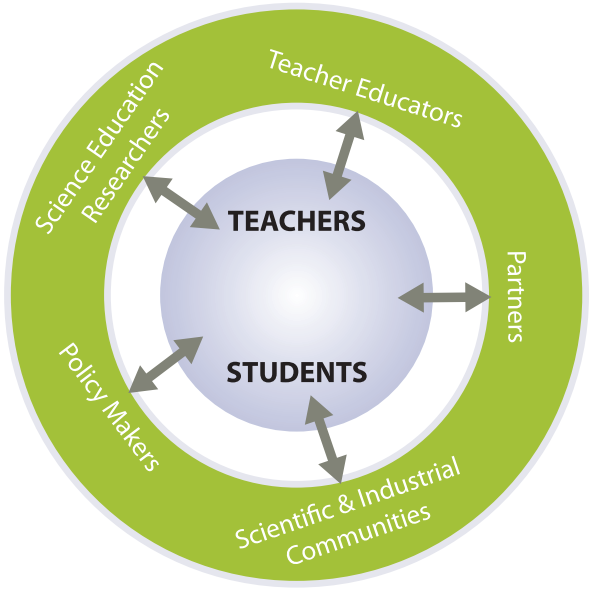
Inquiry-based science education…

…providing authentic experiences for the classroom…

The European Science and Technology in Action: Building Links with Industry, Schools and Home (ESTABLISH) is a four year (2010-2013) project funded by the European Commission's 7th Framework Programme for Science in Society. This project involves promotion and dissemination of inquiry-based teaching methods on a large scale in Europe, by provision of teacher education using materials and resources that include authentic problems informed by industry.

More than ever, Europe's success in global competition is dependent on effective partnerships between business and academia to ensure that education delivers usable knowledge together with 'high-level and highly valued skills', (key competencies) as presented in the 2010 EC Working document on the European 2020 Flagship Initiative for all European citizens.[1] Indeed, education and training are central to the Lisbon agenda for growth and jobs, and again take primary focus supporting the 'smart growth' priority of the growth strategy for 2010-2020.[2] Thus, it is inappropriate to continue to provide education without consideration of the key skills and competencies now required and therefore changes in classroom practices are needed. Crucial to the development of such key competencies is the engagement of young people in the education process and recommendations from international reports identify the need for 'engaging curricula to tackle the issue of out-of date and irrelevant contexts and to enable teachers to develop their knowledge and pedagogical skills'.[3,4] Methodologies such as inquiry-based science education (IBSE) have been highlighted as having the potential to increase young people's interest in science and impact on their long-term engagement in science. However, in order to promote the use of IBSE in classrooms across Europe, teachers need to be supported through appropriate teacher education and provision of teaching and learning resources.



ESTABLISH: Bringing together the stakeholders to influence classroom practices

The ESTABLISH project addresses these challenges in implementing IBSE by bringing together a consortium of over 60 partners from 11 European countries (Ireland, Germany, Sweden, Cyprus, Czech Republic, Poland, Slovakia, Malta, Netherlands, Estonia and Italy). Members of the consortium work with local teachers and students (aged 12-18 years) to develop and implement IBSE teaching and learning materials and evaluation tools that are culturally adapted for use in each country. The rationale for ESTABLISH lies in creating authentic learning environments for science by bringing together and involving all the key communities in second level science education, including: the science teachers, educators and networks; the scientific and industrial communities; the young people and their parents; the policymakers responsible for science curriculum and assessment; and the science education research community. The outcomes of the project will result in changes in classroom practices through the:

- Identification of suitable model(s) of science teacher education, at both pre and in-service levels, for inquiry-based science teaching;
- Preparation of a large team of science teachers across Europe who are skilled and confident in inquiry-based science teaching methodology;
- Promotion of inquiry in the classroom, involving the relevant stakeholders in science and science education.

However, what does IBSE mean and to what extent is IBSE implemented in schools and in teacher education across Europe? Are there different approaches to IBSE in different countries and can IBSE teaching and learning resources be developed that are suitable for implementation in each region?

The ESTABLISH project has adopted a common understanding of inquiry as the 'intentional process of diagnosing

Representatives of each participating country at the ESTABLISH kick-off meeting

problems, critiquing experiments and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments'.[5] This definition forms the basis of an agreed framework for development of IBSE teaching and learning materials or 'ESTABLISH IBSE units'. The scientific themes of the units were selected by the consortium so as to be applicable to the second level science curricula in the participating countries. Within each unit, material is offered at different levels and that cover different elements of inquiry so as to offer a flexible resource for use in the classroom. The consortium will collectively develop 16 such IBSE units spanning the science disciplines that are culturally adapted for implementation in teacher professional development programmes in each country. Each unit also describes essential elements of pedagogical content knowledge (PCK) to support the unit's scientific concepts together with – what has been uniquely termed as – industrial content knowledge (ICK) as necessary components. By purposefully including this concept of ICK, teachers, and in turn their own students, can gain a deeper appreciation of the scientific concepts and the applications of science by incorporating authentic learning experiences from scientific and industrial communities into the science classroom. These experiences in real and tangible contexts of science beyond the school curricula serve to engage those young people that are often on the periphery of science as well as those that pursue long-term careers in science.

ESTABLISH workshops and summer schools are available to science teachers in each country where the participating teachers can gain a deeper understanding of IBSE and where they will be provided with appropriate resources to support them in implementing IBSE in their own classrooms.

The outcomes of this project will inform policymakers and other stakeholders of the importance of IBSE inclusion in the school curricula, the need for suitable professional development of teachers and also on the factors that affect and effect meaningful change in classroom practices across Europe.

1 European Commission (EC), 'Europe 2020 Flagship Initiative Innovation Union', 2010, European Commission: Brussels. p. 43

2 European Commission (EC), 'EUROPE 2020: A strategy for smart, sustainable and inclusive growth', 2010, European Commission: Brussels

3 European Commission (EC) and High Level Group on Science Education, 'Science Education NOW: A Renewed Pedagogy for the Future of Europe', 2007, DG Research: Brussels. p. 17

4 Osbourne, J. and J. Dillon, 'Science Education in Europe: Critical Reflections', 2008, King's College, London: London. p. 1-32

5 Linn, M.C., E.A. Davis, and B.-S. Eylon, 'The scaffolded knowledge integration framework for instruction, in Internet environments for science education', M.C. Linn, E.A. Davis, and P. Bell, Editors. 2004, Lawrence Erlbaum Associates: Mahwah, NJ. p. 47-72

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