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XIX IOSTE SYMPOSIUM

Transforming Science & Technology Education to Cultivate Participatory Citizens

Daegu, Korea, 23-28 August, 2020

A model to analyze attempt of Science Education to coincide with Participatory Education by schooling SocioScientific Issue : Case study of French lesson dealing with Vaccine Hesitancy

Olivier MORIN et Pierre Dutreuil

Abstract

Questioning contemporary stakes is questioning the future of a world made up of hybrid objects belonging both to the natural and the cultural, to the scientific, technical, political, economic and social fields. Insisting on the scientific dimension of such issues, Irwin (2001) names *scientific citizenship* the possibility given to non-specialist citizens to take part democratically in the choices of society in terms of technoscientific innovations. It requires an education whose modalities, such as the schooling of socioscientific controversies, deserve to be questioned. In this paper, we will consider the articulation of science education and political education approaches, drawing on the typology of Levinson (2010). We offer a model to characterize the strategies adopted *a priori* by the teachers and to compare them *a posteriori* with the pupils' reactions. A study of two biology sessions during which 13 to 15-year-old French pupils discussed with their teacher the delicate issue of vaccine hesitancy shows the potential interest of this model to characterize the orchestration of surveys (Simonneaux, 2019) about Socially Acute Questions.

Keywords: Biology Education ; Citizenship Education ; Socially Acute Questions ; Vaccine Hesitancy

Rationale

Questioning contemporary stakes is questioning the future of a world made up of hybrid objects belonging both to the natural and the cultural, to the scientific, technical, political, economic and social fields. It calls for forging links between knowledge (scientific, technical, professional, local, traditional) distributed among stakeholders and particular to specific situations. It also leads to adopt and defend delicate positions regarding complex problems. Insisting on the scientific dimension of such issues, Irwin (2001) names *scientific citizenship* the possibility given to non-specialist citizens to take part democratically in the choices of society in terms of technoscientific innovations. It requires an education whose modalities, such as the schooling of socioscientific controversies, deserve to be questioned. Considering the orchestrations of investigative approaches (Simonneaux, 2019) about Socially Acute Questions (SAQ), we are focusing this study on the articulation of science education and political education approaches.

Framework

We draw on the typology of Levinson (2010). He distinguishes four types: the *deficit framework* where the knowledge taught are that produced by science and delivered to teachers, who in turn deliver them to students, the *deliberative framework* where inquiries to solve



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scientific problems are favored, but without debating the societal issues, the science *education as praxis* model, where the knowledge taught are not only that which generate consensus and the knowledge discussed are not only scientific knowledge, and the *dissent & conflict* model which questions the socio-political context of the emergence of socioscientific controversies. In order to constitute an interpreting grid of teaching-learning situations, we have translated each of these types into indicators to characterize on the one hand the specificity of strategies adopted *a priori* by teachers, on the other hand *a posteriori* the pupils' reaction in these situations. Thus, our grid typically considers four items: the educational objectives targeted by the teachers and the nature of the knowledge to which the investigations they submit to their students relate, the nature of the knowledge the students actually mobilize and their mode of effective apprehension of these knowledge. For this communication, we propose to test this model by analyzing a case study.

Case study

Context

The case study deals with two biology sessions conducted with French pupils aged 13 to 15 (4^o middle school class), built within the framework of the CEHVAC project (Controversy, Teaching and History of Vaccination) according to a design-experiment approach (Cobb, Confrey, Lehrer, & Schauble, 2003; Sanchez & Monod-Ansaldi, 2015) aiming to be both collaborative and iterative. For this first iteration, the pupils worked with their teacher on the delicate question of vaccine hesitancy that we acknowledge as a SAQ. Indeed, this question is exceptionnally delicate in France (Larson, et al., 2016 ; Raude & Mueller, 2017), as this country is worldwide a specifical case of such a Vaccine Hesitancy: according to Welcome Global Monitor 2018 (p 112) a very large part of French people (33%) disagreed in 2019 that vaccines were safe, and (19%) that they were effective. The class focused for two periods of one hour and a half on the Human Papilloma Virus vaccine recommended for adolescent girls (and soon for adolescents boys), as its effectiveness and safety are questioned in the media.

Method of Analysis

After a cutting-out into episodes based on the activity instructions given to the pupils, we've analyzed each of the two periods. The grid is applied to each of the episodes: i) the wording of the instructions allows us to fill in the first item (the targeted educational objective), ii) the documents provided to the pupils allow us to fill in the second item (the knowledge on which the teachers want the students' investigations to focus), iii) the pupils' questions and remarks are retained for the third item (the nature of the knowledge the students actually mobilize), and iiiii) the pupils' written and oral productions are used for the last item (the effective way of understanding this knowledge by the students).

Findings

We will present and discuss the main results of the crossing of these four analyzes in terms of the model's potential to account for an orchestration of investigative approaches. First, the case study shows the differences in the nature of the knowledge-investigative objects perceived by the teacher and the pupils and the possible adjustments that it allows. Second, it also shows that the complementarity and the articulation of the two strategies adopted by the



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teacher helped the pupils to identify stabilized knowledge but also to problematize a controversial knowledge as well as to consider their participation in the debate with dynamic positions subjected to re-consideration.

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