Analysis of Scientific Literacy in Reader Comments to the Coverage of Animal Experimentation in the Hebrew Online Media

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Abstract

New media platforms enable proliferation of available spaces for public discourse, while exposing users to complex, contradictory and sometimes unreliable information. One of the goals of formal education for science literacy is to provide the public with appropriate skills which enable engagement with real-world science related issues. Therefore, public discourse in authentic online media environments can be used as an indicator of the relevance and applicability of science education. Readers' comments to articles on animal experimentation (AE) in a leading news website were examined. A year worth of widely read Israeli online news site (ynet.co.il) coverage of Animal Experimentation and its subsequent reader comments was analyzed for the use of scientific concepts in relations to the articles' content and to readers' position presented. The levels of scientific concepts appearing in the articles and in their comments were classified according to their place in the Israeli science curriculum. The findings indicate that the focus of the article – directly concerning AE or traditional science stories involving AE – and the attitude presented in the comments, were correlated with the level and the number of scientific concepts. Identifying the factors affecting science knowledge expression in readers' comments enables creating guidelines to encouraging informed citizenship.

Keywords: Scientific literacy, New media, Public engagement in science.

Rationale

Technological developments expanded the available platforms for learning science and for active participation in decision making on science issues. The internet triggered proliferation of available spaces for public discourse, allowing a variety of new audiences to take part, and making it increasingly easier to access multiple and contradictory messages in the public sphere, exposing users to complex, contradictory and sometimes unreliable information. Expressing opinions in socio-scientific issues during a public debate requires scientific knowledge. Readers comments (Talkbacks) in online news sites enables investigating aspects of science learning, and exploring skills used by the public to set positions and to make decisions on conflicting issues. Thus it may shed light on the on science education as promoting informed citizenship. Characterization of public's application of scientific knowledge, inquiry skills and attitudes in online discussion, will be based on the well developed goals of science literacy. This study presents an analysis of reader's comments in public discourse on the bioethical issue of animal experimentation in a leading news site. The study examines the expression of scientific literacy, as defined by the formal Israeli biology curriculum, in an authentic public discourse at informal internet platform.

Background

The Internet triggers numerous cultural and social changes; some of them enabled by the new media. The term "new media" refers to a wide range of changes in media production, distribution and use. The changes are beyond technology. They are textual, conventional, and cultural. One such change is the proliferation of available spaces for public discourse, allowing a variety of new audiences to take part. Another change is an increasingly easier access to multiple and contradictory messages in the public sphere (DiMaggio, Hargittai, Neuman, & Robinson, 2001). The new media democratizes public discussions in science while exposing users to complex, contradictory and sometimes unreliable information. Therefore, the internet, especially reader comments (Talkbacks) in online news sites, enables investigation of cognitive aspects of learning as reflected in the public sphere (Laslo, Baram-Tsabari, & Lewenstein, 2011).These developments affect the lifelong learning, and need to be considered in curriculum design.

Reader comments, usually referred to as 'talkbacks' in Israel, quickly became a dominant phenomenon in the Israeli media, more than in other countries (Goldshmidt, 2006; Videl, 2006). Most comments are authentic and spontaneous, and used to voice an opinion, elaborate, or correct an error, usually within one day of an article having been published. The talkback system provides a rich data source for analyzing formally desired learning outcomes in science related discussions in an authentic environment.

Science literacy

During the 1980s and the 1990s the goals of science education were changed from teaching more and better scientists to educating all citizens (Lopez & Schultz, 2001; Stringer & Warren, 2002). As a consequence, education for informed citizenship, knowledge-based decision-making, application of scientific knowledge and ways of thinking to everyday life – became the main goals of the science literacy movement (Hurd, 1998; J. D. Miller & Pardo, 2000; Ryder, 2001). Feinstein (Feinstein, 2011) suggested making science literacy a meaningful educational goal by redefining it based on the actual uses of science in daily life. Consequently, educators must pay attention to the ways in which laypeople become involved in science.

'Public Engagement with Science' is a relatively new academic field, which explores ways to improve the engagement of different publics with science, and study the interaction between the public and the world of science (Lewenstein, 2011; S. Miller, 2001). The new media enables public participation in scientific activities, often driven by a commitment to "democratizing" science, and enhancing public participation in science policy. 'Public Engagement with Science' provides a perspective to examine the use of scientific literacy by public engaging in the new media.

Animal experimentation

Experimental medicine has been based on animal experimentation, throughout the history of mankind. Today, along with other methods, animals are still a significant part of the medical research. The modern debate about animal experimentation revolves around the questions of animals' consciousness and rights, animals' suffering, and the value of scientific knowledge gained in animal research (Grayson, 2000; Monamy, 2000). Over time there has been a general movement towards a less positive attitude to animal experimentation, especially among women and younger people (Birke, Arluke, & Michael, 2007). There are conflicting results regarding the role of scientific literacy in determining attitudes towards animal experimentation (Birke et al., 2007; Grayson, 2000).

Research Questions

In order to learn about the role of technology in enabling public engagement with science, we ask how scientific literacy, in accordance with the goals defined in the formal education, is relevant to public discussion on web platform. In this study specifically, we ask (a) to what extent responders to news items on the issue of animal experimentation, use formal scientific knowledge? and (b) how do factors as articles content and responders' attitude affect the science concepts' used by readers?

Methodology

Our interest in the expression of formal knowledge in online discourses meant that we wanted to know how the content of the article shaped the expression of scientific knowledge in public discussion that followed it, and how the attitude of the commenter affect the extent and level of scientific concepts.

Sampling

All animal experimentation (AE) related stories published in the course of one year (July 2009 – July 2010) were collected from *Ynet,* the most popular Israeli online news site, along their 2,448 reader comments. Of these, 15 stories were directly concerning AE (e.g. 'Britain: record number in animal experimentation', published 26 July 2009), and 13 were science stories involving AE (e.g. 'Peter Pan syndrome in apes', published 1 June 2010). The number and levels of science concepts were analyzed. More detailed analysis of the Attitudes toward AE and the development of the discourse were conducted in ten of these articles and their 684 comments that were selected by quota sampling.

Data analysis

Attitudes: The comments were classified as either (1) approving AE (2) against AE (3) no opinion and (4) complex position. Inter-coder reliability was established by two independent coders on ten percent of the comments (Cohen's Kappa 0.85).

Concepts Index: In order to describe the level and the number of science concepts that appeared in the comments, an index was developed. First, all science concepts were identified, then new concepts which were not previously introduced to the discussion in the article or comments ('new') were separated from science concepts that were already used ('reused'). Science concepts were then classified according to their place in the Israeli biology curriculum: Elementary school (e.g. health, raw material); Junior high school (e.g. electrodes, carbon dioxide); High school (e.g. immunology, reliability of experiment), and concepts in an academic level (e.g. thalidomide, f-MRI). Each reader comment was then assigned a 'science concepts score' based on the number and level of science concepts it introduced to the discussion, and the number of science concepts reused:

Science concepts score = (no. of new Elementary school level concepts)+2(no. of new Junior high school level concepts)+3(no. of new High school level concepts)+4(no. new Academic level new concepts)+(no. of reused concepts of all levels)

Inter-coder reliability for identification of scientific concepts was established based on independent coding of 20 percent of the items by two coders (Cohen's Kappa 0.94). Inter-coder reliability for the classification of the scientific concepts, according to their level, established by two experienced biology teachers (Cohen's Kappa was 0.97).

Two tailed chi squared tests were used to analyze the distribution of the attitudes toward the issue. Two tailed t-test were used in the analysis of the science concepts index, and Pearson's correlation were used for the analysis of distribution of science concepts.

Results

Science concepts level in the articles and the comments

In reaction to media coverage related to animal experimentation, 2,448 reader comments were submitted. A total of 304 scientific concepts were found in the articles and 409 scientific concepts were found in readers' comments. The concepts were classified to levels according to their position in the science curriculum. Sixty five percent of the scientific concepts that were used in the articles and 65.7% of the concepts in the comments were classified to the high school and academic levels. At that level (above grade 10) science study is elective in Israel. Therefore, it is likely to assume that only a small part of the public have required the knowledge needed to engage in the authentic AE debate while in school. A distribution of concepts levels, shows high correlation between the science concepts used in the articles and in reader comments ($r = 0.96$, fig 1).

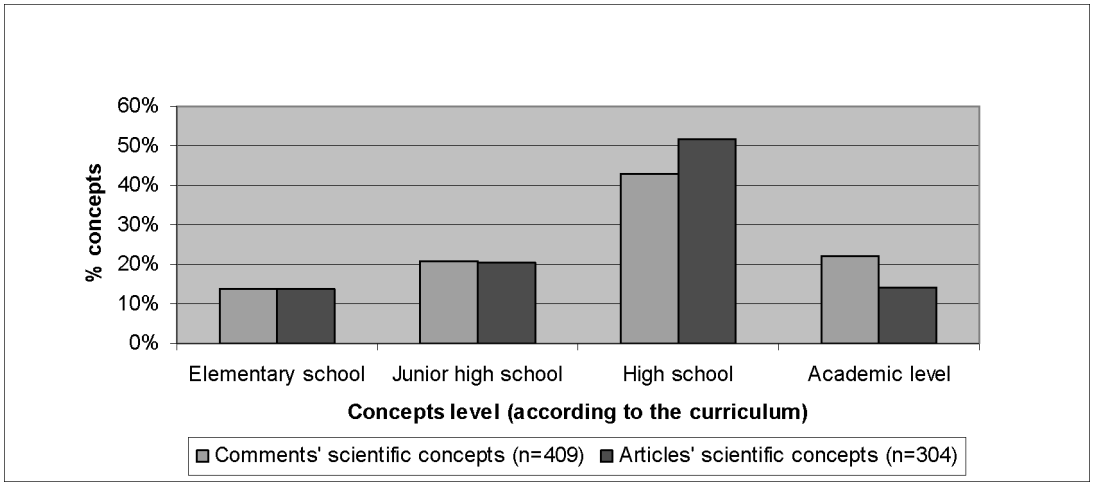

Figure 1. Distribution of scientific concepts' level in articles and reader comments

Further exploration of ten articles with 684 comments was conducted.

Attitudes

Attitudes expressed towards animal experimentation in readers discussions vary according to the item focus (figure 2). Stories about animal experimentation are followed by majority of opposed positions, while discussions following traditional science reporting presented more balance between for and against positions, and about a third of the responders did not express any opinion ($P<0.001$, Chi square test, $Chi=29.46$, 3df). Only 16 comments out of 684 comments expressed complex position (e.g. *"We should distinguish between luxuries and life-saving medicines. In the first category there is no justification (and need) for animal experiments, the other is justified by saving life, but we can reduce the use of animals"*).

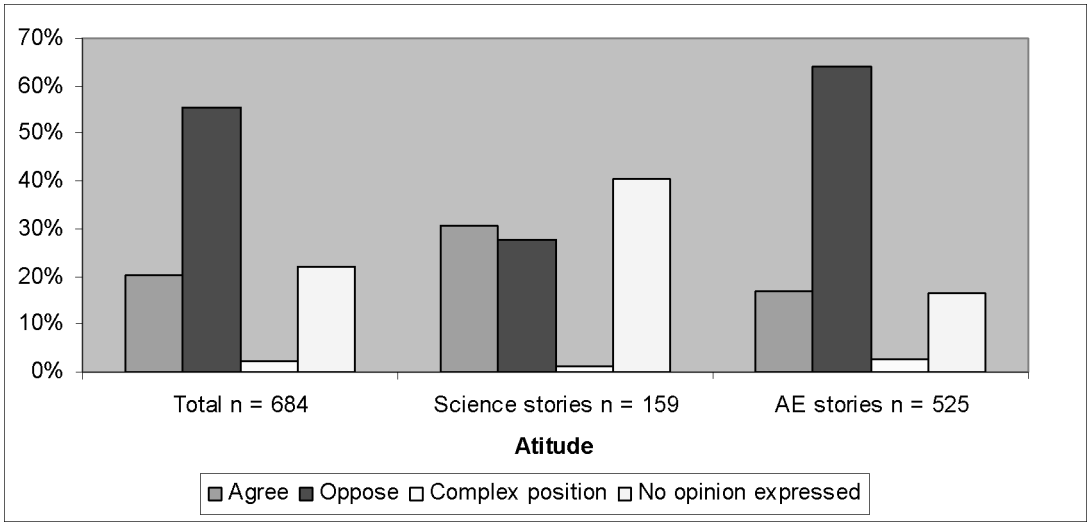

Figure 2. distribution of attitudes toward animal experimentation in the comments according to the focus of the article

Science concepts index

Science concepts index (figure 3) indicated that responders who agree with AE tend to use more scientific concepts and higher level concepts than responders who opposed them ($p < 0.05$, paired 2 tailed t test, $t = 2.9$). Responses to articles focused on AE stories used more and higher level scientific concepts, compared to responses to articles focused on science stories ($p < 0.01$, independent 2 tailed t-test, $t = 2.9$).

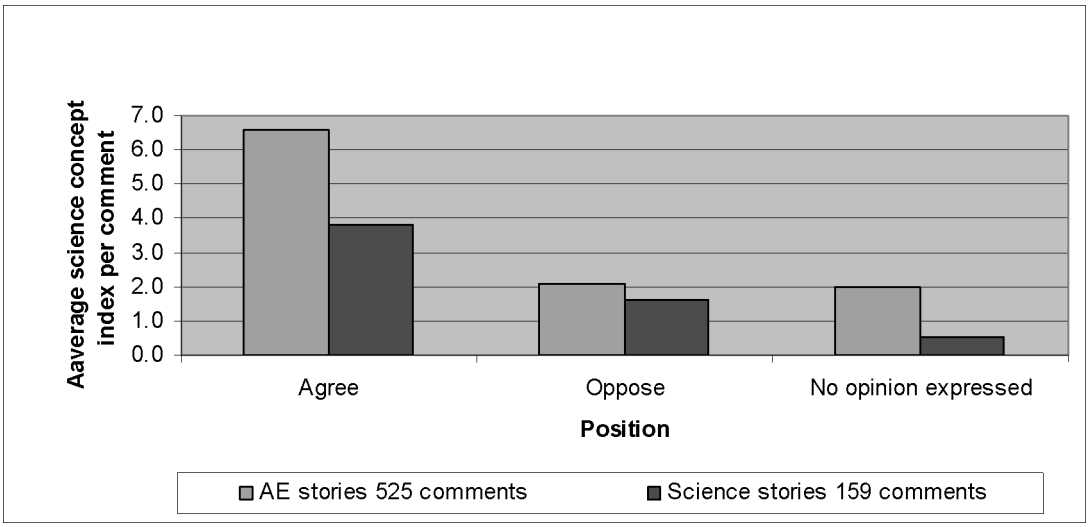

Figure 3. Average science concepts index according to position of the comment

Comments which voiced a strong opinion (for either side) showed significant higher concept index than those who did not ($p < 0.05$ paired 2 tailed t-test, $t = 2.4$).

Discussion

The goal of this study is to demonstrate how the affordances of the new media provide a platform for public discussion of a science related issue, and to study its relations to the scientific literacy required for informed participation.

News websites enable readers to express their position to science related content.

Our data suggests that the article's focus and responder's attitude, both affect the expression of science knowledge, as measured by the number and level of scientific concepts used in the comments.

Responses to AE stories tend to display more resistance to AE than comments to traditional science stories. This can be explained either by different population of responders, or by adjusting the response to the spirit of the media coverage. Complex responses indicate a high level of argumentation (Toulmin, 1958), but only few such reactions were found (2%).

In a debate on socio-scientific issue, such as animal experimentation, most scientific concepts used were above the level of the compulsory science curriculum. This raises a question regarding the relevance of the compulsory science curriculum to educating informed public which is able to engage with controversial socio-scientific issues, such as animal experimentation.

Bioethical issues are by nature multidisciplinary; therefore the use of scientific concepts is not the only indicator of the comment's level. This study is a part of a wider project which explores also reasoning skills and perceptions of science in the comments. In a previous paper (Laslo, Baram Tsabari & Lewenstein) we explored the scientific and ethical dimensions of the discussion.

One of the limitations of this study is the choice of animal experimentation as a topic. It is a uniquely emotional issue, which involves many stakeholders. Therefore, public authentic discussion around other socio-scientific issues should be studied as well.

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