



Controversy Mapping for Studying Socioscientific Issues: Case Study of a Local Problem in Spain

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Abstract

Learning science implies learning to transfer scientific models in order to analyze contextualized scenarios and make decisions. In science education, this aspect is well represented by science learning activities around controversial socio-scientific issues (SSI). The approach that press takes on news on SSI can be a starting point and a driver of learning to develop scientific literacy throughout the population. Such news on SSI can be used in the science classroom to show to the students the different points of view on these science-in-the-making subjects and their social repercussions.

This study is part of a larger project with the objective of identifying indicators of SSI in the written press, applying those indicators to a concrete topic and analyzing their usefulness for generalizing identification of any topic in the press as a SSI or not. Hence, in this paper, we attempt to fill the gap existing in how a subject is identified as a SSI, showing some new indicators for news on SSI and moreover presenting the use of the "Controversy Mapping". The "Controversy Mapping" methodology allows us to carry out a depth study on SSI analyzing the links among the networks of actants, types of event of the news and socioscientific trends in the news. As a result after applying this method to our case study, the case of water in Almería (Spain), we find two new SSI indicators generalizable to other subjects. Therefore this methodology is a good instrument to study news with SSI that teachers can implement in the science classroom in order to study the different dimensions of the SSI as well as the complexity and diversity in the discordant points of view on a SSI.

1. Introduction

This study is part of a wider research project for the purpose of identifying indicators of socioscientific issues (SSI) in the written press, to apply those indicators to a concrete topic (water) in the local press and to analyze their usefulness for generalizing identification of any subject in the press as a SSI or not. We carried out our research looking for SSI indicators trying to fill the gap that exists concerning what determines a SSI. From the point of view of relevance, this has important repercussions on the public's understanding of science, and in schools, the selection of news items showing SSI must be the first step for any teacher who wants to use the press in the science classroom [1]. We selected a subject in the local press for our study because the subject taken into the science classroom must be close to the students and because local newspapers are usually among the resources available in any school.

The subject of water was chosen for extracting SSI indicators because of its relevance in the province of Almería (Spain) both due to the high demand by intensive agriculture and the social perception of a water deficit - it is one of the provinces with the lowest rainfall index in Europe.

In addition, the debate created in 2004 by the repeal of the National Hydrological Plan (PHN) caused strong national debate because of the cost and environmental damage the transfer would cause.

All of the above led us to believe that the subject of water could be a SSI that appears in the local press, and which therefore, could serve as our case study for identifying SSI indicators to verify whether it is in fact an issue.

In this paper, we focus on the links among indicators of issues already found in a previous study [2], and on the relevance and potential of the methodology used for applying them in the science classroom as tools for studying SSI.

2. Rationale

Scientific literacy of the general public serves as a context for this study, as it justifies the attempt to advance toward a more social conception of science and is one of the major goals of science education [3].

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We believe that SSI, as problems related to science and society could be drivers of scientific literacy [4,5].

If the priority goal of teaching science is to educate citizens who are able to confront modern society, education based on SSI explicitly approaches the challenge of educating students to be able to negotiate science-related questions. These questions show the need for science literacy to concentrate on the nature of situations with a scientific component, situations in which the students are going to find themselves as citizens, and which involve more considerations than just those related to science. Although many science teachers may be in agreement with this goal, those who consider it a priority goal are still in the minority because more importance continues to be given scientific content [6].

3. Methodology

A sample of 60 news items were selected from two local newspapers assembling all the news related to our topic during the month of March 2004. This period was found by the “witness-news” methodology [7], which enabled us to study the frequency of news on a timeline. This is how we found the month in which the increase in news on this subject was strongest in the reference national newspapers. Later we extrapolated this result to the local press, studying the controversy related to water during this period.

For an in-depth analysis of our subject during this period, we used “controversy mapping”, developed by Bruno Latour and Michelle Callon, which is an adaptation of the Actor-Network Theory [8]. We plotted the most relevant issue indicators already determined on this map as described below.

3.1 Actants and Actants Networks

According to the Actor-Network Theory, actants are the epicenter of science social studies [9] although each on their own does not make up an SSI indicator. The SSI indicator is the relationships that are established among the different actants - actants networks.

The actants networks intervening in the water issue were found without setting up previous categories, grouping them by their similarity. In this case,, we started out from the hypothesis that, “dispersion in the actants networks indicates that the water topic affects many actants, and therefore, is a SSI, as many interests are involved”.

We found a total of 17 actants networks (of 69 news items in this sample). The wide dispersion of networks demonstrates that the subject of water requires the support of numerous actants who are interested in its consolidation for different reasons, showing that the controversy moves from one context to another, attracting the attention of a large number of actants.

3.2 Types of events in the news

We considered five types of events to analyse this item: “innovation/research”, “political-economic”, “politics-investigation”, “public information” and “negative” events [10]. For the topic studied, water, to be a SSI, related news would have to be more related to politics than other types of events since that type of event demonstrates a much more “conflictive” context and generates controversy. Therefore, there has to be a greater concentration of the “political-economic” type of event showing the controversial nature of the news. For the sample selected, all the news concentrates on political-economic events (85.5%) and innovation-research (14.5%) showing the existence of controversy.

3.3 Socioscientific trends

We analyzed the news items in the sample studied for socioscientific trends and found those that posed controversial approaches. To do this, we grouped the possibly controversial approaches to water that appeared most by their similarity, forming categories and finding keywords that gave us an idea of the controversial issue in the news.

The links among these three SSI indicators: actants networks, types of event and socioscientific trends were plotted using UCINET 6 [11].

4. Analysis, results and educational applications

To show the results, we have separated the links between actants networks and types of event (Figure 1) and links between actants networks and socioscientific trends (Figure 2).

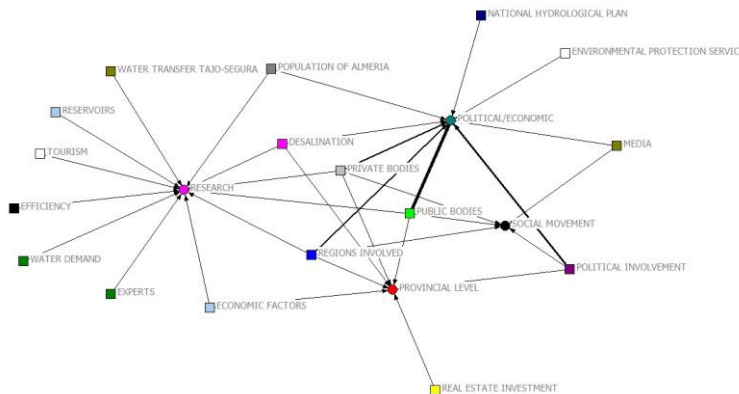


Figure 1. Map of links between actants networks and types of event

We obtained a map where the 17 actants networks found (squares) and four types of events (circles), which make up the nodes on the map are represented (Figure 1).

The actants networks which show the most connections with types of events are Public bodies, Private bodies and Regions involved appearing in “political-economic” events or related to “research”. That is, of the 17 actants networks, only five interact with more than two types of event.

The map in Figure 2, where the 17 actants networks (squares) and the five socioscientific trends (circles) are represented, shows the links between actants networks and socioscientific trends.

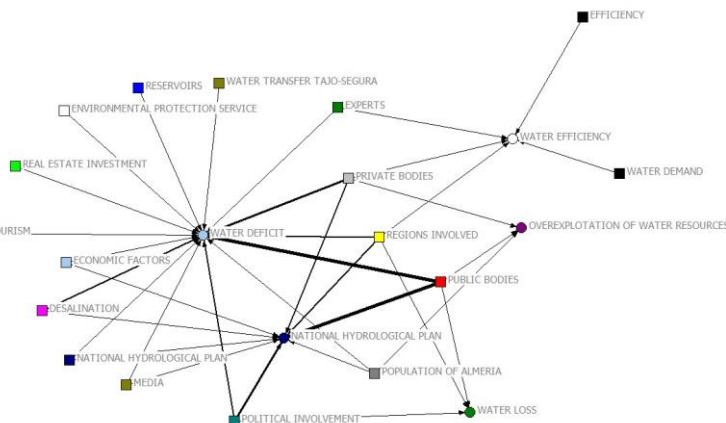


Figure 2. Map of links between actants networks and socioscientific trends

As in the previous map (Figure 1), the actants networks with the most interactions with socioscientific trends are still Public bodies, Private bodies and Regions involved, with four or more links with socioscientific trends as their common denominator, such as the PHN or water deficit. If we look at the trends on the map, these two (PHN and water deficit) are linked to most of the actants networks (15 and 9 links, respectively). If we exclude the nodes related to networks which are only linked once or twice to trends, the issues map would change slightly, and “water deficit” would be the most common trend.

The map characterizes the existence of an SSI and shows its real nature in the environment of our study: the local Almería press. One of the most controversial nodes, as expected, is the PHN, since the news items selected correspond to the period when controversy in the national press on the political debate was at its height, however, there are two “native” trends, which are water deficit and water efficiency, two alternative conceptions well rooted in the population of Almería related to low rainfall in the province of Almería.

The “mapping controversy” could be an important tool for studying the news with SSI. On the one hand, this method allows to study the different points of view, arguments and evidences of a SSI (e.g. global warming) hence, mapping controversy could be an innovative instrument to study some characteristics of the nature of science. On the other hand, this method offers also an excellent



opportunity for teachers to engage students in the great social debates, identifying the different interests in play, participating in debates related to science and technology and making critical, fundamental decisions.

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