# KIDSINNSCIENCE: TRANSFERABILITY OF INNOVATIVE APPROACHES IN SCIENCE EDUCATION

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## Abstract

kidsINNscience - Innovation in Science Education – Turning Kids on to Science is a research project involving ten partners in Europe and Latin America. It aims to identify and promote innovative approaches for teaching and learning science, adapt and test them for implementation in mainstream schools and develop innovation strategies for science and technology education in all participating countries.

Keywords: science and technology education, adaptation of innovative practices, inquiry based science education, gender equity, cultural diversity, field trial

## 1 INTRODUCTION

kidsINNscience. Innovation in Science Education – Turning Kids on to Science[1] is a collaborative SICA action funded by FP7. The research project analyses and compares strategies for innovating curricula, for teaching and learning in science and technology (S&T) in different partner countries. It aims to improve performance and interest in S&T among young people. Therefore goals are to facilitate educationalists at different positions in the educational system to operate more creatively within the system and to help generate changes toward more active learning systems.

Although constantly innovated, science education suffers from considerable differences between countries and even within countries. Though, innovations that work well in one country cannot simply be transferred to another. Culture and traditions differ from country to country and even within countries. This is reflected in the various educational systems and policies. Thus a comparative approach that distinguishes general conditions that apply to all countries and specific conditions that apply to one country, a group of countries or a target group within a country is appropriate. The basic assumption is that innovations in S&T education work efficiently if they meet agreed quality criteria and are adapted to the local circumstances and conditions. kidsINNscience proposes to adopt adaptive strategies to enable participating countries to learn from each other and to develop feasible innovation plans and carry out effective pilots that fit the specific needs and conditions of a given country. Accordingly, the main questions that kidsINNscience addresses are:

1. What strategies for teaching and learning in S&T motivate teachers and learners in the participating countries?

2. What similarities and differences are there in innovating S&T teaching and learning in the participating countries?

3. What strategies to innovate S&T teaching and learning would work in the participating countries, considering its characteristics of S&T teaching and learning?

## 2 MAIN STEPS IN THE PROJECT

In kidsINNscience, partner countries learn together how to carry out effective pilots to collect evidence and to formulate feasible innovation plans that fit their own conditions.

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[1] Participating countries are Austria, Brazil, Germany, Italy, Mexico, the Netherlands, Slovenia, Spain, Switzerland and the United Kingdom. Duration: November 2009 to July 2013. For more information, see www.kidsinnscience.eu

The starting point of the project was the definition of a set of quality criteria and indicators to describe and compare S&T curricula, practices and methodologies. It constituted the basis for description and comparison of innovative practices that were collected in each participating country and merged in the scan of innovative practices. In a next step, a selection and adaptation of innovative practices out of the scan preceded the pilots. In the current school years 2010/2011 and the coming school year 2011/2012, the adapted innovative practices are implemented in a number of selected schools. These field trials are evaluated with respect to feasibility and effectiveness of activities. Based on these results the set of criteria and indicators is revised and country-specific strategies for innovating S&T education are formulated. Cultural diversity, gender aspects and activity based and learner centred approaches such as Inquiry Based Science Education (IBSE) are explicitly addressed throughout all steps. All steps are interrelated and closely intermeshed. Intensive involvement of teacher and school networks is a pre-requisite when testing innovative approaches for implementation in mainstream schools and in the development of cross national innovation strategies in S&T education.

## 2.1 Steps taken in kidsINNscience (by April 2011)

An overview of the tasks realised in the first period, from November 2009 till April 2011, as well as a few findings and the interrelation between the steps of the project are briefly described in the following sections. For further information: www.kidsINNscience.eu.

### *2.1.1 Set of key quality criteria*

Perception of quality often depends heavily on context and local culture. Thus specific quality criteria and indicators may not be appropriate in new situations or different countries. In order to produce a framework that could be applied to various countries and different environments in S&T education, a common set of quality criteria was compiled and grouped into basic categories. First, general quality criteria such as scientific and pedagogic soundness constitute basic prerequisites. Second, specific categories on the level of the innovative science education practice such as social relevance are taken into account, and third, categories such as transferability were discussed (Lorenz[2], 2010, p. 7). This common set of key quality criteria was used to describe and compare S&T practices and methodologies and will be redefined on the basis of the outcome of the field trials.

### *2.1.2 Collection of innovative practices and international comparison*

The collection and description of innovative approaches meeting the quality criteria was a pivotal step in the process of the project. It constituted the starting point of adaptation and the field trials carried out by teachers in the partner countries.

The result is a structured international compilation of about 80 innovative science education practices whose function is twofold: it serves as a catalogue and supports all partners in the choice of the innovations to be realised in the pilots. Thus the partners are enabled to select the innovative practices in the light of their own country needs and of the adaptability of the practices to the national or regional situation. Key aspects – gender and diversity aspects and activity based and learner centred approaches – were included. It constitutes the basis for the comparison of the state of the art of S&T education on an international level. The comparative analysis realised by Mayer & Torracca (2010), identifies differences and trends in science education and represents a rich source of reflection on the idea of innovation in the field of science education.

In addition a more detailed comparative report is produced framing the national findings within the results of international studies, such as the PISA 2009 results which were published in October/November 2010. The selection process is taken into account as source of further information. The aim of the report is to support the adaptation of innovative practices from one context to another and, furthermore, to foster an adequate design of the trials. It provides a clear vision of what are the main differences and analogies between the various educational systems, policies and practices in the different partner countries as far as science education is concerned.

### *2.1.3 Selection and Adaptation Process*

The process of adaptation has a dynamic nature, involving interactions within the project team, among the consortium partners and the schoolteachers and, in some occasions, even between the authors of

[2] This project deliverable Common Set of Key Criteria is restricted to a target group defined by the consortium. Requests can be addressed to the project coordinator.

the original innovative practices and the teachers who were or are going to implement the respective practices. The adaptation process, the preparatory step of the field trials, consisted of two phases: The selection of innovative practices originating from other partner countries were followed by the adaptation to the national educational conditions. In the first phase, each partner country reduced the compilation of innovative practices to about 20 examples for potential adaptation in order to have a manageable list of practices to be in the second phase discussed with the teachers. This initial set had to meet the selection criteria of flexibility and of potential for adaptation to the particular national context. Other conditions to be met were to keep the core of the innovative practice and to guarantee that at least one of the key aspects gender equity, activity and learner centred approaches such as IBSE and cultural diversity are taken into account. Out of the list of twenty innovative practices, five practices were identified to be adapted and implemented in the field trials. This step was performed in close cooperation with the teachers. The adaptation process was framed by the following guidelines: coherence with the concept of Inquiry Based Science Education, preservation of the key features of the innovation, and identification of the features or dimensions in need of change (Jiménez-Aleixandre & Eirexas-Santamaría 2010, p. 41/42).

### *2.1.4 Field Trials*

The adapted innovative practices are implemented in field trials in a selected number of pre-primary, primary and secondary schools in the partner countries in the school year 2010/2011 (first cycle of field trials) and 2011/2012 (second cycle). To allow an analysis of the changes to be applied against the backdrop of the individual national and local context, clusters of partner countries are formed which adapt and implement the same innovative practice of origin. During the performance of the trials, exchange between partners is vital. Highlights are that even teachers who implement a trial and teachers who have performed the original innovative practice started to discuss their experience.

### *2.1.5 Evaluation*

Currently, the field trials of the first cycle are evaluated with respect to feasibility and effectiveness of activities. The evaluation questions address at least one aspect of cultural diversity, gender or inquiry-based teaching and learning.

## 3 TRANSFERABILITY OF INNOVATIVE PRACTICES – FIRST CONCLUSIONS

kidsINNscience fosters the transferability of innovation in S&T education. The challenge within transferring innovative approaches consists in adapting practices, methodologies or strategies, to the contexts and conditions that are specific to each country. For any successful transfer of innovation the framework and requirements, the national educational and social context of both, the country/context of origin and the target country/context must be taken into account. Therefore, a good innovative practice, according to the understanding of the project team of kidsINNscience, aims to change or improve the regular context of learning/teaching of S&T. It should address one of the problems nationally perceived as relevant and should be in contents - and/or in approaches to contents - and in teaching/learning methodologies innovative. Every innovation is relative to a cultural context and a good innovation should present successful results concerning the problem addressed.

## REFERENCES


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