the discussion leaders (for example, how often must the leader solicit student interventions to keep the discussion moving) and through the nature of student public utterances (does the student make a statement, ask for information, refute another statement, ask for clarification, etc.). Early results indicate that the experimental café organizational scheme performs better than the classical café scheme as judged by these criteria.

The broader research subject considers finer aspects of students’ interactions during the event and the articulation between the informal, private space discussion and the more ordered public space discussion. Early analysis on the corpus (twelve hours of private space discussions) has identified episodes where individual students put forward first in the private, table-talk space tentative positions before intervening in the public debate. Of particular interest will be the incidence of group co-construction of arguments and the eventual role of peer validation as a factor leading to public space intervention. In an extension of our previous studies, (Buty, 2009) attention will also be given to the position adapted by the student with respect to his own responses: does he intervene publicly to justify or explain his own response or, rather, does he comment on positions he does not support? Does he identify with his true position, as recorded in the electronic vote?

Endnotes

(1) <http://www.prometheanworld.com/server.php?show=nav.15999>

References

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