Science Education Workshops  
Day 1 - 16 September Promoting and carrying out research in science education

Students worked in their discipline groups:
- Reflecting on your own experiences as students, what was the teaching and learning environment like?
- Discuss possible innovations which might have improved your learning.
- Suggest and discuss methods to investigate the possible value of your innovations.

**Feedback from the groups:**

**Physics**

**Classroom problems**
- Passive
- Chalk and talk
- No cooperative activities
- Rote-learning; exercises; problems without understanding
- Dry lab
- Demonstration by teacher with students watching but not doing

**Innovations**
- Use of local materials in interactive lecture demonstrations; allowing activity in the classroom.

**Evaluations**
- Use attitude of students
- Test effectiveness using standard tests

**Biology**

**Classroom problems**
- Teacher-centred
  - Lectures are a one way communications
  - A lot of homework is given; assignments but not enough feedback
  - No group discussions
  - No integrations
- Environment
  - Good relationship between teacher and student
  - Increase entrance rate
  - Evaluation based on final exam
- Material
  - Lack of materials too much use of chalk hoards
  - Need models etc. to demonstrate ideas
  - More laboratory work with real hands-on activities

**Innovations**
- Learn by doing; active learning; questioning enquiry; critical thinking:
- authentic learning
- Change evaluation — paper test. project. assignment. formative evaluation
- Create learning material appropriate to the content
- Use of Internet, web sites, CD-ROMs

**Evaluations**
- Use of concept maps, exams and reports to test the cognitive domain
- Use of observations in class, presentations etc to test the affective domain
- Look for development of skills to test the psychomotor domain

**Mathematics and Computer Science**

**Classroom problems**
- Teacher needs to analyse the content before entering the classroom
- They follow a recipe; not suitable for all students
- Need to motivate the students about the importance of maths
- Need to help the development of appropriate technical skills
- Students find maths difficult — content is too broad: not easy to apply: students cannot see the relevance of maths
Innovations
• Make the experiences student-centred with activities, projects, problems, group discussions

Evaluations
• Interview students
• Use questionnaires
• Observations
• Web-based tests

Chemistry
Classroom problems
• Teachers not always sufficiently competent within the discipline: not always able to connect the content for the students
• Teachers do not encourage students to think for themselves
• Test rote-learning more than critical thinking
• Materials not available in high schools. Teachers talk about what happens but do not do it.
• Students have to learn a lot of content but they do not know why they are learning it: not real world experiences
• At university lab work can be difficult because students have not done any before and find using equipment difficult

Innovations
• Use of local examples
• Emphasise importance and relevance of content
• Create interest for the students so that they want to learn: allow participation
• Use local people for specific topics — eg a local chemical works
• Use technology, put course materials online

Evaluations
• Use questionnaires; interviews; research; attitude tests
• Use of drama to illustrate the content