



Learning effects of active involvement of secondary school students in scientific research within the Sparkling Science project "FlussAu:WOW!"

Michaela Poppe (1), Andreas Zitek (1), Sigrid Scheickl (1), Andrea Heidenreich (2), Roman Kurz (2), Martin Schrittwieser (2), and Susanne Muhar (1)

(1) BOKU Vienna, Institute of Hydrobiology & Aquatic Ecosystem Management, Vienna, Austria (michaela.poppe@boku.ac.at), (2) BG/BRG St.Pölten, Josefstraße 84, 3100 St.Pölten

Due to immense technological and economic developments, human activities producing greenhouse gases, destructing ecosystems, changing landscapes and societies are influencing the world to such a degree, that the environment and human well-being are significantly affected. This results in a need to educate citizens towards a scientific understanding of complex socio-environmental systems. The OECD programme for international student assessment (PISA - <http://www.pisa.oecd.org>) investigated in detail the science competencies of 15-year-old students in 2006. The report documented that teenagers in OECD countries are mostly well aware of environmental issues but often know little about their causes or options to tackle these challenges in the future.

For the integration of science with school learning and involving young people actively into scientific research Sparkling Science projects are funded by the Federal Ministry of Science and Research in Austria. Within the Sparkling Science Project "FlussAu:WOW!" (<http://www.sparklingscience.at/de/projekte/574-flussau-wow-/>) scientists work together with 15 to 18-year-old students of two Austrian High Schools over two years to assess the functions and processes in near natural and anthropogenically changed river floodplains. Within the first year of collaboration students, teachers and scientists elaborated on abiotic, biotic and spatial indicators for assessing and evaluating the ecological functionality of riverine systems. After a theoretical introduction students formulated research questions, hypotheses and planned and conducted field work in two different floodplain areas in Lower Austria. From the second year on, students are going to develop qualitative models on processes in river floodplain systems by means of the learning software "DynaLearn". The "DynaLearn" software is an engaging, interactive, hierarchically structured learning environment that was developed within the EU-FP7 project "DynaLearn" (<http://www.dynalearn.eu>) to capture and simulate qualitative causal relationships across disciplines and scales. In "FlussAu:WOW!" students work in groups of two and are guided to think about processes and interactions of hydrological, biological, ecological, spatial and societal elements within a river catchment. They can develop their own causal models and scenarios (e.g., hydrological changes in river run off due to landscape changes in the upper catchment) but also can compare their conceptions to expert models that will be provided. As main benefit, the models help students to reflect their own conceptions in the light of scientific knowledge but also scientists learn about the viewpoints and conceptions young students might have from their environment.

The comparison of pre- and post-tests conducted within the "FlussAu:WOW!" project showed that students increased significantly their factual knowledge on different processes in river systems during the first year. Questions regarding functions, processes and elements of riverine landscapes were answered more extensively. This can be ascribed to students' active involvement in scientific research. However, the causal understanding still showed room for improvement, which will be tackled during the next qualitative modelling exercises.

Summarizing, involvement of secondary school students in research projects is an effective means to increase scientific literacy when active participation with reflective integration are combined. Ensuring that young people are proficient in system knowledge and understanding makes it more likely that environmental and sustainable considerations are soundly addressed in the future.