

E-learning neutron scattering (Networking)

Leading beneficiary: University of Copenhagen (UCPH)

Partners: Technical University of Denmark (DTU), Institut Laue-Langevin (ILL), Paul Scherrer Institute (PSI), ISIS, Technical University of Munich (TUM), European Spallation Source (ESS), Oxford University (OU), University of Montpellier (UM), Helmholtz-Zentrum Berlin (HZB)

Estimated budget (in person months, other direct cost) and tentative distribution per partner:

100 PM total in 4 years distributed tentatively on

UCPH (48 PM): Management, PR, networking (12 PM). Assessment, testing of tools, webanalysis (12 PM). Didactical consultancy, research & development (12 PM). Content management, syntax moderation, formatting/translating material (12 PM).

DTU (24 PM): Development of virtual facility, development of web-simulation tool, development and tailoring of virtual instruments.

ILL, PSI, ISIS, TUM, ESS, HZB, OU, UM (28 PM): Input and collaboration on building virtual instruments and testing them with students (1 PM/instrument),

Abstract of your innovative activity:

1. State of the Art

There is presently no unified online e-learning portal with freely available interactive tools for teaching neutron scattering which enables the students to learn and transit all the steps from theory to proposal and execution and analysis of experiments.

We propose to develop a state-of-the-art interactive e-learning platform for the education of students and future and present users of large scale neutron scattering facilities.

2. What is new? Why should it be done on a European consortium level (synergies)?

We have developed a novel set of interactive tools for education in experimental scientific topics including

- an interactive WIKIbook with exercises and hints
- Quizzes with adaptive feedback based on scientific cases
- a browser-based Monte Carlo simulation tool with highly adaptive virtual instruments producing data comparable to, and analysable as, real data.

We have implemented these tools in a prototype e-learning platform targeted for teaching the neutron scattering technique. In order to harness the full use of the platform and prepare new and future users of large-scale neutron scattering facilities to perform efficient experiments, we however need to develop virtual neutron facilities corresponding to the existing ones and the one under construction as well as didactic teaching material on using the facilities.

We aim to teach all the steps of neutron scattering from theory to experiment proposals, data treatment and publication of results within the e-learning portal through high-guidance courses and lessons based on collaborative WIKIbook material as well as browser-based quizzes with feedback and virtual experiments. The synergy between universities and neutron scattering facilities is clearly very strong as the facilities rely on the universities to educate their future users but the universities also rely on the facilities to provide details of instruments and software for data analysis.

The development of high-quality didactical teaching material in the portal depends on strong collaboration between the neutron scattering facilities and universities based on carefully selected examples with clear learning goals. The didactic qualities should be assessed and developed throughout the project both in terms of analysis of user behaviour statistics but also in terms of classical didactic research.

The portal should be continuously updated to follow current web-standards and the feedback from user and contributors implemented. This implies maintenance and development of the servers and software used for the portal as well as the contents.

3. *How could your activity be connected with other methods and techniques (outside the neutrons community)?*

The interactive tools are a very strong way of visualising what is possible to achieve with neutron scattering and therefore very well suited to reach out beyond the neutron scattering community.

Furthermore, all the interactive tools we have developed so far could be transferred to build a sister site for the education and training of users of x-ray/synchrotron facilities.

4. *Is there any link with national initiatives/projects (e.g. national data initiatives, but also European roadmaps etc)?*

- Interreg Baltic Sea project Ready to Research (outreach from large scale facilities to industry).
- Nordic Scientist School (application of 3-4 Mkr yearly from Nordic funds in process).
- The e-learning resources developed in this project are free to be used and integrated into existing neutron scattering training schools (class-room + hands-on) which take place regularly throughout Europe.

5. *How is the user community involved in your activity? Benefit for the user (evtl for any specific science community?)*

All interest and development of a scientific topic starts with the accessibility to good quality teaching on the topic which is adapted for the individual student's need. Thus both the user community and the individual user will profit from a 24/7 web-accessible high-guidance learning system with many student activities on various levels.

The user community will be directly involved in the development of the portal through their feedback and our analysis of their usage of the platform. Some science communities like bio-chemistry, biology and engineering which are not yet utilising fully the neutron scattering technique will profit from e-learning modules taylorred for specific outreach to these groups.