TEACHING WITH ASTROBIOLOGY. ENHANCING SCIENCE AND TECHNOLOGY AWARENESS IN HUMANITIES AND SOCIAL SCIENCE STUDENTS.

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1. Introduction

In a preliminary empirical study of social-science students enrolled in teacher-training programs at two German universities, the authors have found a disparaging view of technology and science among said students. Their material knowledge of technology and science is the result of content they learned in highschool themselves. After having graduated, they chose social sciences or humanities as their subjects. There is little or no overlap between science and engineering subjects and social-science and humanities subjects in teacher training programs. That is not institutionally aimed for, but rather the consequence of the students choices. The consequence for science- and technology awareness among the students is problematic, to say the least. While their knowledge of science and technology -being the product of high-school education - is often not up to date and also lacking in current developments, their moral and ethical judgement about the implications of scientific research and use of technology is strong.

The preliminary study also showed, that the students are interested in new technological and scientific developments, they just lack the ability to include this into their world-view, which is very strongly influenced by their choice of subjects in the humanities and social sciences. Teaching these students has convinced the authors, that their lack of technology and science knowledge combined with their inherent tendency to judge science and technology from the point of view of their respective field impairs their ability to taken an adequate part in science and technology discourse. Their awareness and thus their competence to rationally engage with science and technology is lacking.

That is in part due to the depiction of science in technology in humanities and social-science courses, on the other hand due to a lack in current science and technology education as part of a humanities and social - sciences program. As the authors study has shown, these students are really interested in science and technology, they just lack key competencies to make an analytical connection between their field of choice (humanities and social sciences) and technology and science, without resorting to moral and ethical judgement.

2. Adding Astrobiology

This is where the authors believe that Astrobiology as an interdisciplinary academic field will show its merits.

Astrobiology is the study of the origins, evolution, distribution, and future of life in the universe. This interdisciplinary field requires a comprehensive, integrated understanding of biological, planetary, and cosmic phenomena. It also includes key questions the humanities and social sciences have been asking for centuries. Especially when looking at extreme habitable worlds, worlds that force humanity to try and accept a new understanding of life and its conditions, this field breaks the boundaries of traditional distinctions between disciplines.

3. Changing Worldviews

Approaching the key questions of habitability and the origins and conditions of and for life in an open and scientific way from an interdisciplinary field gives new approaches to the answers the humanities have given for centuries. This approach will show some of them to be worthwhile and others to be wrong. It will - in short - change established world-views. This addresses one of the key problems the authors have identified with their students technology and science awareness.

4. Teaching with Astrobiology

Our approach to teaching Astrobiology is not so much teaching Astrobiology itself, but using key concepts of Astrobiology research and analysing their underlying assumptions and scientific reasoning. Many of the key concepts of Astrobiology are very well suited to show the students how to bridge a perceived conceptual gap between the STEM subjects and their respective fields without having to resort to ethical or even moral evaluation and judgement. This is where a constructivist pedagogical approach in combination with the concept of the thought experiment comes into play.

5. Thought Experiments

The common denominator between STEM and humanities and social sciences while approaching new ground is the thought experiment. The thought experiment has a long history in philosophy, religion and other fields of the humanities as well as in the natural sciences. Thought experiments have been used for example to further the theory of relativity, they have a long history in philosophical schools and they have been widely used in education in the form of ethical dilemmas to enable students to learn to make analytically sound decisions.
This paper will show the basic structure of the thought experiment in either perspective. Building on this, the paper will explain the pedagogical merits of hypothetical thinking and the structural gain in competencies for the students. A short excursion into the didactics of games and play will serve to theoretically ground the didactical considerations in constructivist pedagogy.

6. Extreme habitable worlds as educational thought experiments

The paper will close with some examples that show a deep connection between Astrobiological methodology and current debates in the humanties and social sciences in an exemplary fashion, thus arguing for the specific merit that the use of Astrobiology in the humanities classroom has to bridge the perceived divide between STEM and the humanities and social sciences.
Thus the students approach to science and technology will change from being an ethical or even moral evaluation of these to learning from both sides of the coin and facing the common possibilities of social and scientific growth.

Short Summary

Astrobiology approaches an unknown in a scientific way while at the same time possibly including traditional philosophical, religious and social questions that come with learning about life. This can be used to teach humanities and social-science students how to bridge the gap between science and the humanities.