

What students entering science related HE courses most need from their schooling- an emerging consensus view from Scottish universities

Formulating a view from the Scottish universities.

Scottish Education System

- 5-14 Curriculum
- Primary school P1-P7: age 5-11
- Secondary school S1-S2: age 12-14
- Standard Grade S3-S4 (English Maths + 1 Science, approx 8 subjects taken)
- Highers S5 (5 subjects)
- Advanced Highers S6 (not compulsory for university entry)

3-18 Curriculum Review

- First time the entire curriculum has been reviewed.
- This appears to be happening world wide.
- There is thought to be a need to develop a more flexible curriculum.
- The position of science in the core curriculum has been questioned.

Submission to the Education Debate by Universities Scotland

- Two key roles of school education in preparing pupils for higher education:
 1. to give a grounding in knowledge and core skills
 2. to equip students to think and learn on their own.

The Project

- Two Universities involved initially- Paisley and Glasgow.
- Interviewed over 60 lecturers in STEM subjects.
- Have held meetings at 11 of the 13 Scottish universities.
- Project set up by the Deans of Science and Engineering group. They are concerned at the drop in numbers of students entering STEM subjects at university.
- Purpose to hopefully influence the 3-18 Review to enable science to keep a high profile in schools.

What is most important? Emerging conclusions.

- Subject specific knowledge
- General or core skills
- Attitudes

General Skills and Attitudes

- Numeracy
- Mathematical ability
- Literacy
- Problem solving skills
- Attitude:
Motivation, Enthusiasm, Perseverance, Interest rather than exam focused. Ability to think and learn independently.

Subject Specific Information gathered

- How well do existing Highers match to the subject at first year?
- Started a matching exercise.
- Subjects looked at: Biology, Human Biology, Chemistry, Geology, Computing, Information Systems, Physics, Mathematics and Technological Studies.

Emerging conclusions:

- Improving the general skills is as important as subject knowledge.
- Need to find ways of motivating and enthusing the student.
- Want to encourage to think and learn independently.
- Assessment is hampering understanding and not testing the desired skills.

Mathematics

- A good grounding in mathematics is required for engineering and the physical sciences.
- Students need more application of practical techniques and to be shown more applied examples.
- Need all the current course content with perhaps some geometry.
- Different teaching methods should be investigated.

Science subjects

- Courses considered overcrowded.
- Some are outdated and perhaps unbalanced.
- Want the basic principles reinforced and at the same time the course to be made more relevant and exciting! (a dilemma here
- More extended practical work for interest, to aid understanding and for problem solving.
- Introduction of topics for debate.

Current Assessment Regime

- Gives a fragmented and rote learning approach to subject delivery.
- Exam grade depends only on the final exam.
- Not testing the desired skills or principles.
- Assessing the practical work seems to prevent other practicals being done.

Changes required

- A more holistic approach should be taken.
- Use the professional judgement of teachers.
- Adopt a more open ended type of problem solving assessment.
- More emphasis on applying principles rather than regurgitating facts.
- Ensure that assessments assess the desired principles and skills.

Why are numbers dropping in science and engineering subjects at school?

- Is it the curriculum?
- The difficulty of the course?
- Method of teaching?
- The assessment process?
- The school laboratory or workshop?
- The image of science and the scientist?
- Perceived job prospects?
- More choice?

Next Steps

- Half way through project
- Present preliminary findings to SEED.
- Will seek opinion of students who are in first year at university.
- Consult with teachers.
- Draw up conclusions and present the final report in February 2005.