

The role of science history for changing the self-image of science

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The science field containing subjects like chemistry, physics and biology is a field which usually is conducting research without an interest in history. Rather the main focus of such subjects is to describe the present phenomena and to try to explain their causal determination. Of the same tenor science teaching is aimed at informing the students about the current results of that research and the latest research methods usually used in the current research.

Against that background: Why it could be useful to teach history of science in the science field? And why could that be of benefit in the context of teaching gender studies in the sciences? In my following input I want to answer that questions.

My main argument is that to teach science without history delivers the notion that science is an activity without context. Only the method, to be more specific the continuing progress of the method seems to be the reason of the changing scientific theories. And secondly conducting science seems to be only a process of accumulating knowledge and dropping false assumptions. A third effect of the absence of history in science teaching is the promotion of the belief that doing science is a linear and rational ascension to the top of a hill, in the direction of the single truth about nature as such.

But science is like other human efforts an intellectual and practical work which is done by concrete persons who are embedded in discourses of contemporary beliefs about the world and about gender. And these concrete persons itself are allowed to do science due to their social status and could bring specific interests in their research and perspectives on the object of research. And - additionally - the criteria of being allowed to do science change in history too and so do the perspectives and interests due to the changing staff.

History of science can point out all that aspects: that science is a human endeavor which is influenced by social and cultural concerns and which is done by changing organization structures of the staff. With science history it is possible to show that doing science is not a linear ascension in direction to one truth but a permanent controversial discussion about the possibilities of interpreting phenomena. And the decision of choosing one interpretation as the best - that means the closing of a research process - could be dependent on very different and contingent factors, for example special social interests and beliefs, the degree of social and

scientific acceptance of a scientist, the possibilities to spread informations about the results of someone's research to the community and many other context conditions.

Teaching history of science therefore has the effect to demystify science (vergl. Höttecke et al. 2012). Doing science can't be no longer depicted as an effort of a few Geniuses or strange persons, mad scientists, but of a community of usual persons who are just interested in phenomenons of nature. And their endeavor can be shown as an often nonlinear way of searching, trying, failing, being irritated, changing, beginning again. Further conducting research especially since the 19th century can be shown as a group process with special social dynamics. That means that not one person by its own was and is successful but only a special composition of a collective was able to find a special result. And relating to the research process: instead of the idealizing black boxing, that means the concealing of the concrete and complex processes which take place when conducting empirical research historical case studies can give an insight in doing science as an endeavor not out of this world, not a mysterious procedure of witchcraft for what extraordinary und unreachable abilities were needed. And last but not least: scientific results and theories don't have the status of unchangeable and awesome truths any more that have to be accepted but instead of that they can be considered as the temporary result that was produced in the context of specific social, technological and institutional conditions and therefore can be traced back to that but also can again and again be changed and negotiated in the context of new conditions.

Why these benefits of teaching history of science are also important for teaching gender studies in science? I think you can find benefits for all of the three different levels which usually are discussed in the Gender Studies which are related to science: a. The staff level, b. The level of the scientific content, c. The level of epistemology.

Ad a. The staff level: As mentioned before History of science can show that the criteria of participating to science has changed relating to the social values and the gender order. That means that the current gendered staff organization in science is not reflecting biological given abilities but is a social developed order. This awareness can encourage persons who are underrepresented in some science fields to have confidence in their personal abilities and interests and to take up a profession in that range. In my courses where I'm teaching history of science especially female students reported, that they felt relieved and unburdened after learning about the social reasons of the organization of the staff in science. So they could analyse and blame the institution for hindering conditions for women and not question themselves any more for a biologically based weakness.

Ad b: The level of the scientific content: History of science can also show that the theories of science, especially the biological ones relating to sex traits are not fixed and just true and unevitable, but the result of a complicated technical, skilled and social process which depends on many factors. So instead of telling the truth about the bodily fate every theory relating to the difference of the sexes can be questioned in regard to its way of becoming in a complex context. Everyone, especially persons who are trained in science, are therefore requested to scrutinize the way of the becoming of a theory and to criticize a possible gender bias which can be imported into every biological theory. Particularly students who have experienced sexism and / or racism reported back in my courses that the historical perspective relieves them from the helplessness against the argument, that biology has provided evidence for clear facts of difference, especially difference for abilities for example by arguing with evolutionary theory of race and sex evolving. Instead of that studying the history of science leads to the facility to study the premises and the making of such theories and to evaluate and criticize every theory within the horizon of the contemporary technical and social possibilities - and finally to intervene with another nonsexist and nonracist theory.

Ad c. The level of epistemology. Learning something about the history of science changes the naive image of science as a kind of truth machine. Instead of that the responsibility of each person or group who conducts science comes into focus. But to be responsible for the results of the own empirical research means to be able to reflect it against the background of the social and cultural context. That reflexion cannot be developed with scientific means, so that the history informed scientists are led to collaborate with the humanities, especially with gender studies to learn about the ways the social gender order influences the research process. So at least teaching history of science in the science field can rise the acceptance of gender studies and support the transdisciplinary discussion and exchange of knowledge between the sciences and gender studies.

In sum I believe that teaching history of science in the field of the sciences can be a very appropriate means to support and encourage the underprivileged in that field and to foster a useful collaboration between science and gender studies to develop a more reflexive science.

Literature

Höttecke, D., Henke, A., Riess, F. (2012), Implementing History and Philosophy in Science Teaching: Strategies, Methods, Results and Experiences from the European HIPST Project, *Science & Education*, 21, 1233–1261.