Innovative and Effective Teaching in Undergraduate Philosophy of Science and Logic

This session is sponsored by the Interdivisional Teaching Commission of the DHST/DLMPS to enable presentations on innovative and effective undergraduate teaching of philosophy of science and logic. Presenters will share good, engaging and effective approaches to undergraduate classroom and web-based teaching of the disciplines. Presentations will cover curriculum, materials, texts, classwork, assessment, use of social media, and other means that have been found in practice to promote more engagement, interest and learning of philosophy of science and logic.

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Teaching with Argument Maps
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An argument map is a visual representation of support relationships between claims in an argument. It provides an easy-to-read visual representation of an argument, and thereby enables precise evaluation of the reasoning and claims in that argument.

The skills that go into producing an argument map are all component skills of advanced philosophical thinking. For instance, to produce an argument map one needs to locate claims within a text, and understand their role within a broader argumentative structure. Furthermore, to map a *logically valid* argument, one needs to add (often implicit) premises to the argument map and determine logical validity.

There is some recent evidence that teaching philosophy with argument maps dramatically increases students' analytical skills. In my experience, at least, students are also really excited about argument mapping. In this presentation, I will explain the basics of argument mapping, and give a few ideas for integrating argument maps in philosophy assignments (both traditional and non-traditional) and in-class activities. I will also give some strategies for scaffolding argument map exercises.

Teaching Philosophy of Cognitive Science
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This presentation will outline, how the empirically based findings of conceptual change studies can be applied in didactics of philosophy, and in philosophy of science in particular. In the conceptual change paradigm, learning of scientific content is seen as a replacement of everyday commonsensical frameworks with new more sophisticated and theoretically deeper ones. In other words, learning is seen as a specific kind of process, in which learner´s conceptual system undergoes a restructuring process that affects ontological commitments, inferential relations, and standards of explanation.   Thus, in conceptual change the difference between the initial state and the outcome of learning is not merely accumulation of knowledge and rejection of false beliefs. Instead, the students' conceptions of phenomena in a domain undergo a holistic restructuring process, leading to acquisition of scientific concepts and a reorganization of the students' web of beliefs from a fragmented set of commonsense

beliefs to a consistent web of scientific conceptions. Examples will be given of how the design of didactics can support this learning process in philosophy class rooms.

Linking Philosophy and History in a Unified Story: How Epistemology of Science Emerges from Scientists' Biographies.

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One of the most important aspects in the experimental design and scientific practice is to find the adequate explanatory level for a given phenomenon. This epistemological issue asks for a deeper analysis and understanding of the role of what we call 'human factor' in scientific practice. In the presentation we offer some examples of how history of science has shown that such 'human factor' actually plays a crucial role in producing revolutionary innovation in biomedicine, technology and medicine: e.g. no stethoscope, nor any other biomedical diagnostic tool, without the modesty of René Laennec; no Atlantic Cable, nor modern telecommunications, without the tenacity (and the money!) of Cyrus Field; no cardiac surgery without the encounter of two borderline visionaries such as Alexis Carrel and Charles Lindbergh; no *Apple*, nor computer graphics without the awkward fondness of Steve Jobs for very old-fashioned calligraphy; and, probably, no spectacular rise in the twentieth century American medicine, without the sympathy and the ability to inspire of William Osler. As insidious as it can be, we think that the biographical approach can prove to be a valuable introduction to philosophical and epistemological insights in the evolution of science and technology and in particular to teach our students why the most relevant issue in scientific practice is to ask the right question and to choose the right model.

Elements of Critical and Computational Thinking in Education of Pre-school Children

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In my presentation I wish to share some observations regarding the education of pre-school children in the areas of problem solving, critical and computational thinking as part of FiloZosia project. The key question I am willing to address is whether certain techniques used in our project can be applied in teaching subjects such as Logic or Science Methodology to undergraduate university students.   FiloZosia (from: *Zosia* - a Polish diminutive term for *Zofia* ñ eng: *S ophie*) is an experimental educational scheme based on learn-through-play concept. The project in question Is currently at the stage of development. It will be carried out in the form of workshops or games, the first set of which is scheduled for June 2015. The aim is to encourage children at the early stages of their education to try and solve some intellectual riddles, which in the world of grown-ups are generally known as philosophical. The games will address various topics, which constitute following modules:
   (1) ëI amí (identity)
   (2) (2) ëI observeí (experience and cognition)
   (3) (3) ëI thinkí/íI knowí (knowledge and justification)
   (4) (4) ëI actí(praxeology and ethics)

In my presentation I will focus on third module. Here the emphasis will be laid on the practical application of self-correction procedures and the formulation of some very basic rules concerning the correctness of our reasoning. Children will be presented with a ёbrokení toy built of plastic blocks, and will be encouraged to fix it. Thus they will learn to analyse its constructional patterns. At the same time they will be asked to build their own narrative concerning their actions and to justify them. This narrational aspect of the game marks the transition between extensional and intesional contexts: the ability to analyse ones mistakes calls for abstract notions and flexible (rather than simplistic) application of inference rules. On higher abstraction level the same general principle can be used in undergraduate logical education. Perhaps fixing a flawed argument or a faulty logical proof is not that different from mending a broken aeroplane built of plastic blocks.