RiskEdu

How can teachers support the development of scientific literacy through teaching about risk and risk-assessment?

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Introduction

Extensive use of new technical solutions leads to an increased exposure of humans to low doses of ionizing radiation (medicine, industry, energy) as well as electromagnetic fields (medicine, mobile phones), while tourism to sunny countries increases exposure to UV-radiation. The radiation may be beneficial, but it may also be harmful. Thus, exposure is always linked to a certain risk, and the trade-off between risks and benefits may be a quite complicated matter that people generally have difficulty assessing. The ability to make judgments about risk, both on a personal and societal level, is a crucial part of scientific literacy, defined as the ability to evaluate scientific information and arguments based on scientific evidence, and draw conclusions from these. Education about risks encountered in modern society should already start in schools so that young people are able to make sovereign decisions when entering adult life. The important question is how this education should be conducted in an efficient way.

In several curricula, including the Swedish one for the upper secondary school, teachers are required to teach science in such ways that students learn to partake in the public debate, which often involves making decisions based on accurate risk assessment. However, including risk assessment in science teaching makes it more complex because (a) students need to handle not only scientific concepts and relationships, but also how that knowledge relates to values and personal experiences and (b) the subject matter often consists of "science-in-the-making" that is negotiated between different stakeholders. As a result, science teachers perceive numerous barriers to including and assessing competen-cies involving risk-assessment in their teaching due to lack of training, knowledge, external re-sources, or other kinds of support.

The aim of the project

The purpose of this project is to generate knowledge about how science teaching can support the development of high-school students' competency in making decisions based on informed risk assessment in societal issues involving exposure to threats associated with modern technologies, such as ionizing radiation from nuclear power plants, electromagnetic fields from wireless telecommunication or the rapidly growing knowledge in biotechnology. This is accomplished through a close collaboration between researchers and practicing teachers, in which principles and tools for teaching are successively generated, tested, and refined. The project focuses on the following specific research questions:

1. What consequences does teaching of risk and risk-assessment as part of school science have for students' ability to make decisions based on risk-assessments and formulate alternative courses of action in current societal issues?
2. What consequences does teaching about risk and risk assessment have for students' learning of science subject matter (e.g. radiation), as this is assessed in standardized tests?
3. In what ways do existing methods for teaching about risk and risk assessment need to be modified in order to better support student learning?

The choice of focusing on a certain competency (to make risk assessments) and certain subject matter (ionizing and non-ionizing radiation and biotechnology), is made in order to ensure that the results are generated from authentic classroom activities, in which particular problems can be identified, addressed, and pursued jointly by teachers and researchers. This design is in line with the tenets of European subject didactics, namely to produce knowledge that can help teachers make informed choices of purposes, content, and methods in their day-to-day classroom practice. At the same time, it is important that such teacher relevant knowledge is possible to apply beyond specific settings and specific subject matter. Therefore, the project will include two different science subjects, (physics and biology) as well as two different groups of students within the Natural Science Program, one group from the orientation Natural Sciences and another one from the orientation Natural Sciences and Society.

Methodology and project outcome

The project involves collaboration between researchers from the Stockholm University, the Royal Technical High School and two experienced science teachers in two upper secondary public schools in the Stockholm area (Blackeberg gymnasium and Tumba gymnasium). The collaboration consists of repeated cycles of planning – teaching – analysis (figure 1). In each cycle, planning and analysis are done jointly by teachers and researchers, whereas actual teaching is done by the teachers alone, the researchers being responsible for documenting the teaching activities.
The teaching outcome wil be analysed by asking students to fill out a questionnaire designed to measure the perception of risk from different activities and industries. The questionnaire will be given to students enrolled in risk education and to those that are not.
RTRISK kicked off in summer 2015 and will last for 3 years. The results will form the scientific basis for introducing and designing teaching bout risk and risk management in secondary schools.

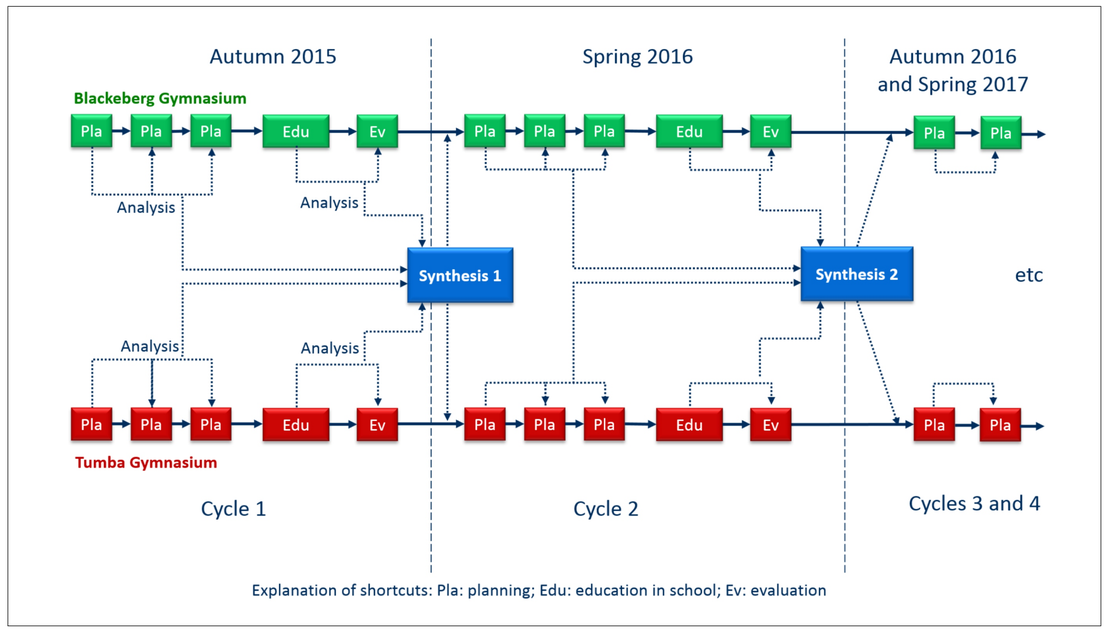

Figure 1. Scheme and timing of planning - teaching - analysis cycles.

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