ISE – Inspiring Science Education
Large Scale Experimentation Scenarios to Mainstream E-learning in Science, Mathematics and Technology in Primary and Secondary Schools

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Abstract
This paper presents the project mission and activities of ISE- Inspiring Science Education Large Scale Experimentation Scenarios to Mainstream eLearning in Science, Mathematics and Technology in Primary and Secondary Schools project, funded with support from the European Commission in the context of the Seventh Framework Programme (FP7).
The Inspiring Science Education project intends to highlight and promote the best practices STEM education in schools.
The mission of the project is to provide digital resources and opportunities for teachers to help them make science education more attractive and relevant to students' lives.
Inspirational science teachers are at the heart of successful science teaching – ask any scientific Nobel prize-winner who had the greatest influence on their decision to become a scientist and invariably the answer will be –my Science Teacher! So what is it that makes a science teacher truly inspirational? That's one of the conundrums the project aims to unravel in the Inspiring Science Education project. That's why the project team is setting up workshops and exchanges, communities of practice and learning opportunities for science teachers and teacher trainers aimed at helping them find ways to make their teaching of science more inspirational.
Large-scale take-up amongst European Science teachers is the project's aim. Pilot activities are taking place in 5000 primary and secondary schools in 15 European countries.
Inspiring Science Education approach conceives the goals of science education not in terms of the knowledge of a body of facts and theories but a progression towards key ideas which together enable understanding of events and phenomena of relevance to students' lives during and beyond their school years.
The educational approach of Inspiring Science Education builds upon the existing knowledge and develops a pedagogical model that will boost the adoption of eLearning resources, which have been put in practice in large scale activities and future national and European initiatives.

1. The vision and the results of the project
This paper presents the project vision and mission of ISE - Inspiring Science Education Large Scale Experimentation Scenarios to Mainstream eLearning in Science, Mathematics and Technology in Primary and Secondary Schools project.
The Inspiring Science Education project intends to highlight and promote the best practices STEM education in schools.
The mission in the Inspiring Science Education team is to provide digital resources and opportunities for teachers to help them make science education more attractive and relevant to students' lives.
Through the Inspiring Science Education website and the activities organised by the partners, teachers can help students make their own scientific discoveries, witness and understand natural and scientific phenomena and access the latest, interactive tools and digital resources from within their classrooms.
Inspirational science teachers are at the heart of successful science teaching – ask any scientific Nobel prize-winner who had the greatest influence on their decision to become a scientist and invariably the answer will be –my Science Teacher! So what is it that makes a science teacher truly inspirational? That's one of the conundrums we aim to unravel in the Inspiring Science Education project. That's why we will be setting up workshops and exchanges, communities of practice and learning opportunities for science teachers and teacher trainers aimed at helping them find ways to make their teaching of science more inspirational.

Large-scale take-up amongst European Science teachers is the project team's aim. Pilot activities will take place in 5000 primary and secondary schools in 15 European countries.
During these pilots, teachers will be accessing interactive simulations, educational games and eScience applications and integrating them with extra-curricular activities, such as field trips to science centres and discovery parks, and virtual visits to research centres. Teachers will also have the possibility to access remote and online labs, and relevant scenarios for their use in the school classroom. Students will be inspired to use eTools and digital resources to learn Science, Technology, Engineering and Maths (STEM related subjects) in a practical, competitive and exciting way.
The key outcomes of the Inspiring Science Education project

1. access to online, interactive tools and digital resources from all over the world that can be used for science teaching
2. templates, scenarios and methodologies to support science teachers and teacher trainers in their drive to make their teaching more exciting, fun and relevant for students
3. a platform that can be used by students and teachers alike to take science teaching beyond the classroom and into the realms of extra-curricular learning
4. a variety of eTools and digital resources that provide opportunities for students to collaborate with each other (in or out of the classroom) or with others outside of the class
5. ways in which students themselves can be involved in scientific research activities
6. a strong support network for teachers.

2. The Inquiry based Learning and the Big Ideas in Science

There is an enormous range of possible topics and activities. How are teachers to choose those that make the best use of limited and precious learning time?
Part of the solution to these problems is to conceive the goals of science education not in terms of the knowledge of a body of facts and theories but a progression towards key ideas which together enable understanding of events and phenomena of relevance to students' lives during and beyond their school years. We describe these as 'big ideas' in science.

1. All material in the Universe is made of very small particles.
2. Objects can affect other objects at a distance.
3. Changing the movement of an object requires a net force to be acting on it.
4. The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen.
5. The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate.
6. The solar system is a very small part of one of millions of galaxies in the Universe.
7. Organisms are organised on a cellular basis.
8. Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.
9. Genetic information is passed down from one generation of organisms to another.
10. The diversity of organisms, living and extinct, is the result of evolution.

Inquiry-based teaching is demanding, both of teachers' skill and of time for teaching and learning. Inquiry-based learning can lead to greater depth in understanding but as it takes more time the corollary is that the breadth has to be reduced. Thus identifying big ideas in science is a natural, and indeed necessary, accompaniment to promoting inquiry-based science education.

3. The impact evaluation of activities

ISE also aims at implementing a systematic evaluation and validation of the proposed activities in order to identify their impact in terms of their effectiveness and efficiency. The evaluation approach will be based first on the PISA 2012 Framework developed for the assessment of problem solving competence that will offer the reference for validating the introduction of innovation in schools so that piloting and field testing results can be collated and analysed systematically and then disseminated widely, thus ensuring rapid impact and widespread uptake. The key areas of interest of the proposed evaluation and validation methodology will be student knowledge, skills, competences and attitudes, science pedagogy, organisational issues (e.g., impact on the curriculum), technology (tools, services and infrastructure), economic (value for money), added value, as well as cultural and linguistic issues. Methods used will range from qualitative and quantitative experimental studies to large-scale questionnaire-based research.
To address one of the main barriers for innovation in science learning and provide with the sustainability of the enhanced hereby introduced (INSPIRING) learning processes, the work on the

impact assessment will also build and validate corresponding quality benchmarking frameworks for (a) teacher competence (professional) development, related to (b) school development and evaluation, as well.

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