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Physics in Waldorf Schools

Teaching Physics Phenomenologically

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CREATION + DISCOVERY

Physics



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1 Introduction

The world with its wealth of appearances can move and enchant us in ever new ways. When we teach physics, we face the challenge of taking our students on a journey on which, in encountering the magic of the phenomena, they are able to discover for themselves the joy of understanding. They are allowed to be present as the first meeting with a phenomenon flows into a thoughtful consideration of its appearing. They can (and should) learn to be sensitive to how thinking through a series of phenomena can cast light on their specific nature, as well as how premature theorizing can cast them in a false light.

This booklet explores a series of teaching experiences and considers them from a didactic perspective. It is an attempt to gain a better understanding of a phenomenological approach both as teaching method and as a way to understand the world.

Although phenomenological approaches can be clearly described and epistemologically defined when generalized, their application in particular cases is a source of controversy. Time and again we find that the full scope of the phenomenological method only becomes apparent when we apply it to specific phenomena.

For this reason, I have kept the general discussion of phenomenology brief. A deeper sense for the approach should become apparent as we follow how concepts of voltage, current, electrical fields and charge arise from the observation and consideration of selected series of experiments. These are assigned to various grades as is common in many Waldorf schools.

When we observe what comes to appearance in the world, our interest is naturally focused outside of ourselves. When we consider what we have observed and search for conceptual relationships, we distance ourselves from our immediate, personal experience. This becomes something we take into consideration from a place of reflective remove.

The body plays a central role in this process that is initiated by the appearing of a phenomenon and that leads to a conceptual understanding of it. Examples taken from teaching mechanics and optics illustrate how when teaching physics we can draw on bodily experience and allow it to become a bridge spanning immediate experience and conceptual understanding. The body, through which we, on the one hand, find ourselves looking out at the world, is also the key to overcoming the subject-object consciousness arising from this sense of confrontation.

In the chapter concerning phenomenology, electricity and the role of the body in learning are frequent references to ongoing academic discussions of subject-specific didactics. The original German version of this text (SOMMER 2018) addresses them in more detail.

2 Phenomenology

2.1 Phenomenology as a method for teaching physics in main lesson blocks

Since the opening of the first Waldorf School in 1919 phenomenological approaches have been an important focus in teaching physics. We can discover in them many connections to an exemplary approach as has been described for example by KLAFKI and WAGENSCHNEIDER [SOMMER 2014].

Phenomenological teaching methods are to be found not only in physics classes but play a role throughout science and humanity classes in Waldorf Education. They can be seen as a specific variation of the notion of the exemplary in learning with a unique three-step structure. Further discussion of this relationship is to be found in an overview of general didactics in articles of the online journal *Research on Steiner Education* [SOMMER 2010, 2014]. These articles will be especially helpful for those readers who are interested in better understanding the anthropological aspects of the main lesson approach.

The concept »phenomenological« calls attention to the fact that those phenomena and series of phenomena that have the potential of revealing a universal contained in a particular become the center of the learning process in the lessons. It is a programmatic use of the term that captures verbally the specific nature of the main lesson block approach.

2.2 Phenomenology as a method for developing understanding in physics

Phenomenological approaches have a long tradition in the teaching of the sciences. A good overview of the origins and development of such approaches is to be found in *Doing phenomenology in science education: a research review* by ØSTERGAARD, DAHLIN and HUGO [2008]). The authors draw attention among other things to the gap students can experience between the direct, sensual, embodied perception of a natural phenomenon and the concepts that are used to explain it. Their discussion focuses on whether doing phenomenology – as a structured approach to developing understanding – can bridge this gap.

FUCHS [2008] views the gap as inherent in modern science when in a reductionist approach the »original lifeworld experience« is broken down into a »physical quantitative« and a »subjective qualitative component« (p. 18). In scientific practice, constructs, generalized as explanations that can be quantified, establish themselves as what is considered to be »actually« real. They are viewed as the causal factors of what we experience in the life world. Our perception of the sunlit world is seen as »just« the emission of light rays, their reflection by various objects and their coming into contact with our eyes; warmth as »just« the movement of atoms; solid matter »just« a different configuration of atoms than gaseous matter.

Instead of feeling connected with and imbedded in nature, a sense of isolation and foreignness can arise. We are taught to believe that the qualitative life world experience is »just« a subjective addendum to what is »actually« real. WEIZSÄCKER termed the view that a world »in itself« exists behind the appearances, a world of objects with the capacity to bring forth the appearances (for instance light rays that bring forth brightness), metaphysical realism. In