iTEC

Designing the future classroom

# Cycle 3 Evaluation Report

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# Executive Summary

This document, iTEC Internal Deliverable 5.5, reports on the evaluation of the project's Cycle 3 large-scale pilots between September 2012 and December 2012.

The focus of Cycle 3 (C3) pilots was engaging students in the process of design. Four Learning Stories (LSs) were presented to teachers, each underpinned by a set of six Learning Activities (LAs) concerned with design processes. The fours LAs were Redesigning school (RS), Visualizing the planet surface (VPS), Designing a physics simulation (DPS) and Designing a math learning game (DMG). The six LAs were Design Brief, Contextual Inquiry (Observation for RS and VPS, Benchmarking for DPS and DMG), Product Design, Participatory Design Workshop, Final Product Design and Reflection.

The most popular Learning Stories were DMG, offered in 11 countries and chosen by 39% of teachers, and RS, offered in nine countries and chosen by 30% of the teachers. These two LSs are the most generic, whereas the other two present specific challenges: VPS requires some activities to take place outside school (thus requiring additional organization) and DPS is subject-specific.

334 teachers responded to the Cycle 3 survey, representing 403 pilots[1] across 18 countries. As in previous cycles, teachers have taken the resources and used them as sources of inspiration, adopting and adapting elements of them according to their own needs and situations. As a consequence, each implementation is unique to the teacher. Teachers report using a wide variety of digital tools to support the implementation, the majority using between four and seven different tools, the five most common being for data capture, communication, media authoring, accessing digital resources and collaboration.

There were five evaluation questions in Cycle 3, assessing the extent to which iTEC Learning Stories and technologies **benefited teaching and learning** and **were sustainable and scalable** and **fit for purpose,** assessing the **barriers and enablers to implementation,** and evaluating the **piloting process** itself. A mixed methods approach was used with quantitative data on the teacher's prior experience and context, together with their implementation of the Learning Story being collected via a 'Teacher Questionnaire'. 334 teacher questionnaires were completed representing 403 of 578 pilots conducted in C3, a response rate of 70%. In 13 countries, qualitative case study data was also collected, which included lesson observations, interviews with the teacher, head teacher, ICT co-ordinator (if applicable) and students. Each National Pedagogical Coordinator (NPC) chose approximately three teachers as case study teachers and a total of 47 case studies were analysed. NPCs also completed an end-of-cycle questionnaire summarising experience at a national level.

[1] Some teachers conducted two pilots (ie implemented iTEC with two separate cohorts of learners).

A summary of the main findings is now presented in relation to the five evaluation questions.

## 1. To what extent do the iTEC Learning Stories and relevant iTEC technologies benefit learning and teaching?

Each of the iTEC Learning Stories and technologies impacted positively on student attainment, motivation and 21st century skills. Participation also led to a positive impact on teacher competences, attitudes and motivation. The majority of teachers were confident or very confident that the iTEC resources (LSs, LAs, technologies) have the potential to lead to innovation in the classroom. The iTEC resources led to an increase in effective use of technologies and the uptake of innovative digital tools in the classroom[2]. Technology-enabled pedagogical innovation occurred as teachers adopted new practices such as changes in teacher and student roles, new forms of assessment such as peer assessment, student-centred and individualised approaches, and group work.

Teachers considered that the iTEC resources were beneficial for teaching and learning in a variety of ways:

- **To improve learning outcomes**. Cycle 3 of iTEC impacted positively on **student attainment, motivation and 21st century skills**. Three out of five teachers felt that there had been a positive impact on student attainment as evidenced by their assessment data[3]. **An increase in student motivation was identified as the most important benefit by 20% of teachers** (n=312). Four out of five teachers felt that students had developed skills in relation to creativity and autonomy. Digital literacy was noted to be improved in 30 of 47 case studies.

- **To develop teacher competences**. Participation led to a **positive impact on teacher competences, attitudes and motivation**. Four out of five teachers stated that, as a result of participating, they would use digital tools more often in the future. Three out of four teachers reported that their ICT skills had improved and that they had a better pedagogical knowledge of the use of ICT in the classroom. Three out of four teachers felt that participation had enabled them to develop their creative skills.

- **To bring about innovation**. The majority of teachers (98%) were very confident or confident that **the iTEC resources (LS, LA, technologies) have the potential to lead to innovation in the classroom**, irrespective of the LS they implemented. Teachers responding to the survey provided over 20 different reasons for why the iTEC resources have the potential to lead to innovation in the classroom from increased student motivation to increasing creativity in the classroom. **The development of an 'innovative approach to learning' was identified as the most important benefit of iTEC resources by 21% of**

[2] Tools which teachers had not used to support teaching and learning previously.
[3] Limited data were collected in Cycle 3 on learning outcomes; more extensive data will be collected in Cycle 4.

**teachers** (n=312). This covered both technology and pedagogy as described in the remaining bullets below.

- **To increase effective technology use.** The case studies, survey and NPC end-of-cycle questionnaires demonstrated that many different digital tools were used to support all activities throughout the implementation (four out of five teachers used four or more different types of digital tools during the implementation). Thus **technology was integrated as a part of everyday practices and employed regularly throughout the learning process** (eg for assessment, reflection, communication, aspects of classroom management) rather than being an ad-hoc add-on. This resulted in **increased use of technology in the classroom by both the teacher and the students**. Most interestingly, **student use of technology in the classroom was perceived by students participating in the case studies to be something they had not done before;** although teacher use of technology such as IWBs was relatively commonplace, opportunities for students to engage with technology in the classroom were more limited prior to iTEC.

- **To introduce innovative digital tools into the classroom. Three out of five teachers indicated that they used digital tools they had not used before** (eg Scratch, Sketch Up, blogs). **The introduction of new digital tools was identified as the most important benefit of iTEC resources by 14% of teachers** (n=312). 56% of teachers used blogs in their implementations to facilitate reflection and communication. The main benefits of blogs were noted to be sharing ideas and resources (easily accessible by all members of the group, at school or home), to support monitoring of progress, and the development of student communication skills and engagement with a wider range of stakeholders such as teachers and learners from other schools and parents. In addition, tools which were familiar to teachers and students outside school (such as Facebook and YouTube) were also used.

- **To change classroom practices. Technology-enabled pedagogical innovation occurred as teachers adopted new approaches** such as changing the role of the teacher, re-locating learning, adopting new forms of assessment, introducing group work and other forms of collaboration, using student-centred and individualised approaches, and creating authentic learning experiences. 85% of teachers responding to the survey felt that **participation led to the integration of new pedagogical practices** (such as those identified above). **An increase in collaboration was identified as the most important benefit by 19% of teachers** (n=312). **An increase in student autonomy and independent learning was identified as the most important benefit by 12% of teachers** (n=312). For some teachers, participation led to evolving current practices, whilst for others, the change in practice was more radical. Technology enabled the pedagogical changes through becoming embedded in daily practices and facilitating new assessment methods, student independence, and group work. As a consequence of these new practices, changes in the teacher and student roles were also noted.

Some examples are:

- **Assessment**:
  - Technology-enabled reflection through blogs enabling teachers to monitor progress, developing students' metacognition and self-evaluation, supporting peer learning.
  - Using learner response systems to provide students with immediate feedback.
- **Communication and collaboration**:
  - Technology such as blogs changing how teachers and students interact with each other, increasing teacher-student communication and enabling peer tutoring and peer feedback.
  - Using Facebook, Dropbox and blogs to facilitate group work and collaboration.
- **Designing and making**:
  - Using a range of digital tools to support the entire design process (e.g. Scratch) rather than only to undertake research and present findings.
- **Independence**:
  - Facilitating student autonomy and engagement more readily through student use of technology using blogs for example to support self-reflection, enabling students to refine their ideas.

**Differences between countries:** The main benefits identified by teachers from different countries varied. Teachers from eight countries identified an innovative approach to learning (AT, EE, ES, FI, LT, NO, PT, SK). Teachers from eight countries identified specific changes to pedagogy such as increased collaboration and enhanced student autonomy (CZ, EE, ES, HU, IT, PT, SK, TR). Teachers from four countries identified an improvement in student motivation (BE, FR, LT, NO). Teachers from three countries identified the introduction of new digital tools (FR, NO, PT).

In relation to the introduction of digital tools, teachers from Belgium used an average of three different types of digital tools whereas teachers from Italy, Lithuania, Spain (SMART) and Turkey an average of seven or more different tools.

## 2. To what extent are the iTEC Learning Stories and iTEC technologies sustainable, transferable and scalable?

Evidence gathered thus far is limited and the question will be addressed in depth through separate national case studies developed with key stakeholders. Nearly all teachers indicated that they would continue to use iTEC Learning Stories and iTEC technologies despite concerns in relation to common barriers to the uptake of ICT. National Pedagogical Co-ordinators (NPCs) felt confident that the innovation in case study schools would be sustained beyond the project, and transferred within and beyond the schools. Nearly all teachers indicated that they were very likely or likely to

recommend the resources to other teachers. However, insufficient computers and unreliable connectivity are frequently reported barriers to ICT uptake.

Evidence from Cycle 3 in relation to sustainability, transferability and scalability is limited. This is partly because individual teachers are not necessarily concerned with these issues and partly because many head teachers and ICT co-ordinators do not feel that it is yet possible to comment. This will be addressed in the later stages of iTEC through conducting national case studies with key stakeholders including policy makers, focusing more specifically on these aspects. Nevertheless, some indications emerged from observations, interviews and questionnaires.

- **There is some evidence that iTEC teachers are likely to continue using the iTEC resources in the future. Almost all (96%) teachers indicated they were very likely or likely to continue to use the approaches introduced in iTEC and to extend them** (eg devising their own LSs). For example, a small number of case study teachers mentioned adapting and combining ideas from the wider set of iTEC resources (C1-C3) to create new learning and teaching resources. **NPCs felt confident that innovation in case study schools would be sustained beyond the project** (19 of 36 case studies).

- **There is some evidence that iTEC approaches are likely to transfer to other teachers and other schools.** There was interest from other teachers (in the same school and occasionally other schools), especially if this was supported by the head teacher. **96% of teachers said that they were very likely or likely to recommend the resources to other teachers**. Eight of the case study interviewees suggested that iTEC had encouraged teachers to work together more collaboratively in relation to technology-enabled pedagogical change and there were specific references to running in-house Continuing Professional Development (CPD) events drawing on experiences of iTEC in two (of the 47) case studies. **National Pedagogical Co-ordinators (NPCs) felt confident that innovation was likely to be transferred within and beyond the participating case study school** (27 out of 36 case study reports). Data from two case studies suggests transfer beyond the participating school.

- **Barriers to ICT uptake are still a concern**. **A range of barriers were identified in relation to sustainability, transferability and scalability** (see question 4 below), notably insufficient infrastructure and unreliable Internet access – both essential pre-conditions for success.

**Differences between countries:** The majority of teachers in ten countries (AT, HU, IS, LT, PL, PT, SK, ES) felt it was highly likely (rather than likely) that they would continue to use the approaches introduced in iTEC. The majority of teachers in eleven countries (AT, CZ, HU, IS, IT, LT, PL, PT, SK, ES, TR) felt it was highly likely (rather than likely) that they would recommend the resources to other teachers.

## 3. To what extent are the Learning Stories and iTEC technologies fit for purpose?

The Learning Stories and Learning Activities were perceived to be fit for purpose, offering a source of inspiration (rather than a blueprint) enabling teachers to increase their use of digital tools and develop technology-enabled pedagogies. The recommended iTEC environments were perceived to be usable and beneficial. The concept of TeamUp was perceived to be beneficial and worthy of further development (beyond a prototype).

This question addressed usability, connection to current practice, what works and what does not work. The iTEC technologies included the following:

- Learning Activities (LAs) (7) and Learning Stories (LSs) (4)
- Learning environments (4 recommended: Moodle, dotLRN, ActivInspire, SMART Notebook)
- TeamUp

The three main types of resources presented were positively received.

- **The LSs and LAs are fit for purpose.** In almost two-thirds (23 out of 36) of the case study reports, the Learning Stories were felt to fit 'fully with current school policies and plans and in 11 cases, they were believed to fit 'to some extent'. Most (62%, 207 of 334) teachers found the Learning Stories easy to adapt (if necessary) without help. The LAs and LSs were sufficiently flexible to meet teachers' needs and were a source of inspiration enabling teachers to increase their use of digital tools and develop technology-enabled pedagogies. However, some teachers required support to interpret the LAs and LSs and develop resources for their own classrooms. This reflects the difficulties that arise when developing resources for teachers with a wide range of backgrounds and experiences, and working in different educational cultures across Europe.

- **Teachers were broadly positive about the usability and benefits of the learning environments**. Only 90 of the 334 teachers (27%) indicated that they had used one or more of the iTEC learning environments. **Four out of five of the teachers (n = 90) agreed or strongly agreed that the iTEC learning environments were usable and beneficial.** The main benefits of these particular environments were perceived by these teachers to be the technology itself, its impact on student attainment, efficiency and ease of use, and the fact that they opened up new pedagogical approaches. The main challenges included the technology, insufficient ICT skills for both teachers and students, lack of teacher preparation time, a lack of interest in the learning environments from some students and concerns that students without home access would be disadvantaged.

- **The concept of TeamUp has potential**. As in previous cycles, teachers feel that **TeamUp is a useful tool with many benefits** (such as enabling students and teachers to track progress, and promoting student self-evaluation) but some continue to experience difficulties in relation to reliability and technical issues. This is hardly surprising given that it is a prototype. For others, time to familiarise themselves with this tool was a challenge or they had alternative ways of achieving the same functionality (forming teams, recording reflections).

**Differences between countries:** Use of specific learning environments was reported by fewer than five teachers in most countries. In PT, 18 of 35 teachers (51%) indicated that they used Moodle. In ES (SMART), 13 of 20 teachers (65%) indicated that they used SMART Notebook. In both countries teachers were positive about the usability and benefits of the learning environments, in line with the findings aggregated across countries.

TeamUp was not used in BE, NO and PL. It was used by at least 10 teachers in ES (SMART), FI, HU, PT and TR. It was use specifically for recording reflections by at least 10 teachers in ES (SMART), PT and TR. In PT, technical problems using TeamUp was reported to be one of the main technical challenges that teachers faced (30 of 35 teachers in PT used TeamUp).

## 4. What are the enablers of and barriers to adoption of iTEC Learning Stories and iTEC technologies?

The most important enablers were: a positive student attitude, reliable infrastructure, support from other teachers, a positive teacher attitude and the Learning Stories/Learning Activities.

The most important challenges were: a lack of time to prepare and implement the Learning Stories/Learning Activities, unreliable internet access, negative student attitudes, insufficient access to technology, TeamUp, the constraints of the curriculum and facilitating group work.

### *Enablers*

Teachers identified a wide range of enablers, relating to attitudes, resources and support. Enablers can be grouped under the headings: Student, Teacher, Institutional and iTEC.

- **Student-related enablers.** The most important student-related enabler (and the most important perceived enabler overall) was a **positive student attitude** identified by 27% of teachers (82 of 299) responding to a question on enablers in the survey. This included general motivation, enjoying the use of ICT to support learning, and enjoying student-centred approaches, particularly collaboration. Although not identified as a main enabler, case study data

identified the importance of student ICT skills for success, sometimes facilitated through peer support.

- **Teacher-related enablers.** As for students, the most important teacher-related enabler was a **positive teacher attitude** to change identified by 12% of teachers (37 of 299) responding to a question on enablers in the survey. The importance of teachers being prepared to experiment with their approaches and adopt new pedagogies was mentioned in 12 (of 47) case studies.

- **Institutional-related enablers.** The most important institutional-related enabler was **reliable infrastructure** identified by 21% of teachers (62 of 299 responses). The availability of resources and Internet access were also mentioned as enablers in 14 case studies**. Support from other teachers** was identified by 16% of teachers (49 of 299 responses). Technical support (for example from an ICT co-ordinator) was mentioned in five case studies as an enabler. Although not identified as main enablers: the support of the head teacher was identified by 9% of teachers (26 of 299 responses) in the survey; the school's ethos was noted to be important in 17 (of X47) case studies; and a flexible approach to school organization including support for 'Bring Your Own Devices' was perceived to be important in 10 (of 47) case studies..

- **iTEC resources and processes acted as enablers.** The **Learning Stories and Learning Activities** could be powerful enablers providing ideas for innovative approaches to learning identified by 9% of teachers (27 of 299 responses). Although not identified as a main enabler, the training offered was seen to contribute to success by 20 (of 47) teachers in the case study data and 15 teachers responding to the survey. X NPCs also noted that the training was essential. Teachers enjoyed opportunities to meet others face-to-face and share knowledge and ideas with each other. Support from the NPC/NTC (National Technical Coordinator) at national level emerged as an enabler through case study data with references from 16 (of 47) case studies and 15 teachers responding to the survey. Fifteen case study teachers also identified being part of a community of teachers (not necessarily online) as a factor contributing to success.

***Barriers***

Barriers can be grouped under the headings: organizational, technical, skills, pedagogical and attitudinal.

- **Organizational barriers**. The most important barrier identified by teachers was **the lack of time required to prepare and implement the Learning Stories** (52%, 174 of 334). As in previous cycles, lack of time related to preparation including training and familiarisation, and finding sufficient space in the curriculum (in some cases relying on students doing additional work outside class in order to complete the project). Group work was also perceived to be time-consuming. Although not a main organizational barrier, outdated

school ICT policies were identified in seven (of 47) case studies, preventing access to student-owned technologies, and to social media tools like Facebook and Twitter.

- **Technical barriers.** The main technical barrier identified by 17% of teachers (56 of 334) in the survey and 25 of 47 case studies was **internet access problems**. The most common were lack of wireless access, limited bandwidth, unreliable Internet connections and few rooms/machines with an Internet connection. **Insufficient access to technology** (including at home) was perceived to be a main barrier by 16% of teachers (53 of 334) responding to the survey. A lack of equipment and resources was also mentioned in 29 (of 47) case studies. Some schools addressed this by encouraging students to bring their own devices to school, but this raised the issue of financial constraints. **TeamUp** was identified as a barrier by 10% of teachers (35 of 334) responding to the survey. Specific challenges were also noted in relation to the use of blogs (one of the main types of digital tools promoted through the LS and LAs) to support teaching and learning; largely that they were time-consuming to set up and manage (29 of the 117 teachers who used blogs, 17%). Although not identified as a main technical barrier, lack of technical support was identified as a challenge in two (of X) case studies. In addition, 31 case study teachers identified basic technical challenges (such as hardware not working and difficulties understanding how to use a program or web service) which could be resolved with adequate technical support.

- **Student competence barriers.** Although not identified as a main challenge by teachers responding to the survey, inadequate student ICT skills were mentioned as a challenge in 25 (of 47) case studies. Common issues reported included skills in handling image and sound files, information gathering skills and blog writing, as well as organizational problems such as forgotten passwords. In six case studies, poor student time management skills were also identified as a challenge. In some cases this was linked to the age of the students.

- **Teacher competence barriers.** Inadequate teacher ICT skills were mentioned in 13 (of 47) case studies. Some were not familiar with relatively common digital tools (eg Dropbox) whilst those who were already ICT confident still reported the need to learn how to use new tools (demanding an investment of time).

- **Negative attitudes.** Finally, one of the main challenges identified in the survey was **negative student attitudes** (14%, 47 of 334). This included included negative student attitudes in relation to group work and working in non-friendship groups, and resistance to use of new technologies. In addition, students in two case studies equated technology use with leisure rather than learning. In five case studies (of 47) teacher resistance to change was noted (by head teachers) to be a concern in terms of potential scaling-up of iTEC processes through the whole school.

**Differences between countries:** Positive student attitude was identified as a main enabler in EE, ES (SMART), FR, HU, IS, IT, LT, PT, SK, TR, UK. Sufficient infrastructure and resources was identified in BE, CZ, ES (SMART), HU, NO, SK, UK. Support from other teachers was identified in AT, BE, CZ, PT. Positive teacher attitude was identified in EE, ES (SMART), IS, IT, LT. New pedagogy was identified in DE. The support of the head teacher (or senior staff) was identified in CZ, ES (SMART), IS.

Insufficient time was identified as a main challenge in CZ, DE, EE, ES (SMART), FI, FR, HU, IS, IT, LT, NO, PT, SK, UK (Promethean). Unreliable internet access was identified in BE, ES (both SMART and Promethean), HU, IT and TR, whilst insufficient access to ICT resources was identified in BE, FR, IT, NO and UK. Negative student attitude was identified FI and IT. Curriculum constraints were identified in DE.

## 5. To what extent was the piloting process effective and what were the challenges faced?

NPCs found it easy to select LSs and localise the resources. Recruitment for Cycle 3 was successful with 578 pilots undertaken across 18 countries. Of the 75% of teachers who indicated they had received training and support, the majority of teachers were satisfied with the provision. Challenges faced included sufficient time to localise resources (translation), recruit and prepare teachers (including technical training); supporting teachers unable to attend face-to-face workshops, and maintaining teacher engagement.

As in previous cycles, NPCs were asked to identify lessons learned and challenges in relation to localisation of resources, teacher selection, and training and support.

- **NPCs were easily able to select appropriate LSs and localise resources**. Seven NPCs did not offer schools all Cycle 3 LSs (two of whom offered no choice and pre-selected a LS), choosing instead those which they felt were most innovative yet realistic for teachers in their country. NPCs in Estonia and Lithuania adapted the Designing a Math Learning Games LS so that it was applicable across other subject areas. As in Cycle 2, **LSs which are open and flexible, based on ideas that are easy to understand and can be adapted to fit a range of curriculum areas are perceived by NPCs to be most likely to be successful.** When teachers are given a choice of LS they are more likely to require support (and time) to adapt the resources. Involving teachers in the selection process (if not offering a completely free choice to teachers) is important for success; involving students in this process can be beneficial. Two NPCs noted that translation of the resources was an additional burden when resources were already stretched.

- **Recruitment for Cycle 3 was a success.** There were 578 pilots across 18 countries. In two countries (Estonia and Lithuania) all teachers who

volunteered to participate in the project were accepted whereas in the rest of the countries, NPCs adopted some form of selection process. Elements of the recruitment process that worked well included relying on teachers to volunteer (self-motivated), involving several teachers from a single school, involving the head teacher, involving the MoE and regional educational authorities, and ensuring that teachers had some ICT competency prior to participation. Challenges included lack of support from head teachers, short timescales and limited resources for recruitment, lack of incentives for teacher participation, and ensuring that teachers had the necessary skills.

- **The majority of teachers were satisfied with training and support.** Most NPCs started with an initial face-to-face workshop or meeting. Subsequently, NPCs provided support in a variety of ways with the majority making use of online tools, including email, blogs, websites, webinars, videoconferencing, Skype and learning environments. Activities that worked well included the inclusion of practical examples, encouraging teachers (from earlier cycles and pre-pilots) to share their stories and experience, and the use of national online communities. Challenges included lack of time to teach advanced ICT skills, and difficulty in supporting teachers unable to attend face-to-face workshops. In relation to the iTEC website and forums (previously the Teacher Community), about half the participating teachers felt they were useful for discovering new pedagogical practices and new digital tools. However, only 34% of teachers indicated that they visited the iTEC website/forums at least weekly. Some teachers experienced technical problems when trying to register for the iTEC forums.

**Differences between countries:** localisation beyond translation occurred in 8 countries: resources were mapped to the curriculum (IS, NO); Designing Maths Games was extended to other subject areas (EE, LT); minor amendments were made (AT, ES, NO) and significant amendments (BE). Some recruitment challenges were noted by more than one country: lack of support of head teacher (HU, IT, NO, UK); lack of incentives for teachers (IS, NO, SK, TR); ensuring that teachers have necessary skills (ES, IT, NO). Six NPCs referred to a national website and/or community as an effective means of supporting teachers (BE, EE, FR, HU, LT, NO). Some piloting success factors were highlighted by more than one NPC: motivated teachers (HU, IS, SK, TR), prior experience (ES, NO), face-to-face training (HU, IT) and teachers sharing their experiences with others (ES, LT).

# Recommendations

A number of recommendations arise from the findings reported in this report.

## Scenario development (WP 2)

1. MoEs in iTEC should:
    a. Develop – with teachers and students and other stakeholders – more open-ended scenarios and Learning Activities which can be adopted across a wide range of subject areas and which meet national needs.
    b. Offer teachers innovative ideas which can be applied using commonplace technologies (including some that are not reliant on networking capabilities) and low-tech resources, alongside the more pioneering and disruptive ideas.
    c. Make materials produced (scenarios, Learning Activity) accessible for teachers through different media formats (text, video, podcast etc).

## Learning Activity development (WP 3)

2. Aalto should provide detailed guidance on known TeamUp problems (with outdated browsers for example) and how to install it on a local server.

## Piloting (WP 4)

3. WP4 partners should:
    a. Support MoEs and NPCs to include Initial Teacher Education providers/trainees in a pilot for C5;
    b. Consider alternative (additional) platforms to the iTEC website/forum.

## Scaling up (WP 11)

4. At European level, WP11 partners should:
    a. Work with other partners to document visually the iTEC process to facilitate scaling-up. Simple visualisations and videos of the process and links to more detailed explanations of aspects of the process would enable teachers to develop an understanding of the iTEC approach.

5. At national level, iTEC MoEs should:
    a. Analyse WP4 data in relation to website visitors (unique visits, by country) to determine the reach of iTEC beyond project participants.

b. Scale up the iTEC process to national level. Evaluation of the iTEC process has shown that it can lead to change and innovation classrooms and that teachers have been enthusiastic and inspired.
c. Ensure that national support structures are in place to maximise the benefits offered through iTEC processes and resources. Around one third of teachers needed support to adapt the resources to meet their needs.
d. Nominate and support teachers who have been involved in several cycles as iTEC ambassadors sharing their experiences and supporting other teachers, thus ensuring the approach spreads in their own school and other schools.
e. Facilitate national dissemination and events, led by iTEC ambassadors
f. Encourage the development of national and local online communities as they support the uptake of iTEC processes and resources. Local communities of practice provide opportunities for local support and dissemination of practices. This is more likely to happen when there are several teachers from a single school (or cluster of schools) engaged in scenario implementation.
g. Consider offering national teacher incentives, including release from classroom teaching, supporting training and opportunities for accreditation. Time is the biggest barrier for 50% of teachers; teachers need to be rewarded for their investment.
h. Translate iTEC case studies disseminate them widely through national online communities and CPD networks to maximise reach.

Finally, in order to support scaling–up, investment may be required at national level in order to address all or some of the following barriers identified in iTEC pilots:

6. Infrastructure and technical support:
    a. Invest in the development of ICT infrastructure including the provision of reliable and sufficient access to the internet
    b. Prioritise the provision of ICT technical support and ICT pedagogical support within schools (or across clusters of schools);
    c. Review national/regional/local school ICT policies to encourage the use of student-owned devices (BYOD) in school contexts;

7. Teacher competence development:
    a. Develop national/regional/local pre- and in-service programmes to increase teachers' ICT technical and pedagogical skills. Provide training/guidance for teachers on: managing group working, supporting students' reflection and peer feedback, and supporting students in online environments.
    b. Produce national resources to facilitate the development of teachers' ICT skills (guides, screencasts, video tutorials, online helpdesks);

c. Create opportunities for teachers to meet in face-to-face settings (the inclusion of dissemination/training activities in national teacher conferences through presentations/workshops for example);
d. Foster positive teacher and student attitudes to change and the use of technology to support teaching and learning, and develop strategies to engage head teachers and senior managers;
e. Liaise with other projects that are similar in mission in order to seek mutual benefit and enhancement of impact.

The above recommendations support those made by the iTEC Higher Level Group in October 2012 (Dykes & Ayre, 2012):

- The development of a review framework would ensure that appropriate actions are prioritised to maximise the impact at school level of any MoE investment in infrastructure, technical support and teacher competence development (see for example recommendations 6 and 7).
- A review of initial teacher training programmes would ensure that teachers develop appropriate technical and pedagogical competences, enabling them to adopt and adapt iTEC resources (see for example recommendation 7a).
- Develop a community of iTEC ambassadors to stimulate uptake of iTEC resources and participate in national events promoting the benefits of iTEC as part of a blueprint for mainstreaming (see for example recommendations 5d and 5e).

# Introduction

This is the third of five evaluation reports and presents findings in relation to the five evaluation questions:

1. To what extent do the iTEC Learning Stories and relevant iTEC technologies benefit learning and teaching?
2. To what extent are the iTEC Learning Stories and iTEC technologies sustainable, transferable and scalable?
3. To what extent are the Learning Stories and iTEC technologies fit for purpose?
4. What are the enablers of and barriers to adoption of iTEC Learning Stories and iTEC technologies?
5. To what extent was the piloting process effective and what were the challenges faced?

In iTEC, a Learning Story (LS) is a narrative overview of learning developed from the educational scenario. A Learning Story provides an exemplar of how the Learning Activities may work together. The Learning Activity is a concrete description of a learning sequence that can be used in teaching and learning. A Learning Activity can be supported, either partially or completely, by a set of technological tools. The use of technology is explained explicitly in the Learning Activity guidance which has been prepared for teachers.

In addition to the above, a greater emphasis has been placed on levels of innovation in relation to technology and pedagogy, together with evidencing how the technology has enabled the pedagogy to change. In addition, short case studies have been produced to exemplify how the LSs and LAs have been interpreted and implemented at national levels.

The data collection and analysis undertaken by Work Package 5 at the end of a cycle represents the end product of a process to which many iTEC colleagues make substantial inputs. The Ministries of Education play the leading role in the setup and oversight of the pilots and the collection of the data.

To organize access to schools by native-speaking educationalists, familiar with national policies and priorities, each Ministry has identified a National Pedagogic Coordinator (NPC) and a National Technological Coordinator (NTC) who arrange and support the pilots. In a number of countries, it has been possible to identify persons able to combine these two roles, but where this has not been the case, the co-ordination of the piloting process and the data collection visits for the evaluation are undertaken by the nominated NPC.

The seven detailed scenarios (narrative descriptions of innovative pedagogical approaches to learning including technological tools) developed for the third cycle by Work Package 2 (WP2) were produced following an adaptation to the process used in Cycle 1 and Cycle 2 (Cranmer, Perrotta, Oldfield and Payton, 2012). Educational trends were developed and analysed as they had been in the first two cycles. In

Cycle 3 these focused on the learner experience. In a change from the first two cycles, the educational scenarios were drafted by WP2 and based on innovative practice collated from iTEC partners and desk-based research rather than being generated initially through collaborative workshops. In addition, five workshops were undertaken with groups of learners in four countries to elicit their suggestions for educational scenarios. Subsequently, the scenarios were refined through a collaborative workshop involving teachers and pedagogical experts from beyond the iTEC project team. The feedback from the learner workshops was also shared.

The seven detailed scenarios were then analysed and through a participatory design process 7 LAs and 4 LSs were developed (Keune, Toikkanen and Leinonen, 2012). Following participatory design workshops (held in 8 countries), with focus groups (7 sessions involving teachers, students and experts from 9 countries) and other activities to produce prototypes, two packages of LAs were pre-piloted with teachers (receiving 41 comments from teachers from four countries). The results of the pre-pilot informed revisions of the LSs and LAs prior to the full pilots (Sep 2012 – Dec 2012). As in previous cycles, the LSs and LAs along with tools and other resources are thus also the outputs of an iterative process with a high level of user engagement, drawing on the significant pedagogical and technological expertise available to the consortium.

WP3 also provided 'TeamUp' as a technical prototype, together with a brief visual user manual to accompany it. This tool enables teachers to generate teams, either teacher-defined or randomly generated. Teachers and students can generate topics or themes and then the students can indicate their preference. Teachers can also identify other relevant characteristics such as gender. Teams can then be formed based on the team size required, whether or not students should be matched to their chosen topic or assigned to groups based on certain characteristics. TeamUp also offers the facility for teams to record 60-second newsflashes about their progress to support reflection. Following its use in Cycle 1, further development was undertaken with regard to facilitating reflection and visualising team formations, with additional improvements to the user interface. Between Cycle 2 and Cycle 3, a number of identified problems were resolved.

The NPCs and their pilot schools are supported by Work Package 4 (WP4). In order to address one issue arising in Cycle 1 and Cycle 2 (that there was insufficient time to prepare and implement LSs and LAs, the process for selecting and handing over LAs and LSs from WP3 to WP4 was simplified. This enabled WP4 to launch Cycle 3 more promptly. Prior to the start of Cycle 3 in September 2012, WP4 offered an online 'question and answer' workshop on June 20th 2012 and presented the Learning Stories and Learning Activities.

Following the review of the teacher community in Cycle 1 and Cycle 2, the online community was merged with the iTEC website and the registration process was simplified further. The new site was relaunched in September 2012. The majority of the site is freely accessible and teachers only need to register (through a simple process) to contribute to forum discussions. In addition, a greater focus has been placed on providing resources for teachers, giving teacher's work more visibility and

making the benefits of participation clearer. Teachers can find out about: educational scenarios; Learning Stories and Learning Activities; iTEC technologies; the effective use of technologies to support teaching and learning; how to participate in pilots; and training opportunities.

In addition, WP4 ran two workshops in September. Firstly, a 1.5-day workshop for NTCs to explain how to integrate iTEC technologies in Cycle 3 pilots. Secondly, a 2-day workshop for teachers (one ambassador from each country) on iTEC technologies and filming opportunities. WP4 also sent regular email updates to NPCs and NTCs advising them of deadlines and forthcoming tasks/events. Finally, WP4 host the TeamUp server. Following issue in Cycle 2, TeamUp was migrated to a new server and known technical bugs were solved.

Although they are education experts, NPCs are not professional researchers. Work Package 5 (WP5) has provided support for the data collection element of their role through induction briefings and the provision of a detailed Evaluation Handbook that was updated to reflect the experience gained in Cycle 2. Data collected in Cycle 3 included one teacher online survey (about their current uses of ICT and about the implementation of the Learning Story), three case studies (lesson observation and interviews with teachers, students and the head teacher) and an NPC survey.

Technical support for the pilots is provided by Work Package 6 (WP6). During Cycle 2 WP6 facilitated webinars on Moodle set-up, DotLRN set-up, widgets and the smaller tools recommended in the WP3 resources for the Learning Activities (eg Blogger, Prezi, YouTube, SketchUp, CorkboardMe). In addition, the information about the widget store and the widget store manual were updated (available via the iTEC website). Promethean opened up the webinars run for their own teachers to any iTEC teachers. The webinars covered the Promethean shell ActivInspire, the Learning Stories and Learning Activities for Cycle 3, the Teacher Communities (iTEC and Promethean iTEC), and more information on how to be involved in the pilots. Promethean also exemplified the use of each of the four Cycle 3 Learning Stories and links to these were provided on the iTEC Teacher Community thus making them easily accessible to all teachers. SMART ran a webinar on implementation ideas which was open to all teachers. The ideas related to how the SMART shell (SMART Notebook) could be used to support the Cycle 3 pilots along with suggestions for additional tools to support each of the Learning Activities. The resources presented were also made available via a link on the Teacher Community.

What follows in this report are the findings of the evaluation of Cycle 3 (C3) pilots in relation to benefits, enablers, barriers, challenges and drawbacks. Evidence to support sustainability, transferability and scalability is presented together with recommendations for project partners and policy makers. Finally, evidence is presented in relation to the piloting process. In addition, Appendix A contains case studies will illustrate the process of implementing iTEC at a school and classroom level and summarise the main innovations and enablers as well as teacher and student reflections.

# Context

18 countries participated in Cycle 3: Austria, Belgium (FL), Czech Republic (Associate Partner), Estonia, Finland (Associate Partner), France, Germany (SMART), Hungary, Israel, Italy, Lithuania, Norway, Poland (SMART), Portugal, Slovakia, Spain (SMART), Spain (Promethean), Turkey, United Kingdom (Promethean).

One survey was undertaken: the 'Teacher Questionnaire', which was used to collect data on the teacher's prior experience and context, together with the implementation of the Learning Story. 334 teacher questionnaires were completed. As in previous cycles, in some countries only a very small number of teachers participated. Considering the cultural differences between countries, the variation in implementation (choice of Learning Story, choice of Learning Activities, individual adaptations), as well as some aggregated data, analysis has also been undertaken on a country-by-country basis. Selected data from each country have been analysed separately (Appendix C) then subjected to a meta-analysis. Therefore, data analysis is primarily qualitative. However, where appropriate aggregated data are presented acknowledging the limitation that this does not account for differences in cultural context or country sample sizes.

Thirteen countries participated fully in pilot case study data collection, which included lesson observations, interviews with the teacher, head teacher and students. Each NPC chose approximately three teachers as case study teachers. The selection method varied by country. Three asked for volunteers, while the rest selected schools or teachers known to them. These were often those judged to be most technologically proficient (2) or most advanced in the implementation of the Learning Story, or the iTEC approach generally (6). One NPC said the case studies were chosen to represent a spectrum of ICT proficiency. Another commented that case study teachers also needed to possess good communication skills and two narrowed down their choice by selecting teachers and schools representing a variety of school types, locations and subject disciplines. It is important to note that, while no single consistent method of selection was used, on the whole, the case studies teachers represent a fairly homogenous group: most possess reasonably high levels of technological proficiency and have experienced notable success using the iTEC approach.

The NPCs were provided with a set of guidelines on conducting the case studies to standardise the process as far as possible. However, the interviews were designed to be semi-structured in nature and NPCs were free to make minor adaptations as appropriate, for example, including their own prompts. Therefore, whilst numbers of case study reports or interviewees mentioning various themes are provided throughout this report to allow a comparison of the relative frequency with which they were mentioned, the diversity in the case study selection, and also in the conduct of the case studies, means these should be interpreted as illustrative, rather than statistical figures.

In a change from Cycle 2 (C2), case study teachers were not required to produce a multimedia story but could undertake this activity voluntarily. NPCs were asked to take responsibility for ensuring that the multimedia stories were made available via the Teacher Community. Twenty were produced representing 6 countries. The NPCs produced a case study report for two of the three case studies that they conducted, and provided transcribed and translated raw data for the third case study. The analysis of case study data presented below is based on a total of 47 case studies, described in 36 case study reports, 15 teacher interviews, 15 head teacher interview transcripts, 9 ICT co-ordinator interview transcripts, 19 student interview transcripts, 13 NPC questionnaires and 15 additional questions for NPCs.

Following pre-piloting and development by Work Package 3, iTEC presented two sets of Learning Activities for piloting in Work Package 4 together with four Learning Stories.

The Learning Activities were presented as two packages grounded in learning through design, recording reflections and blogging after each Learning Activity (Aalto University, 2012). Initially, teachers were asked to prepare a 'design brief' which students develop during each stage of the design process.

Package 1: **Observe and Design**

Learning Activities:

- Design Brief: students are presented with an initial design brief linking the tasks to curriculum topics, students form teams and refine the design considering purpose and initial design challenges
- Contextual Inquiry: Observation: students decide who and what to observe, conduct observation and analyse data, refining design brief further
- Product Design: students create a prototype and refine the design brief
- Participatory Design Workshop: students meet with 3-4 potential users, present prototypes and elicit feedback, analyse feedback, and refine design brief
- Final Product Design: students create final design prototype, draw on recorded reflections and consider how identified challenges were overcome, finalise blog and present work to their peers
- Reflection: After the end of each of the above Learning Activities, post and share audio updates of perceived challenges

Two stories have been designed to support the implementation of the package:

- **Redesigning school (RS):** This LS requires students to think about spatial design and the different motivations of people who use the space. A new space for future use is designed based on identified current challenges in relation to school-based activities. See for example, Appendix A, Case Study Stories: Slovakia, UK.

- **Visualizing the planet surface (VPS):** This LS requires students to design a guided walk that highlights aspects (wildlife, buildings/monuments/geographical features) of the local environment for community members or tourists. The final walk should be based on geocaching, a location-aware smartphone game, Google map or printed map, or QR codes. See for example, Appendix A, Case Study Stories: Portugal, Norway.

**Redesigning School (RS), UK**

After being presented with a design brief, students were allowed around the school with mobile devices to record the issues they found. Before they went, students agreed as a class on the ground rules that they must follow. Students used iPads to record photos, videos, make notes and record their thoughts throughout the project. Students without iPads were loaned Flip Video cameras. Students created a prototype and then took part in a participatory design workshop, where they discussed their design with future users. Based on the feedback, students then created their final design prototype which they presented to the class.

Students were divided into groups or three using TeamUp, but they were free to decide on their own role within the team. The teacher set up an Edmodo group to allow students to share their work. She created alerts to the group and posted links to useful websites and documents in the 'library' and students were responsible for uploading their work. Students recorded their reflections throughout the design process.

**Visualizing the Planet Surface (VPS), France**

Thirty primary school students aged 10-11 years took part in this activity to make a documentary film about their village. This was linked to the curriculum for geography and for written expression. There were three stages to the project: information gathering, writing documentary texts and using multimedia tools to make a film.

The information gathering stage involved collecting data from a range of source including photographs, interviews and filming using digital cameras and camcorders. The students then produced and recorded texts which they would use for the film. The final stage was to edit the voice recordings, photographs and videos to produce the finished film.

Throughout the whole duration of the project, they kept a logbook on the project's progress on the school's website, making the work visible to parents and the community.

Package 2: **Benchmark and Design**

Learning Activities:

- Design Brief: as above
- Contextual Inquiry: Benchmark: based on who they are designing for and what they are designing, students collect exemplars of the artifact they are trying to design, share the resources and analyse them, refining their design brief further
- Product Design: as above
- Participatory Design Workshop: as above
- Final Product Design: as above
- Reflection: as above

Two stories have been designed to support the implementation of the package:

- **Designing a physics simulation (DPS):** This LS requires students to design a simulation that can be used to teach a physics concept (eg friction) to other students. The simulation can be virtual or physical. See for example, Appendix A, Case Study Stories: France.
- **Designing a math learning game (DMG):** This LS requires students to design a math learning game to teach a maths concept (eg simple geometry) to younger students. Students are asked to consider what younger students might find challenging and what they might find engaging. See for example, Appendix A, Case Study Stories: Austria, Estonia, Lithuania, Slovakia, Spain, Turkey.

**Designing a Physics Simulation (DPS), Austria**

The topic of this project was Ohm's law. Working with the NPC, this teacher developed the idea of taking the existing Learning Story - Designing a Physics Simulation and adding a few elements from previous cycles to it.

The teacher introduced the students to the basic concepts of the lesson and divided them into groups of four to five to carry out research. Browsing the web and the resource platforms already available, they became familiar with the basic concept of Ohm's law.

Once the students had gained theoretical understanding, the teacher prepared a hands on experiment in the classroom so the students would get a feel for what Ohm's law meant in real life.

The next activity was a Skype chat with an expert of the University of Vienna, allowing the students to learn more an expert in the field and to ask questions, if they had any.

Using a Promethean ActiveBoard, the teacher was able to use the learner response tool to quickly verify if the students had understood the concept of Ohm's law.

After that, they designed a physics simulation, using Scratch in most cases, to explain Ohm's law. Since the class was already familiar with programming, they completed this very quickly.

**Design a Maths Game (DMG), Hungary[4]**

Although based on the DMG Learning Story, the project was conducted in English (and occasional ICT) lessons, so the Learning Story was adapted to make it applicable to a different subject area. The aim of the project was twofold: 1. learning through design and 2. creating useful and enjoyable revision games that might help learning.

Year 7 students (13-14 years) created English revision games for pupils in Year 4 (9-10 years). Ten students were involved and the project took place over 12 lessons (2 for preparation and 8 to complete the task).

The students formed mixed groups of 3-4 students and each group worked on a different kind of game. Each group had to design their own image (logo, motto, group site etc.).

The planning stage included:
*brainstorming about possible language games;
*becoming familiar with the syllabus and the Year 4 coursebook;
*comparison of different products and design briefs;
*searching for useful links.

Students then produced a first draft of their game and tried out the prototype. The Year 4 students tried out the games during the participatory design workshop and completed a feedback questionnaire. Students then modified their products and presented their work during the final evaluation session.

In addition, some teachers created their own LS drawing on the resources for provided. See for example, Appendix A, Case Study Stories: Belgium (FL), Italy.

In the NPC questionnaires, two NPCs indicated that they had selected a single LS to present to teachers. In six countries, teachers were allowed a free choice of LS. The remaining five offered teachers a choice of two or three LSs. Designing a Maths Game was slightly more popular than the other LSs, being offered in eleven countries, compared to eight or nine for each of the others. In one case, a slightly different approach was adopted, which is described by the NPC as follows:

> *Teachers were left to choose one of the two Learning Activities Packages. We told them not to adopt one of the 4 (2 per Package) suggested LS, but to consider them just as example for inspiration: they had to write their own original Learning Story that reflect one of the two packages. They could also decide to 'sum" the two packages, by implementing the 'Contextual Inquiry Activity' with both 'Benchmarking' and 'Observation'. (Italy - NPC questionnaire)*

[4]Taken from a cycle 3 multimedia story: http://files.eun.org/itec/imms/C3_HU_Krisztina_Varga-hun.pdf

Where explanations for limiting teachers' choices to a smaller number of LSs were offered, NPCs indicated that they had selected those LSs which they felt to be most innovative, yet realistic for teachers in their country. In two cases, NPCs said they had adapted the Designing a Maths Game (DMG) LS to make it applicable across a range of subject areas. Where a free choice of LSs was offered to teachers, NPCs said that individual teachers could adapt the LS they chose as they saw fit.

**Table 1: Learning Stories offered**

| | Learning Story offered | | | |
|---|---|---|---|---|
| Country | Redesigning School (RS) | Visualising the planet surface (VPS) | Designing a math learning game (DMG) | Designing a physics simulation (DPS) |
| Austria | ✓ | × | ✓ | ✓ |
| Belgium | ✓ | × | × | × |
| Czech Republic | ✓ | × | ✓ | × |
| Estonia | × | × | ✓ | × |
| Finland | ✓ | ✓ | ✓ | × |
| France | × | ✓ | ✓ | ✓ |
| Hungary | ✓ | ✓ | ✓ | ✓ |
| Israel | ✓ | ✓ | ✓ | ✓ |
| Italy | N/A | N/A | N/A | N/A |
| Lithuania | ✓ | × | ✓ | × |
| Norway | × | ✓ | ✓ | ✓ |
| Slovakia | ✓ | ✓ | ✓ | ✓ |
| Turkey | ✓ | ✓ | ✓ | ✓ |
| SMART (ES, DE, PL) | ✓ | ✓ | ✓ | ✓ |
| Promethean (UK, ES) | ✓ | ✓ | ✓ | ✓ |
| Totals | 11 | 9 | 13 | 9 |

Of the 334 teachers who responded to the survey, the most popular choices were RS and DMG (Table 2). In the spirit of the project, a small number of teachers elected to pilot a different LS to those suggested, drawing on the resources presented as inspiration. These included: flipped classroom (2 teachers) and designing a science learning game (3 teachers).

**Table 2: Learning Story choice**

| Learning Story | No. teachers choosing (% of teachers) |
|---|---|
| Redesigning school (RS) | 130 (39%) |
| Visualising the planet surface (VPS) | 54 (16%) |
| Designing a physics simulation (DPS) | 36 (11%) |

| | |
|---|---|
| Designing a maths learning game (DMG) | 100 (30%) |
| Other | 14 (4%) |

Teachers reported a wide variation in uptake of individual LAs (Table 3). Only 41 teachers piloted all six LAs when implementing a LS from Package 1, with 36 indicating that they had piloted only one of the LAs. Only 32 teachers piloted all six LAs when implementing a LS from Package 2, with 16 indicating that they had piloted only one of the LAs.

**Table 3: Learning Activity choice**

| Learning Activity | No. teachers piloting (% of teachers) |
|---|---|
| Design Brief | 241 (72%) |
| Contextual Inquiry: Observation | 207 (62%) |
| Contextual Inquiry: Benchmark | 146 (44%) |
| Product Design | 142 (42%) |
| Participatory Design Workshop | 141 (42%) |
| Final Product Design | 202 (60%) |
| Reflection | 202 (60%) |

As in previous cycles, this suggests that teachers have used the resources for inspiration (in the spirit of the project) and that each implementation is likely to be different to that of other teachers to varying degrees.

As in previous cycles, when taking into account country and choice of Learning Story, the sample sizes are too small to undertake reliable comparative analyses using statistics (the largest being for RS in Belgium: 25, RS in Lithuania: 17 and DMG in Estonia: 17) (see Appendix B, Table 20).

## Use of technology

The LA resources present pedagogical ideas (for example, participatory design workshops) which could be perceived as being innovative by teachers together with recommendations for different types of technological tools which teachers could use to support/enable the pedagogical ideas. For C3, the tools suggested within the LA resources are summarised in Table 4. The use of blogging tools and reflection tools (such as TeamUp) are highlighted throughout the package of LAs.

**Table 4: Digital tools recommended to support Learning Activities**

| Learning Activity | | Tool(s) |
|---|---|---|
| Design Brief | | TeamUp, blogs (eg Blogger), blog aggregator (eg Google Reader), Google Sites, CorkboardMe |
| Contextual Inquiry | Observe | Media applications for recording (eg AudioBoo, Instagram), cloud storage (eg Dropbox, Google Docs, Flickr, YouTube) |
| | Benchmark | Social bookmarking (eg Delicious, Diigo), Media applications for recording (eg AudioBoo, Instagram), cloud storage (eg Dropbox, Google Docs, Flickr, YouTube) |
| Product Design | | Collaboration tools, Prezi, Sketchup |
| Participatory Design Workshop | | Media applications for recording (eg AudioBoo, Instagram), cloud storage (eg Dropbox, Google Docs, Flickr, YouTube), CorkboardMe |
| Final Product Design | | Digital authoring tools, blogging (eg blogger), cloud storage (eg Dropbox, Google Docs, Flickr, YouTube), Google Sites, Prezi, SketchUp |
| Reflection | | TeamUp, VoiceThread, AudioBoo, Bambuser |

The majority of teachers used between 4 and 7 different tools (as compared to between 5 and 9 different tools in C2) (Table 5, Figure 1). The categories of tool used in C1 were re-developed for subsequent cycles following alignment with terminology used in the WP2 mapping tool (Cranmer et al, 2013). In C1, therefore, specific questions were not asked in relation to student information systems and learner response systems.

The different uses of tools across each cycle reflect the focus of the Learning Activities and Learning Stories, each of which recommends a different list of digital tools according to the required functionality.

**Table 5: Reported use of digital tools in C3, C2 and C1 by tool type (top five indicated)**

| Type of digital tool used[5] | % of teachers reporting use C3 (n= 336) | % of teachers reporting use C2 (n = 261) | % of teachers reporting use C1 (n = 231) | % overall |
|---|---|---|---|---|
| Data capture device | 74% (1) | 72% (3) | 88% (1) | 78% |
| Communication tool | 67% (2) | 75% (2) | 74% (=2) | 72% |
| Digital resources | 66% (3) | 86% (1) | 72% (4) | 75% |
| Collaboration tool | 49% (4) | 65% (=4) | 71% (5) | 62% |
| Mobile devices | 46% (5) | 46% | 50% | 47% |
| Interactive whiteboard | 45% | 63% | 52% | 53% |
| Music/photo/video/slide sharing sites | 44% | 65% (=4) | 55% | 55% |
| TeamUp | 38% | 62% | 59% | 53% |
| Media authoring tool | 35% | 59% | 74% (=2) | 56% |
| Virtual learning environment | 31% | 30% | 23% | 28% |
| Game based learning | 27% | 30% | 27% | 28% |
| Student information system | 20% | 23% | N/A | 22% |
| Document camera/digital visualiser | 15% | 13% | 24% | 17% |
| Virtual experiments and Simulations | 14% | 18% | 7% | 13% |
| Learner response system | 9% | 23% | N/A | 16% |
| High tech instruments for science | 4% | 8% | 8% | 7% |

[5] This list was derived in conjunction with WP2 (in relation to the scenario mapping tool) and WP10 in relation to the functionalities and devices vocabularies in order to align with other work packages.

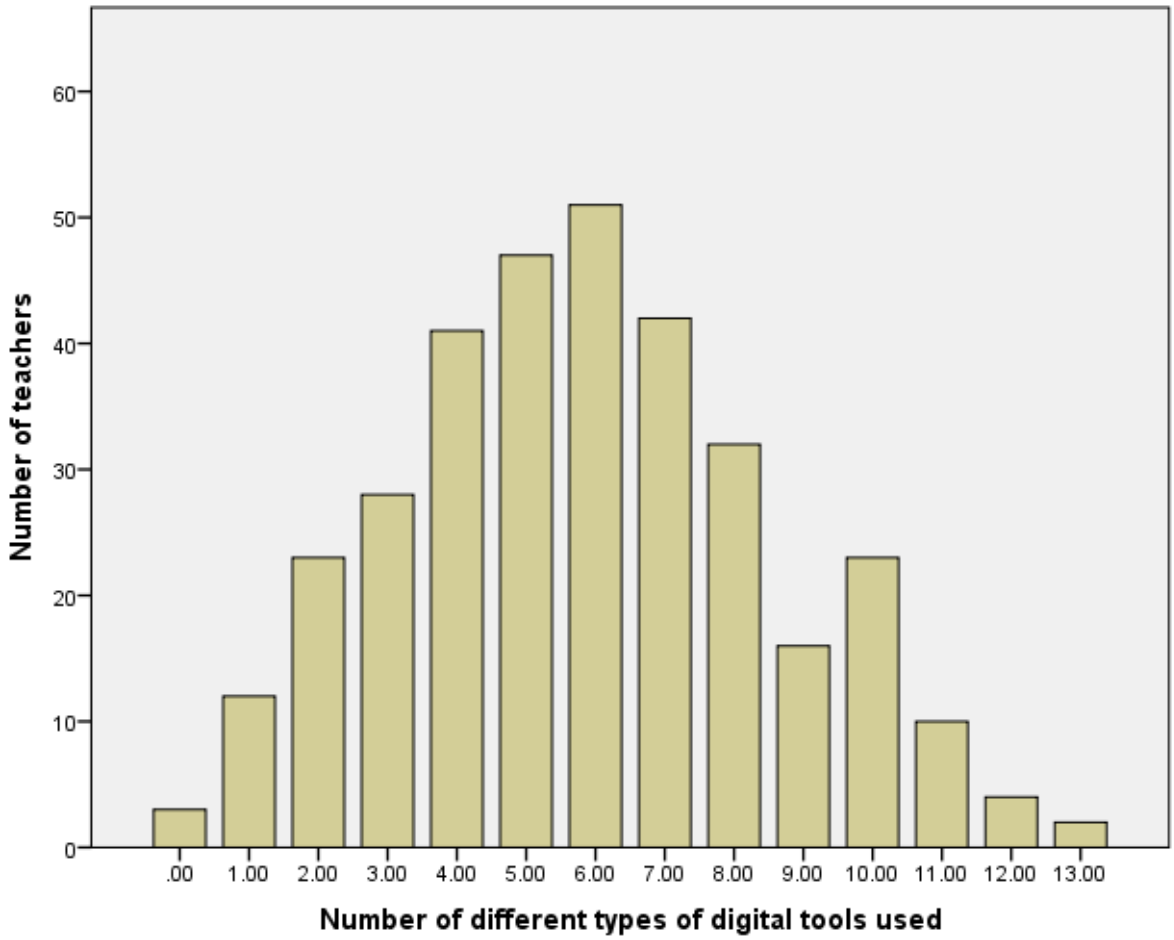



**Figure 1: Number of different types of digital tools used by each teacher during implementation**

What is striking is the wide range and number of tools used by teachers during the implementation (see Table 5 and Figure 1 above). In terms of country differences, teachers from Belgium used only 3 different types of digital tools on average (M=3.3, SD=1.7, n=44) whereas teachers in Italy (M=8.0, SD=3.3, n=10, Lithuania (M=7.3, SD=2.6, n=29), Spain (SMART, M=7.8, SD=2.7, n=20) and Turkey (M=7.1, SD=2.1, n=27) used an average of 7 or 8 different digital tools.

# EQ1) To what extent do the iTEC Learning Stories and relevant iTEC technologies benefit learning and teaching?

Data from the survey and case studies were examined to identify evidence relating to perceptions about the benefits of the LSs. They are presented here in relation to innovations in technology and pedagogy (including technologies as a pedagogical tool) and in relation to students' attitudes, ICT skills and knowledge.

The analysis of the data draws on the Innovation Matrix presented in D2.2 (resubmitted) which is included in this document in Appendix D for reference. The innovation matrix presents a maturity model of five stages for the five key aspects of activities: educational outcomes; the processes involved (pedagogy, learner role and management of teaching, learning and assessment); and the educational resources (underpinning technology).

## Innovation: technological and pedagogical change

The data suggest that for the majority of teachers some degree of innovation[6] occurred. The details of the technological and pedagogical changes are outlined below including exemplification of the ways in which the technology enabled the pedagogical changes. As an overview, NPCs perceived that there were only four teachers (of 36) for whom the pedagogical ideas and suggestions for embedding digital tools were not novel[7]. For the majority, the experiences of teachers and students were different from their prior experiences of teaching and learning (Table 6) as exemplified in the selection of quotes below.

**Table 6: Changes reported in activities of students and teachers in case study reports (n = 36)**

| | Activities of students have changed | Activities of students have not changed |
|---|---|---|
| Activities of teacher have changed | 28 | 0 |
| Activities of teacher have not changed | 4 | 4 |

> *it's **different** from usual lessons; it's **another way** of looking at physics (France, student)*

[6] The iTEC definition of innovation used in Cycle 3 was: Potentially scalable learning activities that provide beneficial pedagogical and technological responses to educational challenges and opportunities. This definition was agreed by the Innovation sub-group, led by WP2.

[7] NPCs were asked to categorise case study reports using a template adapted from the SITES case studies.

*The teacher says that it has encouraged him to organize work in workshops [enabling him to]* ***rethink*** *class organization and the management of time and space. (France, case study report)*

*They learnt maybe because they created exercises, sort of ones they had* ***never created before*** *(Hungary, teacher)*

*they learn history in a* ***different*** *way (Hungary, teacher)*

*The use of student's smartphones provided an opportunity to* ***reflect on BYOD policies*** *and practicalities for the school. (Norway, teacher)*

*we have worked* ***much more*** *than previously* ***across disciplines*** *(Norway, teacher)*

*we learn* ***more easily*** *and in a* ***fun*** *way (Portugal, student)*

*The teacher* ***changed her pedagogy*** *in this learning story, students have* ***more freedom*** *to work on their own (Slovakia, case study report)*

*Some students were very* ***positively impacted*** *by the pilot, they said they will think to look for career in design and 3D modelling. (Slovakia, case study report)*

*This project is not about technology [but] about* ***process*** *and this is what I like. I care more about* ***how I use technology*** *than the technology itself. (Spain, teacher)*

*I noticed that we* ***learn better*** *and* ***more easily*** *in this lesson. We are just trying to learn by listening in the normal school lessons. (Turkey, student)*

*[our emphasis in all above quotations]*

Teachers were asked in the survey whether the LSs and LAs had the potential to lead to innovation in the classroom. Overall, **56% of teachers were very confident that the iTEC resources do have the potential to lead to innovation in the classroom, with 42% positive but cautious**, and 2% disagreeing, irrespective of their chosen LS. The responses from teachers for each LS (both aggregated and from cross-case analysis) are presented below (Table 7 and Table 8[8]).

**Table 7: Potential of LS to lead to innovation in the classroom (aggregated responses) (n = 331)**

| Learning Story | Teachers confident of potential | Teachers positive but cautious | Teachers disagree |
|---|---|---|---|
| Redesigning School (n = 130) | 58% | 40% | 2% |
| Visualising the planet surface (n = 54) | 52% | 46% | 2% |
| Designing a physics simulation (n = 36) | 51% | 49% | 0% |

[8] Data have only been included with regards to teachers being confident and positive but cautious if there are at least five teachers in one country piloting a single Learning Story. Disagreement is reported irrespective of the number of teachers piloting.

| | | | |
|---|---|---|---|
| Designing a math learning game (n = 100) | 55% | 43% | 2% |
| Other (n = 14) | 79% | 21% | 0% |

**Table 8: Potential of Learning Story to lead to innovation in the classroom – cross-case analysis of country responses**

| Learning Story | Majority of teachers confident | Majority of teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School (n = 130) | AT, BE, LT, SK, ES(SM), TR | FI, HU, PL | 1 BE, 1 LT, 1 TR |
| Visualising the planet surface (n = 54) | FR | HU, NO, PT, | 1 FR |
| Designing a physics simulation (n = 36) | HU | PT | |
| Designing a math learning game (n = 98) | AT, HU, LT, PT | EE, FI, NO, ES(SM) | 1 EE, 1 NO |
| Other (n = 14) | IT | | |

Of those few teachers (6 teachers from 334 responses) who disagreed, the reasons given were:

- RS: insufficient fit with curriculum to justify inclusion (BE); financial resources are required to facilitate innovation (LT); school infrastructure is not flexible enough (TR).
- VPS: financial/technical resources are required, and it may be difficult to scale-up to large groups as students need to be motivated (FR).
- DMG: it was felt that the one-off, small-scale implementation would be insufficient and that a 'general change of direction' is needed (EE); game-making is time-consuming and challenging for students (NO).

Some teachers who believed the LS probably had the potential to lead to innovation in the classroom also gave reasons why they believed it would *not* lead to innovation. In common with the reasons given above, they noted that a lack of resources and/or curriculum constraints would be barriers, and that the approach was not suited to all students or all teachers.

Although the number of teachers who created their own learning story (in some cases adapted from those presented) is small, it would be worth investigating whether or not complete freedom to choose, adapt or create LS could lead to a greater degree of innovation.

The teacher survey presented an open-ended question asking respondents to identify the *main benefit* (most important) of implementing the LS[9]. The following table summarizes the perceived main benefits across all the LSs for all teachers and also by country.

**Table 8: Summary of perceived main benefits (n=312)**

| Benefit | % of teachers responding overall | Benefits (by country)[10] |
|---|---|---|
| Innovative approach to learning | 21% | AT, EE, ES, FI, LT, NO, PT, SK |
| Increased student motivation | 20% | BE, FR, LT, NO |
| Increase in collaboration | 19% | CZ, EE, ES, HU, IT, PT, SK |
| New digital tools | 14% | FR, NO, PT |
| Enhanced student autonomy and independent learning | 12% | ES, HU, IT, PT, TR |

**The main benefits identified were the introduction of innovative approaches to learning** (21%), which have the potential to lead to **increased student motivation** (20%), **greater collaboration among students** (19%) and **enhanced student autonomy and opportunities for independent learning** (12%).

An innovative approach to learning could, of course, take many forms, but several teachers commented on changes to the learning environment, including learning outside the classroom and in an online environment. Teachers described the approach as a 'new perspective' (Turkey) and a 'new framework for thinking' (Hungary) which offered greater variety of learning experiences and was engaging and motivating for students:

*Variation - new outlook on learning (Norway – teacher)*

*Studying in a new way - in a fun and active (Estonia - teacher)*

*Ability to implement in the classroom an activity out of the ordinary (Portugal – teacher)*

*We were able to go out everyday frames. (Hungary - teacher)*

*Found new solutions to how learning can be made more attractive. (Estonia – teacher)*

[9] This analysis represents teacher perceptions of the most important benefit for them and not of all benefits.
[10] Identified by at least 20% of teachers in a country (or at least 2 teachers for countries with less than 10 respondents).

**The opportunity to use new digital tools (14%) was also identified as a main benefit by teachers in several countries**. This was felt to have benefits for both students and teachers as both learnt to master new technologies and use them effectively in teaching and learning activities. The survey presented a further open-ended question asking respondents to identify why they felt the LSs had the potential to lead to innovation in the classroom.

**Table 9: Summary of perceived reasons for innovation (n=309)**

| Innovation | No. of teachers responding overall | % of teachers responding overall | Innovations (by country)[11] |
|---|---|---|---|
| Increased student motivation | 43 | 14% | ES, FR, LT |
| Authentic ('real life') learning | 40 | 13% | IT, SK |
| New digital tools | 34 | 11% | NO, TR |
| Student-centred approaches | 34 | 11% | FR, IS |
| Innovative approach to learning | 34 | 11% | BE |

**What is striking about the reasons for innovation is the lack of consensus among teachers about which features of the LSs have the potential for innovation**. Increased student motivation (14%), the use of digital tools (11%), student-centred approaches (11%) and opportunities for authentic learning (13%) all appear to be important, but in total, teachers identified more than twenty ways in which LSs have the potential to be innovative, including increased creativity (5%), and diversification of approaches (3%) and opportunities for interdisciplinary approaches (2%).

This finding reflects comments made by NPCs, who pointed out that **innovation is difficult to describe or quantify as what is innovative to one teacher can be normal practice to another**. Another point to note is that the methods used to select iTEC teachers in most countries mean that teachers involved in the project are likely to have greater technological expertise and greater experience of innovation than many of their colleagues. With these provisos in mind, the following section attempts to describe the impact of iTEC on technological innovation, and on pedagogy. Within these sections, the five stages of the innovation matrix are used, where appropriate, to describe the pedagogical innovation realized through iTEC. (See Appendix D)

[11] Identified by at least 20% of teachers in a country (or at least 2 teachers for countries with less than 10 respondents).

## Technological innovation

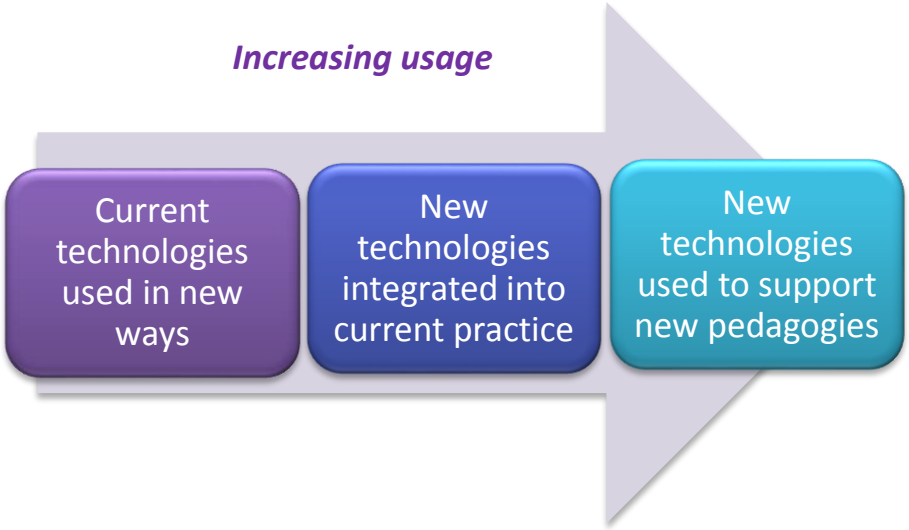



**Figure 2: Technological innovation**

As part of a WP4/5 follow up survey on innovation conducted in C3, NPCs were asked to list the technologies used by teachers in their country. As the diagram below illustrates (Figure 3), a wide range of tools are being used throughout the iTEC project. Although the most commonly mentioned tools are likely to be familiar to many teachers, there are also examples of tools which are likely to be new to both teachers and students.


**Figure 3: Wordle of tools used by teachers (as identified by NPCs from 15 countries)**

When asked to list the types of innovative approaches used by iTEC teachers, several NPCs mentioned experimenting with new software/digital tools:

> *A few worked with game design and tried game-based learning in their classrooms. School A worked with different technologies in mathematics (GPS, measuring width, length, diagonals). School A and School B had good results from their project, making guided tours with QR-codes and digital storytelling. (Norway, NPC)*

In the survey, **three out of five teachers reported that they had used tools that they had not used before**, and that the tools used offered benefits in relation to other digital tools and non-digital alternatives (Figure 4).

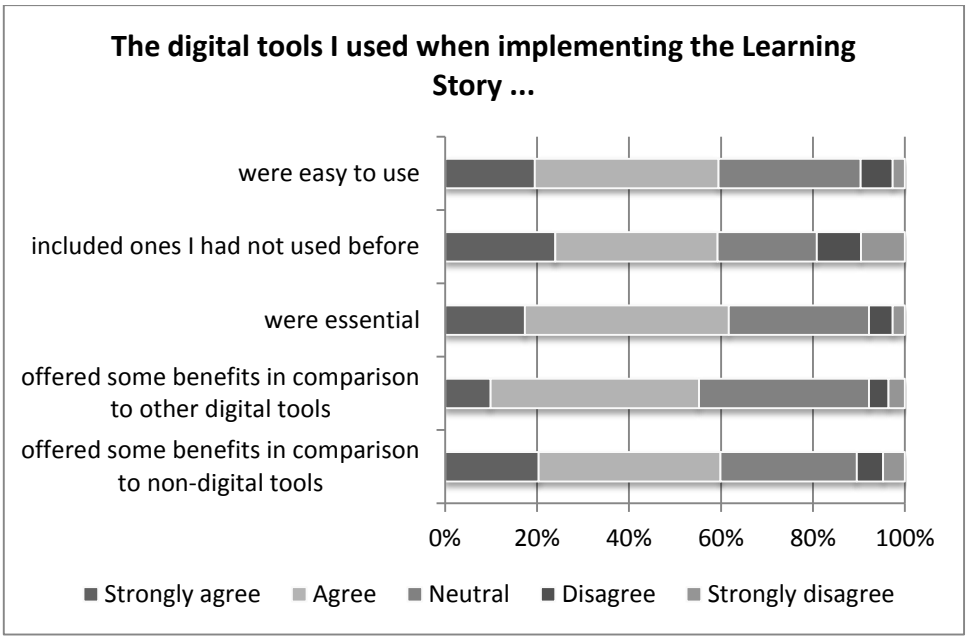



**Figure 4: Teacher perceptions of digital tools used**

The findings in C3 are comparable with those reported in C2 and C1 (Table 9). It should be noted that the tools recommended in each cycle varied according to the Learning Activities and the specific functionalities required. Therefore comparison between cycles is problematic.

**Table 9: Comparison of teacher perceptions of tool use across cycles (% of teachers agreeing with statement)**

| The digital tools I used when implementing the Learning Story … | Cycle 3 (Not including VLE) | Cycle 2 (not including TeamUp) | Cycle 1 (not including TeamUp) |
|---|---|---|---|
| Were easy to use | 59% | 81% | 82% |
| Included ones I had not used before | 59% | 71% | 51% |
| Were essential | 61% | 75% | 80% |
| Offered some benefits in comparison to other digital tools | 55% | 69% | 65% |
| Offered some benefits in comparison to non-digital tools | 60% | 75% | 75% |

## Using existing technology in new ways

It is important to note that **using any type of technology in the classroom was something that students interviewed for the case studies had not done before**. Five of the 17 student groups interviewed said they rarely, if ever, used technology at school and a further four commented that technology was only used in a limited number of subjects:

> *We have made a Powerpoint presentation once or twice, but we don't use computers in our lessons very often. (Estonia, student)*

> *As for working with computers, it doesn't happen often. For instance, this year we worked with new technologies a lot in Sciences, whereas in Physics and Chemistry we worked with computers twice - if I'm not mistaken - and we used them in the Arts classes once. Apart from that, we didn't use computers. (Portugal, student)*

Or, as two student groups pointed out, if technology was used previously, it had tended to be teacher-controlled rather than **students using technology themselves** (Innovation Matrix Underpinning Technology Stage 1):

> *Normally the teacher uses the IWB and we look at the IWB and not at the chalkboard anymore. But it is the only technology that we use at school. Apart from that there is the computer lab that we use rarely, if at all. (Italy, student)*

> *The differences are that during this project* all the students have used a computer not like the rest where only the teacher uses the *computer. (Spain, student)*

Although many of the technologies used were familiar to students, using them in a classroom situation was something new:

> *We only use technology outside of school. But blog broadcasting, video capturing, drawing on the computer, research, etc. in class is very different. (Turkey, student)*

> *For instance a few days ago I happened to do a research for a subject, and I have used several sources, including Facebook, because there was a page dedicated to that topic, and I have used Facebook for school purposes. (Italy, student)*

However, four case studies mentioned the use of new devices and tools, such as learner response systems and video cameras, and a further six mentioned the use of programs and software which students had not used previously, for example, blogging software and Scratch programming language:

> *Pupils got excited about technology, especially the use of learner response system, which was new for them. (Hungary, case study report)*

> *With the help of this project I learned Google SketchUp and some other new things and I like them very much because before itec I had only known powerpoint before but now I know many presentation tools ,design and mindmap tools and I can even create my own blog (Turkey, student)*

It is worth noting that, for a small number of case study teachers, the main change resulting from the project was in the way they used existing technology, as well as new tools, within their teaching. Perhaps the most significant development was that, as a result of their involvement in iTEC, **these teachers said they now used technology on a daily basis, as an integral part of teaching and learning, rather than as an occasional add-on** (Innovation Matrix, Underpinning Technology Stage 2 onwards).

> *Yes, not that my pedagogical approach has changed that much, but now I am using a lot more gadgets on a regular basis. I did not do that before because I was afraid it would delay my lessons. Before that I used technology here and there. Now I have the confidence to use it an almost daily basis. (Austria, teacher)*

The use of Facebook was mentioned in case studies from 11 schools. It was primarily used a communication tool and was used for communication within teams of students (7) or, occasionally, between teachers in different schools (2) (Innovation Matrix Underpinning Technology Stage 2).

YouTube was another resource familiar to students and teachers, but not regularly used in a school context prior to iTEC. This was mentioned in 8 case studies, but most had limited involvement from students, for example, the ICT co-ordinator uploaded videos which they had created.

Skype was another familiar tool, which was used in two schools to contact an outside expert and other schools.

In some schools, involvement in iTEC meant classes were permitted to use resources such as Facebook and mobile phones which were normally not allowed in school. Furthermore, teachers might be using technologies they were already familiar with (Stage 1), but crucially, they were using it in new ways:

> *It was technology we already had but we were using it in new way. (Belgium, ICT co-ordinator )*

Although the use of more familiar technologies may appear less innovative, as an NPC pointed out, using simpler tools has the advantage of allowing teachers to focus on improving teaching and learning, rather than worrying about technical issues:

> *Because they used tablets, teacher*s could focus more on the content than on the technical barriers and challenges. *(Belgium, NPC)*

## Integrating new technologies

In the case studies, Scratch (a programming language for young people) and SketchUp (3D modelling software) were the tools which were most frequently mentioned as being new to teachers and students (Innovation Matrix Underpinning Technology Stage 3), and blogs were another resource which were new to many (Innovation Matrix Underpinning Technology Stage 2). However, where the differences between home and school technologies were discussed with students in the case studies, even **newer technologies in school were usually perceived by students as being less innovative than technologies they commonly used outside school**:

> *For instance, the Corkboard is a cool tool to use and the Scratch program is quite funny. But if we compare it to our Smartphones or Tablets, the level of innovation is limited. (Austria, student)*

The following section describes the use of some of the technologies which were new to many teachers and students.

**SketchUp** was mentioned in six case studies. This tool was recommended within the Product Design LA, intended to underpin all four Learning Stories. This was difficult for some students to master at first, particularly as they were not used to using 3D tools.

***Designing Maths Games using Scratch, Austria***

The scenario implemented was Designing Maths Games. The teacher felt that the Scratch tool would be useful for introducing students to programming. So first, she created a course on the LMS platform - the Austrian implementation of the DotLRN shell. Along with the Scratch tutorial, targets, the assignments and the overall description were provided for students.

Although students did use the tutorial, they felt they learnt to use Scratch mostly through trial and error. In addition, older and more experienced students helped the younger students with Scratch as they had been using it for several years. This process quickly developed a dynamic of its own as students set up Skype chats with the students from another Austrian school involved in iTEC asking them for support and fine-tuning their programs. Students quickly became confident in using Scratch and were able to produce their own games with confidence.

**Scratch** appeared in 10 case studies and, like SketchUp, it was new to both teachers and students. It was recommended in the DMG Learning Story. Again, it took both groups a little time to become familiar with the program, but the feedback suggests that this was easier for students to use than SketchUp and the comments were positive once they had understood how to use it.

**56% of teachers who responded to the survey (n=334) asked their students to write blogs**. Blogs were recommended digital tools to use in support of both the Design Brief LA and the Final Product Design LA, both intended to underpin all four LS. In total, teachers responding to the survey mentioned 33 different blog tools, but only three were used by more than 5% of those responding, namely:

- Blogger (90, or 48%)
- Wordpress (28, or 15%)
- Weebly (12, or 6%).

The use of blogs was mentioned in 25 case studies. These were used both as a reflection tool for students, and as a communication tool. In different schools, students used blogs to communicate with their teacher, other students, or to present their work outside the school. Teachers could track students' progress, comment on their work and offer suggestions via blogs (Innovation Matrix Management Stage 2). Students were able to view each other's work and share information within their team using blogs (Innovation Matrix Underpinning Technology Stage 2). The use of blogs, therefore, offered students greater autonomy over their work, but this could present its own challenges for teachers who were unsure how to support students effectively in this new learning environment.

The survey asked teachers to identify the main benefits (n=182) of using blogs (Table 10).

**Table 10: Main benefits of blogs (from survey data)**

| Benefits of blogs | | |
|---|---|---|
| Benefit | No. teachers | % of teachers |
| Facilitate sharing | 40 | 22% |
| Can be used for monitoring progess | 31 | 17% |
| Communication skills | 17 | 9% |
| Promote wider engagement | 17 | 9% |
| Are easy to use | 16 | 9% |

Blogs were felt to be a good tool to support **sharing of ideas and resources** among students, and between students and teachers (Innovation Matrix Underpinning Technology Stage 2):

> *The possibility of immediate exchange of experiences; possibility of interaction between different students / teams through comments; possibility of exchanging multimedia files, links, ... between computers and the teacher… (Spain, teacher)*

Blogs were also used to **monitor progress**. It was easy for the teacher to see what work each group had done, and to offer suggestions and intervene if necessary (Innovation Matrix Management Stage 2):

> *- everyone can easily follow the progress of the project - teacher can comment and affect to students working easily (Finland, teacher)*

Furthermore, blogs were believed to help to **develop students' communication skills** as they learnt how to write and present blog posts, as well as commenting on other blogs appropriately (Innovation Matrix Learning Objectives Stage 3):

> *Opportunity for expression / authoring and communication. (Portugal, teacher)*

Blogs also made students' work and achievements available beyond the school, facilitating **wider engagement with stakeholders** (Innovation Matrix Learner Role Stage 2). For example, partner schools, parents, and the local community became aware of what was happening within the classroom. Teachers also noted that blogs were a reasonably familiar tool for most students (based on their experiences outside the classroom rather than in school) and were felt to require limited technical skills, thus being easier to manage in the classroom.

## Technology-enabled pedagogical innovation and its impact on teachers

As with technical innovation, the extent of pedagogical innovation can be difficult to identify as teachers involved in iTEC have widely differing prior experiences, so what can seem to be innovative pedagogy to one, might be everyday practice to another. It is not, therefore, surprising that iTEC has resulted in significant changes for some teachers, but is seen as an extension, and natural development of existing practice, by others.

**Involvement in iTEC provided teachers with an opportunity to experiment with new pedagogies**, but for some, the approaches were seen as a development of their existing practice (incremental change), rather than a complete departure (radical change), (7 case study teachers explicitly said this and a further 2 felt that *most* aspects of approach were a development of their existing practice):

> *Being a teacher since 1988, iTEC gave me some ideas to take new approaches in my pedagogy. It did not change it, but it broadened it quite a bit and after 20 years in school, you, as a teacher, are tired of telling the same stories over and over again. (Austria, teacher).*

> *However, for the teacher, the pilot activities are not perceived as a revolution in the way she was teaching and managing the classroom: the activities can rather be considered as a development and a continuation of what usually takes place in the classroom. (Italy, case study report)*

However, **85% of teachers responding to the survey agreed that implementing a Learning Story enabled them to incorporate new pedagogical practices**. For teachers in some case study schools, the approach taken by iTEC was seen as a more significant departure from existing pedagogies:

> *The ICT coordinator said, that the learning story was innovative according how most of the teachers teach. They do not use ICT regularly, they do not accept teamwork, students do not have such freedom in their work and learning. (Slovakia, case study report)*

The Learning Stories approach was seen as innovative as this form of inquiry-based learning was a new method for many as students moved from being recipients, or 'consumers' (Innovation Matrix Learner Role Stage 1) of education to 'users' (Stage 2), 'producers' (Stage 3) or managers (Stage 4) of their learning:

> *The fact that the pupils are involved in the project from its start gives meaning and motivation to the school activities. They have a stake in the project, are proactive and interested. They want to achieve the intended objective. They are role-players in what they are doing. (France, case study report)*

In the case studies, there were a number of examples to be found of the use of technology as an integral component in supporting greater student independence and team working, new assessment and reflection methods and the changed role of the teacher. However, while technology might sometimes help to facilitate these types of innovation, often teachers did not view it as an essential component of pedagogical innovation. For some case study teachers, technology was seen as having very much a secondary role, rather than being a key enabler in driving and expediting change.

The following section details the impact of iTEC on pedagogy, in particular the ways in which it has led to different teacher and student roles, increased collaboration, greater individualisation of learning, management of learning, changes to assessment, linking learning to real life and students as designers and producers.


**Figure 5: Elements of pedagogical innovation**

### *Teacher and student roles*

Perhaps the biggest change in teaching practice was the **changing role of the teacher**. 79% of teachers responding to the survey agreed that the implementation enabled them to explore different teacher and student roles and responsibilities. When implementing the Learning Stories, the teacher becomes a coach, rather than an instructor, as one case study report describes:

> *During the lesson he barely intervened and let the students be creative (Austria, case study report)*

The majority of teachers, even those who were familiar with many of the innovative approaches introduced through iTEC, often perceived that this was a radical change from their usual practice (27 case studies explicitly mention this):

> *Teacher has changed radically the methodology in the class and she feels very proud of the work the students have done. The teacher said "I have learnt from this project also to step back and let students to make mistakes and instead to solve their questions and ask them to try to solve their problems". (Spain, case study report)*

> *"It's a type of work that I had never done… by project, which lasts over several sessions, is longer and incorporates more ideas… it sparked the pupils' interest… in particular the topic about the mobile telephones… and to see everything that already exists in terms of*

*technological items, to do an observation… that was the aim of the comparative workshop" (Belgium, teacher)*

*We already have quite some experience in projects, so that part was no innovation, neither working in teams. I do feel, however, that it was innovative in designing a product, and I don't remember if we have had a similar project earlier, in which we concentrated so pointedly on the product from the beginning to the end. So from this perspective I definitely feel it was innovative, and hopefully we can transfer it and use it in other classes, since it has good sides too. (Hungary, teacher)*

Being able to engage in iTEC successfully necessitated a change in attitudes among many teachers. The student-centred approach and encouragement of group working meant they needed to feel comfortable having less direct control over their students. This was a significant barrier for some at first:

*As a teacher I have also learned a lot, I have to learnt as a teacher to assume the level of noise in the class, as if they are talking there is noise. (Spain, teacher)*

Some teachers commented that the way in which they **interacted with students** had changed through the use of technology, for example, they now communicated and commented on students' work via blogs instead of written comments in exercise books (Innovation Matrix Underpinning Technology Stage 2):

*For example, the use of blogs is another way to interact with them (Spain, ICT co-ordinator)*

One head teacher commented that the use of technology helped to reduce the gap between teachers and students and improved communication as the teacher adopted technology-based communication methods which are now familiar to students in their everyday lives.

*In my opinion those tools are to be used to reduce student – teacher communication gap, because the traditional teaching is not successful in this. (Italy, head teacher)*

A new student role mentioned in a number of case study reports and interviews (11) was peer tutoring, or 'learner as teacher' (Innovation Matrix Pedagogy Stage 3). If one student was not familiar with a particular technology for example, another student with skills in this area would support them:

*If there were any problems with programming the game, two advanced students in programming helped them out which added to a nice social pattern of behaviour. (Austria, case study report)*

*The students corrected and helped one another permanently. (Belgium, case study report)*

Technology appeared to have advantages over more traditional methods in encouraging greater **student autonomy,** allowing learners to take control and manage their own learning (Innovation Matrix Learner Role Stage 4). In the case studies, there are several examples of students using technology, for example blogs or recording devices, to help develop independent learning and self-reflection skills, discovering and correcting their own mistakes, rather than relying on the teacher to do so:

> *Students who are less sure of themselves speaking, dare to speak more because they can start over. This way there is no problem making errors. Because they can correct it afterwards. That is not the fact when one student has to present it in front of the whole classroom. Then I tell them they made a mistake but they don't correct themselves. (Belgium, case study report)*

> *…they could have a place [in blogs] where they could write in English without me controlling so they probably felt freer than in class… (Italy, teacher)*

Teachers also described how technologies which potentially give students greater control over their learning, such as iPads and mobile phones, were being used to engage students in their learning and encourage a more student-centred approach through hands-on experiences:

> *We believe more in tablets then solely digital boards…For example when math teacher teaches about graphs, students are much more involved when they can play with it then when the teacher shows a graph and demonstrates what happens when changing the coordinates. (Belgium, ICT co-ordinator)*

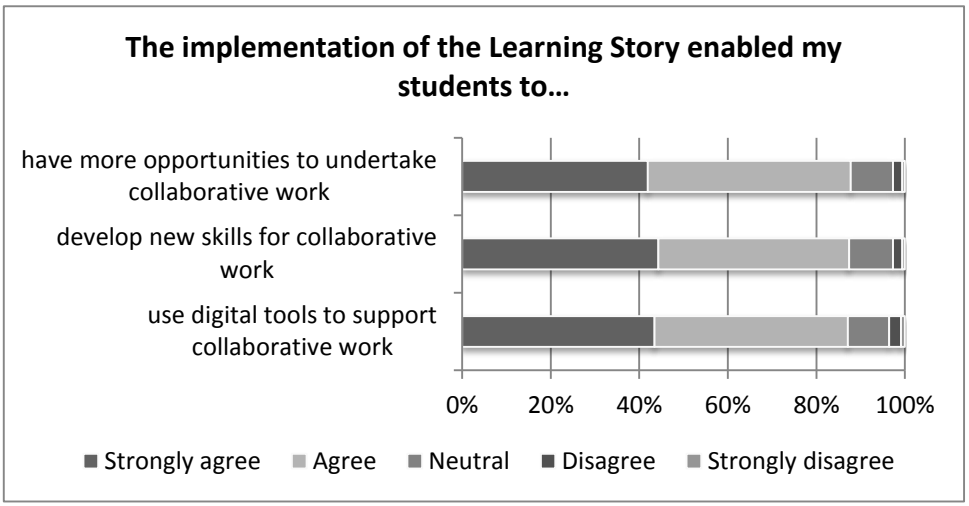
### *Collaboration*

For many teachers, organizing students into **teams** was a new approach:

> *The challenge a teacher should be prepared for is the space given to students and to effectively divide the workload among students since they have different strengths and interests to get the best result possible. So the pedagogical side is much more important than getting trained on any technology! (Austria, teacher)*

In many schools, a key feature of the Learning Stories and Activities was the emphasis on student collaboration and team working. **Four out of five teachers responding to the survey felt that the implementation of the LS enabled students to undertake more collaboration activities supported by digital tools, and develop their collaboration skills** (Table 11).

**Table 11: Teacher perceptions of the impact on collaboration**




Group work was another area where technology played an important role (Innovation Matrix Pedagogy Stage 3). Some teachers made use of TeamUp, but a variety of social media and file sharing tools were also used to facilitate group work. Facebook (9) and Dropbox (5) were the most commonly mentioned, but others include Moodle, Wallwisher and Corkboard:

> *For specific challenges, homeworks or new stuff, we also use Facebook where we create new groups to actively exchange. (Austria, student)*

In all the case study reports, there was thought to be evidence of social/collaborative learning. For a small number of schools, this was common practice, but for many this appeared to be a significant change of approach:

> *Overall we liked the lesson very much. The level of engagement and motivation was quite different. Peers that normally do not participate very much got involved and that was very new. (Austria, student)*

> *But on the other hand I liked this group work because I did find, if I may call them so, new people…I have been attending this school for two years together with them, and I had never close relations with this group, such as M, R, F and G, so it was also useful to establish a good relationship with them. (Italy, student)*

In some schools, projects involved students from more than one year group, which was felt to have benefits, including helping transition:

> *The first and crucial thing is that our fourth graders, who cooperate with the seventh graders, will have been familiarized with a previously unknown segment of our school by the time they become seniors. They are given an insight into the tasks of seniors, which certainly makes the transition from junior to senior smoother, thus tackles a problem we face yearly. (Hungary, head teacher)*

One headteacher felt that this new pattern of student behaviour had moved beyond individual classrooms and was now visible throughout the school:

> *I think that the results are already visible on the willingness of the students to cooperate. I see that students of individual classes do not isolate themselves during breaks, they have learnt to cooperate with each other; in this case we see school-wide cooperation among classes. (Hungary, head teacher)*

One teacher described how they had deliberately arranged groups to facilitate a peer support process:

> *I assembled the student in mixed groups so there were strong and weaker students working together. This was a conscious decision. I will surely do this in other courses because it went well. They strengthened one another. (Belgium, teacher)*

For some teachers too, the notion of **working collaboratively** themselves, for example with colleagues from other disciplinary areas, was innovative:

> *The innovation takes place in the school itself and less in the individual classroom. Teachers talk more to each other about using technology. They work together in an interdisciplinary way using projects. (Belgium, case study report)*

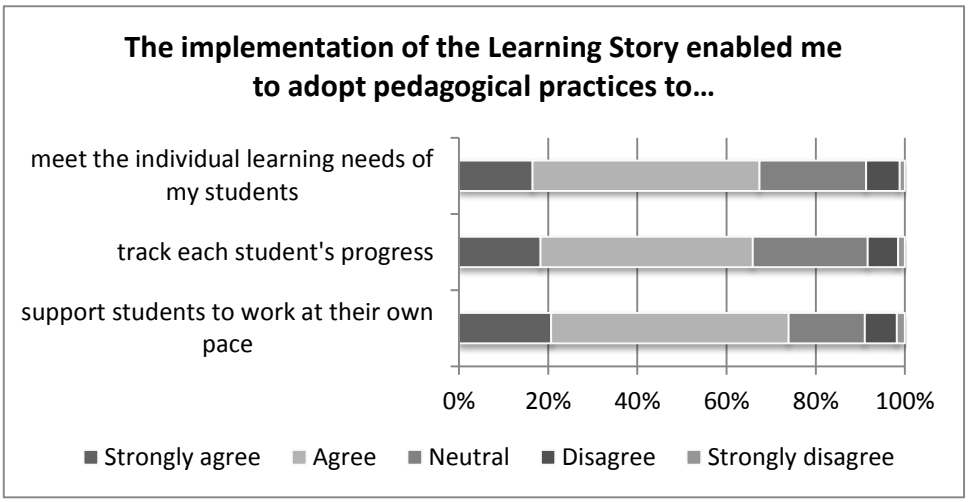
***Individualisation***

Adopting a student-centred approach, naturally encouraged greater **individualisation** of the learning process as students played a more active role in deciding how they would learn – what resources and tools they would use, when they would complete each task etc. This can be seen as developing the role of the learner from a 'consumer' (Innovation Matrix Learner Role Stage 1), to that of a 'user' (Stage 2), and ultimately a manager (Stage 4) of their learning. However, there were only a few direct references to individualisation or personalisation, even in when prompted for in the teacher interview schedule; these were mostly comments about teachers responding to students on an individual basis:

> *At the same time, the teacher also provided personalised support to his pupils, for he responded to questions individually depending on the requests. (France, case study report)*

Others interpreted individualisation as setting tasks which allowed students to work individually, as well as in a team. In most cases, teachers appeared to adopt a passive approach to individualisation, allowing students a degree of freedom, but not actively fostering this, for example, by customising tasks and resources based on individual needs. Three out of five teachers responding to the survey noted that the implementation of the LS enabled them to support aspects of individualization (Table 12). However, as noted above, teachers' interpretations of what is meant by individualisation varies.

**Table 12: Teacher perceptions of the impact on individualisation**




### *Management of learning*

Through iTEC, some teachers had reviewed the way in which **they organized classes and timetabled lessons:**

> *But what I learned in the different reports that I did was group work in workshops, or workshops in a group, in other words working together but not the whole class on the same task. It's something that I didn't do at all and the students had done in nursery school. And when they start primary school, this gets forgotten, even though they are completely capable of working like that. We end up being more available to each group because there are some groups that are more autonomous and others that are less so. We're always complaining that we have too many students, but like this we can work with groups of eight or ten students. It's really the whole point of the project: that's what important in pedagogy, it's really that. (France, teacher)*

There were indications that, through iTEC, learning was moving beyond the classroom; this was seen as innovative by both students and teachers. 84% of teachers responding to the survey agreed that the implementation of the Learning Story enabled them to create opportunities to learn beyond the boundaries of the classroom.

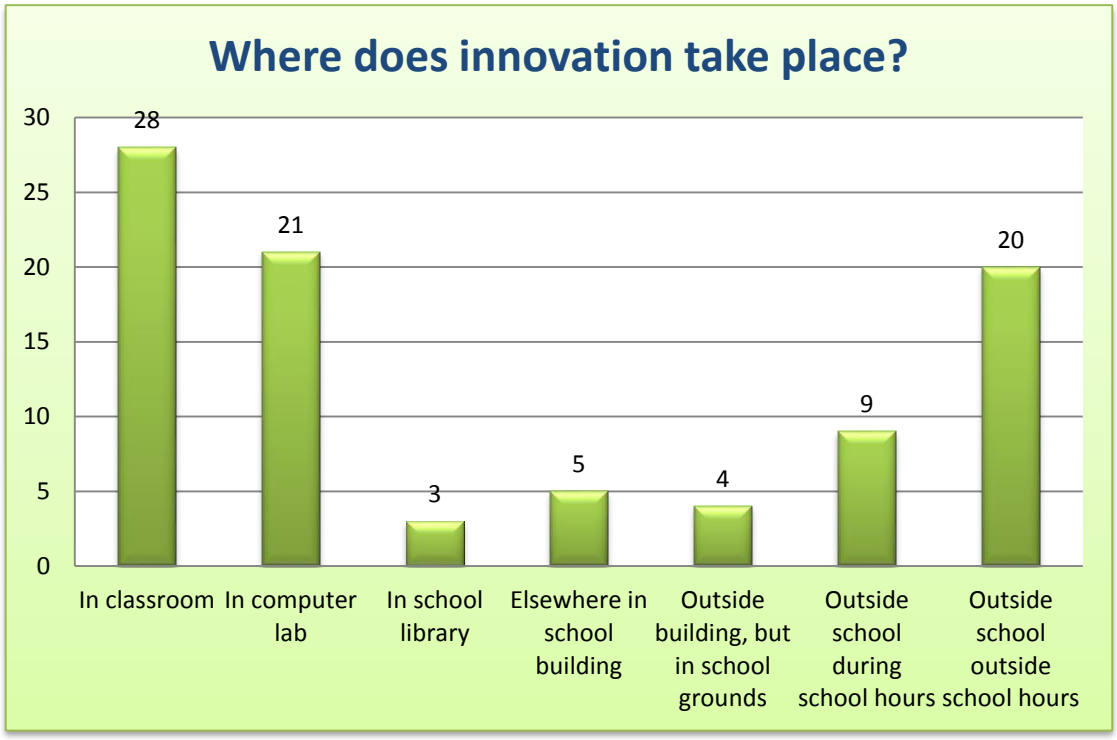



**Figure 5: The locations in which the LS were implemented (from case study data, n=36)**

Only just over three-quarters of the case studies (28 out of 36) took place (partially or completely) within the classroom (Stage 1). More than half (21) used the school computer lab and a few made use of other locations within the school buildings or grounds. Twenty involved work out of school beyond school hours (usually work by the students at home). Nine of the case studies included work outside the school during school hours (eg field trips).

Although most teachers already organized fieldtrips, inviting outside speakers and engaging the local community in school projects was new for many (mentioned in 12 case studies).

Stakeholders beyond the school who were mentioned in the case study reports are shown in the chart below.

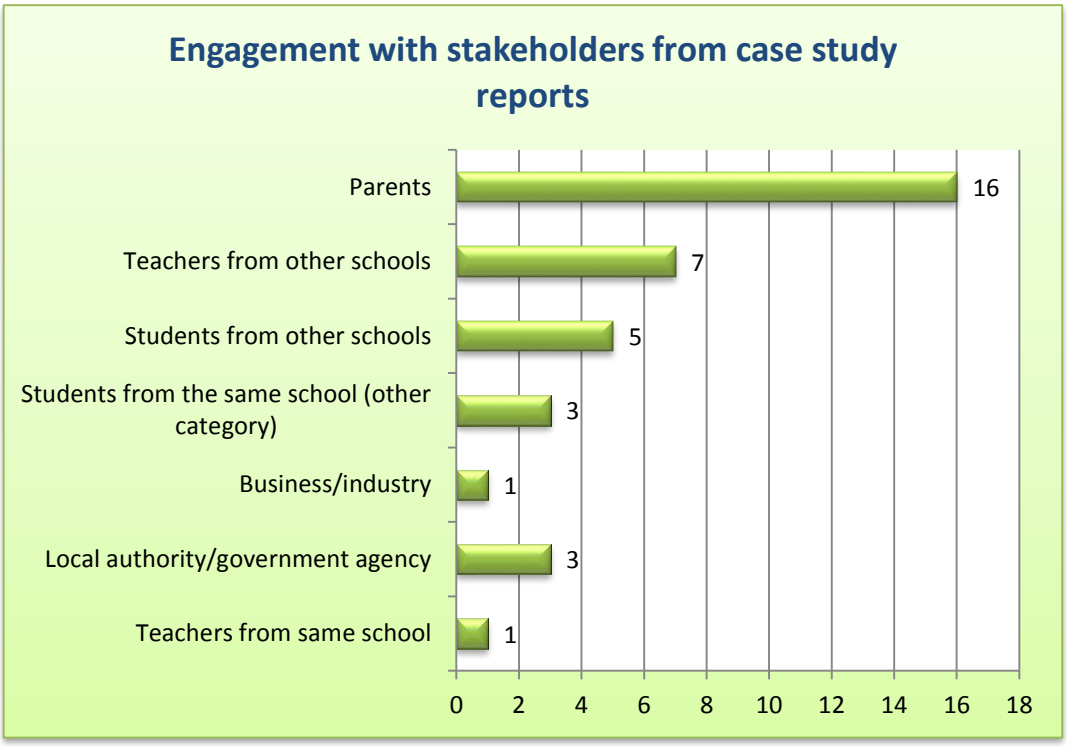



**Figure 6: Engagement with stakeholders (from case study data, n=36)**

### *Assessment*

Involvement in iTEC could also impact on **assessment** in a number of ways. One teacher described how they were now able to assess process skills and less concrete outcomes such as creativity and critical thinking (Innovation Matrix Management Stage 3):

> *… it allowed me to assess some things which are not always easy to measure in a normal class. For example, autonomy, creativity, critical thinking, often during a lecture, or even if there is some dialogue or when there is some dynamics, it is always more difficult to assay. With this project, specifically, I got more feedback in these situations and sometimes even surprises with some students… (Portugal, teacher)*

83% of teachers responding to the survey agreed that the implementation of the Learning Story enabled them to assess students in a new way. Technology such as Learner Response Systems (LRS) was used to support **new assessment methods**. For students, there were two advantages of using such tools: immediate feedback and feedback from their peers (Innovation Matrix Pedagogy Stage 3), which they appeared to value.

The following example describes how one teacher used a combination of methods to assess the various aspects of students' learning.

The students (aged 12-13) created maths games to help younger students (aged 9-10) with revision.

Their final grade was made up of:
* lesson performance (based on the teacher's experience and the student's self-assessment questionnaire),
* blog posts,
* groupwork presentation (based on an evaluation questionnaire),
* communication and the final report - for their final report, groups wrote a blog post based on 15 questions.

Each part of the assessment had detailed descriptions so students were aware of the expectations and requirements.

In addition to formal assessment, informal oral feedback was given at the beginning, and at the end, of lessons.

Finally, the students themselves created a feedback questionnaire to collect the younger students' opinions of the games. This was a formative tool which enabled them to refine their designs.

In addition to impacting on assessment procedures, iTEC also had implications for the way in which students reflected on their own work. A number of reports and interviews mentioned an increase in **self-reflection** amongst students and they frequently used technology to support this process, for example, using blogs as reflection tools. As the survey responses illustrated, being able to record reflections using technology offered a number of benefits. Firstly, it enabled both students and their teachers to monitor the progress of their projects (Innovation Matrix Management Stage 2, Innovation Matrix Learner Role Stage 3):

> *They and teacher saw their own recordings next time. It was easy to follow projects' progression. (Finland, teacher)*

Closely linked to monitoring progress, teachers also frequently commented that the recording helped to develop students' skills in self-evaluation; they were able to see how they were developing as individuals:

> *It forces students to think about their work, become aware of the work we have been able to do, and skills they have developed. (Spain, teacher)*

Reflection also offered an opportunity for students to share their experiences and learn from each other:

*To contrast the different opinions of the students. (Hungary, teacher)*

Teachers also benefited as they were able to learn from students' reflections; they could use these to better appreciate where students struggled and to identify where they needed to make changes to their teaching (Innovation Matrix Management Stage 3).

***Authentic learning experiences***

An important feature of iTEC and the Learning Stories approach in particular for a number of teachers was that it offered students more authentic learning experiences which more closely reflected situations they were likely to encounter in the workplace and in later life more generally. For example, working in teams, working with external partners, and producing work which would be seen, and used, beyond the school.

*Normally, the goal(s) we have to reach are not set as definite as this one and the tasks are not as real-life-like as this one. (Turkey, student?)*

*…Also to show that what we learn here fits in with the reality. Mister Engineer, or rather Madam, because it was a lady engineer, and the gentleman who received us in the mill, and the President of the Parish Council, they spoke about the same things as us…So the outsiders bring witness that what we are learning can be applied outside, in the real context. (Portugal, teacher)*

Also important in some classes the ability to have a constant link from the classroom to almost anywhere in the world, bringing the experiences of the classroom closer to the real world:

*Technology has allowed us to open up our classroom. I'm always connected and I have a real communication with them beyond the class. (Spain, teacher)*

The following example describes the reactions of students engaged in one project which required them to design materials for a wider audience.

**Designing a Physics Simulation, Israel**

Fifth graders prepared activities on the topic of Metals, while sixth graders prepared activities on the topic of Energy. Both groups created activities which were posted on the gallery of the scenarios generator application, sixqs.com, in both Hebrew and English versions.

Student comments indicate that they were highly conscious that other students could view their work. They were aware of the need to ensure the materials they created were designed with their intended audience in mind. While creating a resource which would be more widely used was motivating and gave students a sense of purpose, they also felt a strong sense responsibility to ensure that activities they designed were of high quality.

*"We have prepared a project about alloys. We knew that the activity was for our classmates or generally for any other children who would like to try it. We made sure that it will be of interest and fun to do, to attract the children to use the final product. If I were a kid who receives the task, I would enjoy doing it. Meanwhile we don't have users or those who wish to be, but, I know that our product can be used by others. It is a quality teaching activity, so we will wait and see."*

*"It's very nice to know that what you do affects someone in the world. But then again, it's a bit stressful and confusing to know that someone is going to use what you've created, and it also makes you want to improve it."*

*"I don't know what to say about the fact that other kids will study using something which I have made, it kind of scares me, as if I am a teacher and they are the students."*

***Design and produce***

Finally, in Cycle 3, the use of technology to **design and produce** (Innovation Matrix Stage 3), rather than simply to research and then present (Innovation Matrix Stage 1), was an innovation for many teachers who were not used to design as a learning activity and had to consider how it could be best supported through the use of technologies:

> *Before participating to iTEC Project, I thought that technology could be used mainly for the realization of the final product: we work in class in a traditional way, then the students could make their own power point presentation or whatever. Here is different, because technology is used throughout the project and accompany to reach the goal. In this I've changed my idea of the use of technology. (Italy, teacher)*

Overall, one of the most innovative developments realised through iTEC would seem to be the integration of technology *throughout* the learning process, on a regular and consistent basis. This supports the move from Stage 1 of the innovation matrix, which is focussed on isolated, step-by-step use of technology, to later stages which call for connected, embedded and integrated use of technology to support the educational process. For example, while the teachers involved in iTEC had used technology to support student research or presentation work in the past, they were now making use of technology to interact and communicate with students, facilitate team working, support design and production tasks, assess work and encourage students' self-reflection.

## Impact: Teacher attitudes, ICT skills and knowledge

**Four out of five teachers agreed that their experience would lead to them using digital tools more often**. Four out of five teachers also felt that the investment of time was worthwhile and that the LS and LAs provided exciting opportunities to do things differently in the classroom. 70% agreed that they had become more enthusiastic about their pedagogic practice as a result of participating (Figure 7).

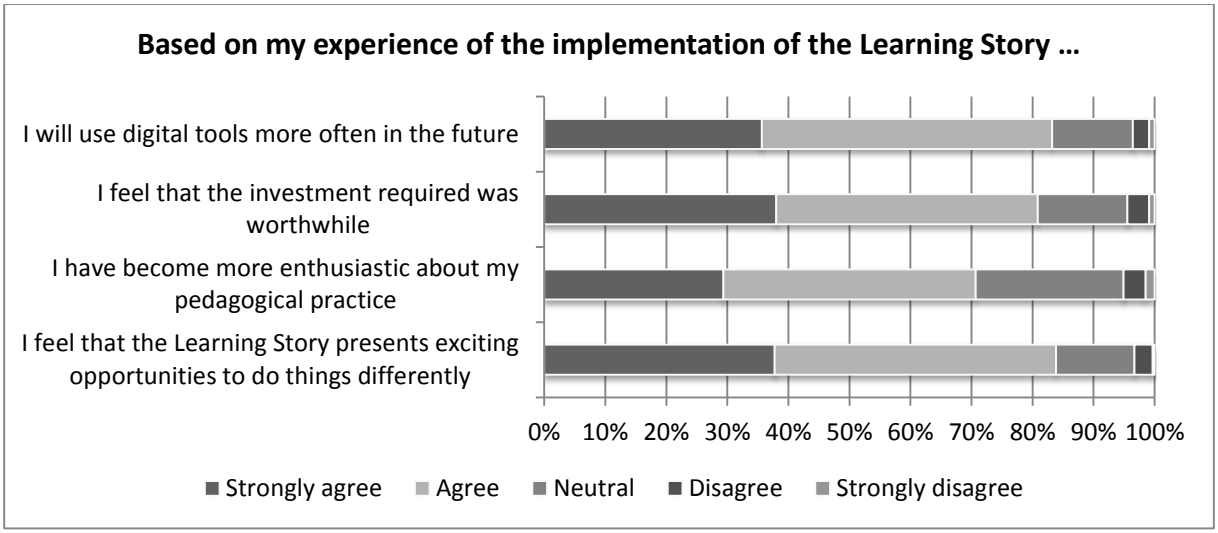



**Figure 7: Perceived impact of iTEC on teacher attitudes**

The positive impact of the project on teacher attitudes was mentioned in reports or interviews from 10 case studies. In most instances, the increase in teacher motivation was felt to be due to seeing the positive impact the project was having on their students:

> *The teacher feels much more motivated his students are learning with fun and experimenting their eagerness gives the teacher a positive energy for his future classes and teacher is more involved in the projects and effective teaching. (Turkey, case study report)*

The motivating impact of technology was also mentioned:

> *I can say that it was so successful. The technological techniques were motivating. (Turkey, teacher)*

Three quarters of the teachers responding to the survey were also positive about the impact of their experience on their ICT skills, pedagogical knowledge of ICT use and understanding of the potential of ICT. The majority of teachers (7 out of 10) also agreed that their experience had developed their understanding of the different ways that students can learn (Figure 8).

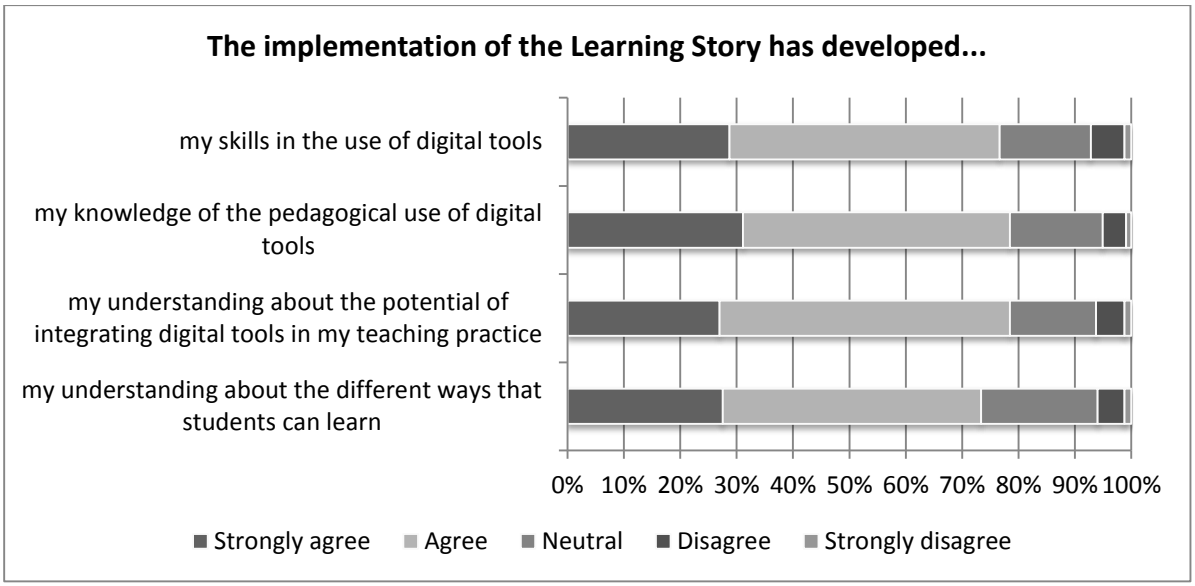



**Figure 8: Perceived impact of implementation on ICT skills and knowledge**

Three quarters of teachers responding to the survey (77%) agreed that implementing the LS and LAs had enabled them to develop their creative skills.

Nine teachers in the case studies commented that the project had helped to improve their digital literacy skills and given them greater confidence when using technology in the classroom:

> *…the confidence of using the technology on a daily basis cannot be emphasized enough. (Austria, ICT co-ordinator)*
>
> *Using innovative technologies in our lessons we have extended our knowledge and experience more. (Turkey, teacher)*

## Impact: Student attitudes, ICT skills and knowledge

There is, of course, no value in introducing innovative practices into the classroom simply for their own sake. Innovations need to deliver positive benefits for teachers, but most importantly, for students. Indeed, the case studies indicated that iTEC had a number of positive impacts on students. The most frequently mentioned were: an increased level of motivation, including those students who were normally less engaged; greater autonomy and independent learning; a perceived (albeit untested) impact on attainment, and improvements to students' digital literacy skills. These are considered in turn below.

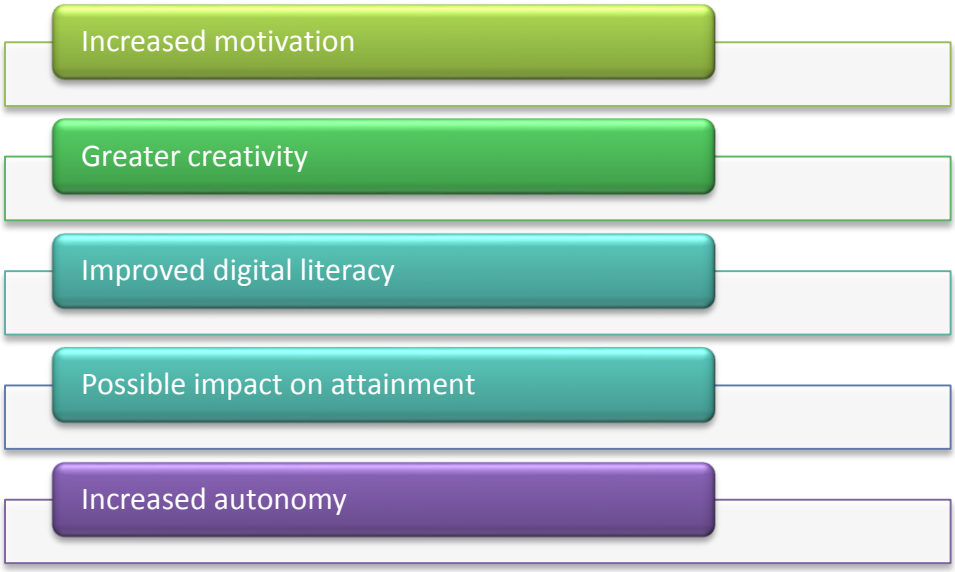



**Figure 9: Summary of impacts of iTEC on students**

## Impact on students' motivation

79% of teachers responding to the survey agreed that the implementation of the LS led to students being deeply engaged in their work. In addition, 76% agreed that **the iTEC resources had a positive impact on student attitudes to learning**.

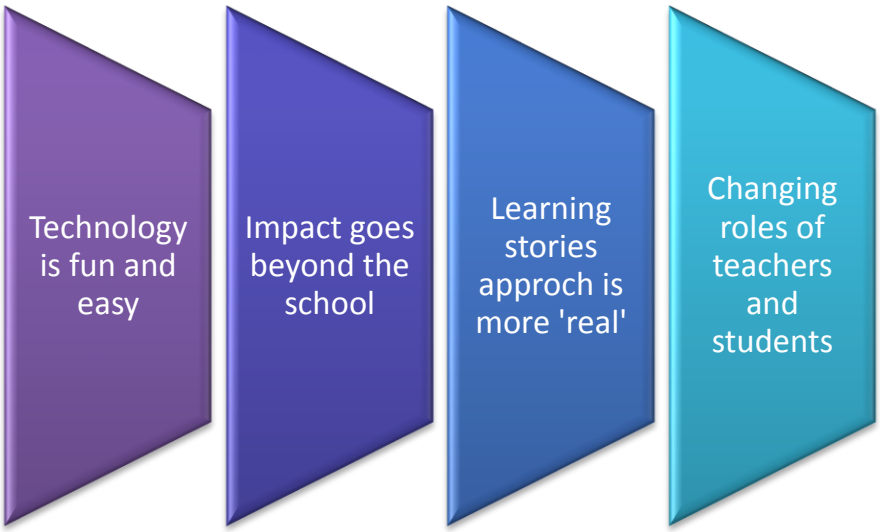



**Figure 10: Aspects of the project impacting on student motivation**

The benefit of iTEC which was mentioned most frequently in the case studies was the positive impact it had on students' attitudes towards learning, particularly their motivation levels (mentioned in 39 case studies). Several teachers reported that

classes which had previous been difficult to engage were much more motivated and more autonomous in their approach to learning.

> *The class which has been observed, normally is quite loud and sometimes the students are not as motivated and concentrated as they should be. Introducing the iTEC learning story that has changed immediately. According to the teacher, the students have been very focused, concentrated and motivated. (Austria, case study report)*

Several teachers said they were pleased that, through iTEC, subjects which are traditionally less popular among students had gained a more positive image:

> *…this completely different view on mathematics, they usually hate mathematics or they did not enjoy it, the math teachers are at the bottom (of popularity), thanks to this approach the opinion on mathematics teachers is changing. (Slovakia, teacher).*

Some interviewees gave possible reasons for this change in student attitudes; some felt it was due to the technology itself, which was seen as fun, and easier than more traditional approaches:

> *Pupils got excited about technology, especially the use of learner response system, which was new for them. (Hungary, case study report)*

However, others felt it was a result of wider engagement and involvement from outside the school:

> *The pupils expressed much motivation, both because they liked the variation in being outside the school area and because they knew that many others than their teacher would see their work, even people they don't know. (Norway, case study report)*

Another explanation offered was that the learning stories and activities helped students to see the tasks they were set by the teacher as more ‘real’ and relevant’ or authentic:

> *I do not have other more precise examples, but I had the feeling that the motivation has increased and not only the engagement. They really tried hard to make real website, spending time to decide how to be useful. (Italy, teacher)*

Yet another possible explanation was the changing atmosphere in the classroom as the roles of students and teachers altered and they worked together more closely:

> *The teacher said that this class was new for her and thanks to that project they got closer. She had opportunity to work with groups and students started to trust her more. One student said that there was no pressure during these lessons. (Estonia, case study report)*

In many schools, iTEC saw students take on the role of teachers, for example, as older students developed materials to teach younger classes particular concepts.

***Devising a Maths Lesson – Czech Republic***

In a school in the Czech Republic, Year 5 students devised a maths lesson about 'expressions and variables' for Year 1 students. They used tools more usually employed by teachers, such as PowerPoint, Prezi, Moodle, along with forums and email, to produce a presentation, quiz and feedback questionnaire, which they then delivered to the Year 1 class. Both groups of students appeared to find the experience useful and enjoyable and one of their teachers said, "I am very satisfied with their work because they worked as a team, it seems to me that all the students enjoyed it and it was a really nice experience for us teachers too". (http://itec.eun.org/web/guest/teacher-stories)

## Impact on creativity

91% of teachers responding to the survey felt that the implementation of the LS had enabled creative activities to take place while 89% agreed that their students had developed creative skills as a result of participating (Innovation Matrix Learning Objectives Stage 3/4). In 31 of the 36 case study reports, it was felt that iTEC had had an impact on students' creativity, providing them with more opportunities to develop their own ideas and to use technology in creative ways. Although this was less frequently mentioned in the case study narratives than the other skills discussed, some examples were given:

> *The devices are being used a lot. What we see now is that students use them more to create things than only use them to look up or produce texts. (Belgium, head teacher)*

> *The interactive white board software was new for the pupils but by the end of the project everybody could use it in a creative way. (Hungary, case study report)*

In a number of schools (9), students themselves said they felt that they were able to be more creative than was the case in other lessons; they were allowed more freedom to experiment and explore rather than simply following instructions from the teacher:

> *The students appreciated the freedom of the assignment. They could work creatively and they did not feel the time pressure. (Slovakia, case study report)*

The use of technology allowed students to explore creative options which were not available to them using more traditional tools:

> *It also helps us to be more creative because sometimes a pencil and a piece of paper aren't enough to show what is in my mind in real terms. (Turkey, student)*

## Impact on students' digital literacy

There were also benefits for students' digital literacy skills (Innovation Matrix Learning Objectives Stage 3/4); this was mentioned in 30 case studies. Students learnt how to use new technologies such as IWB software, blogs, Dropbox and video software; some also had opportunities to develop more advanced skills such as programming. Case study reports found that students' confidence increased as they became more proficient in using new tools:

> *Proudly presenting their maths programs, one could see that they increased their programming skills by far and also their self-confidence. (Austria, case study report)*

However, as well as gaining technical skills, students also learnt how to make appropriate use of technologies and to engage with technology in a real world context, for example, writing in a style suitable for a blog post:

> *For example, before the project, in ICT class, they've used blogs but not with a real use, the project has allowed them to really see what means publish information and work through a blog, they could see how many people would visit them and really understand that their information was public. (Spain, ICT co-ordinator)*

## Impact on attainment

Nearly three out of five teachers (59%) who responded to the survey felt that the implementation of the LS led to improvements in their students' levels of attainment[12]. In 16 of 47 case study schools, teachers, head teachers, and sometimes students too, felt that there had been a positive impact on attainment as a result of iTEC. No interviewees say they believed attainment had been negatively affected. Some of the comments were very general in nature, for example:

> *I see it from the point of view of the students' attainments. (Italy, head teacher)*

> *We learn more, that is for certain. (Austria, student)*

In ten cases, interviewees indicated that there had been a positive impact on subject knowledge:

> *And let me say, they do remember the concept of Ohm's law better than anything I have taught them before. (Austria, teacher)*

> *Achievements of the students in the group increased in the Technology and Design subject. (Turkey, teacher)*

[12] In Cycles 4 and 5 teachers will be asked to provide more data on the impact on attainment and learning outcomes.

Five thought there had been improvements in twenty-first century skills such as critical thinking, communication, teamwork and independent learning:

> *The learning becomes more permanent as the students investigate, and find out, use and evaluate the learning topics by themselves. The student achieved an active learning. It directly effects student achievement. (Turkey, teacher)*

There were four comments about perceived improvements in ICT skills:

> *After this project my ict skills improved very much and I took pleasure of using them (Turkey, student).*

## Increased student autonomy

Four out of five teachers (81%) who responded to the survey felt that the LS promoted active and independent learning in which students took responsibility for their own learning activities or progress (Innovation Matrix Learning Objectives Stage 4). In several case study reports (11), teachers claimed that involvement in the project had led their students to become more independent, self-confident and autonomous learners. A teacher who had been involved in previous iTEC cycles felt that this was a stronger theme of Cycle 3.

Both teachers and students commented that, through working more independently, students developed a more in-depth, holistic understanding, rather than simply memorising facts provided by the teacher:

> *That no one tells us what to do, we have to look for solutions, we don't have to memorize it to explain it, you have to really understand it to create something. (Spain, student)*

> *Sometimes we teach, but knowledge seems watertight, it is separated in boxes. No, they had a holistic idea that everything is related and knowledge is not retained here, it goes beyond the walls of the classroom. I think this is where we can measure success. (Portugal, teacher)*

## Development of other student skills

Although only highlighted as a benefit in a few case studies, **group working** was another of the key skills which both teachers and students felt improved through involvement in iTEC (Innovation Matrix Learning Objectives Stage 3):

> *We've learned to work together (Hungary, student)*

**Presentation and communication skills** were also mentioned (Innovation Matrix Learning Objectives Stage 3). Of course, given the focus of cycle 3, **design skills** were highlighted by several teachers (Innovation Matrix Learning Objectives Stage 3/4):

*The main purpose of this phase was the design – how to teach pupils to design something, give feedback and take others' opinion into account. (Estonia, head teacher).*

# EQ2) To what extent are the iTEC Learning Stories and iTEC technologies sustainable, transferable and scalable?

## Sustainability

Half the teachers who responded to the survey (50%) perceived that they would definitely implement the LS again, with 46% suggesting that they probably would and only 4% who said that they would not. In more than half the case study reports (20 out of 36), NPCs concluded that there was evidence that the innovation would definitely be sustained beyond the pilot and in a further 15 they felt it would probably be sustained; there was only one case study where the NPC felt the innovation would not be sustained.

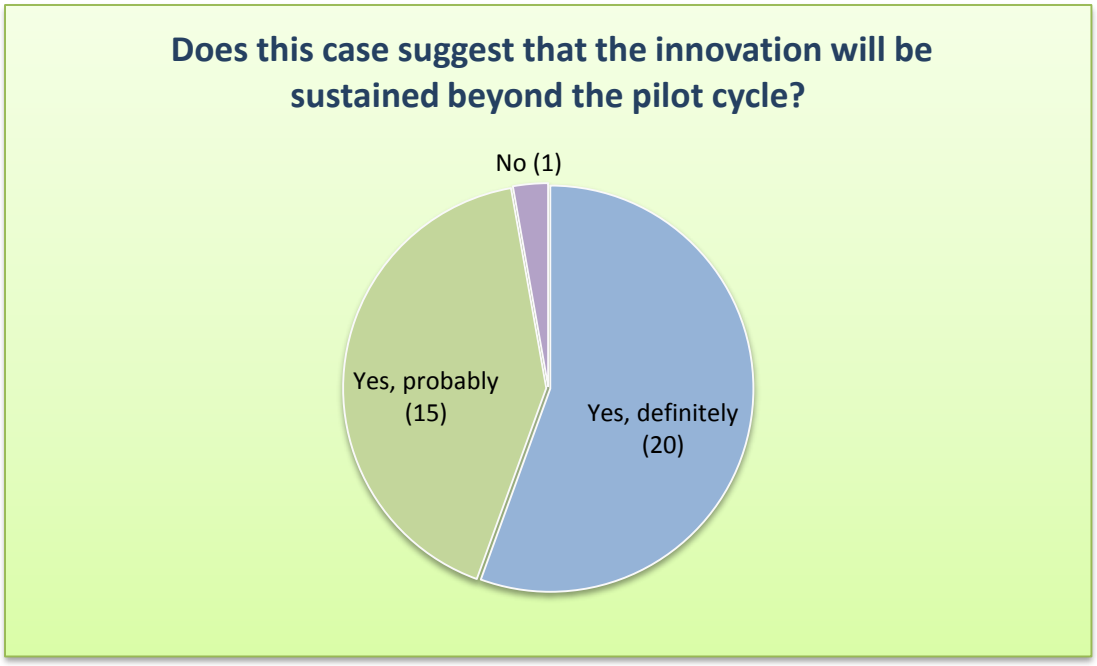



**Figure 11: Does this case suggest that the innovation will be sustained beyond the pilot cycle (n=36)?**

In nine case study narratives, there was direct mention of teachers continuing to use the approaches introduced through iTEC:

> *I could easily come up with other subjects where I could use this kind of scenarios. (Belgium, teacher)*

A small number of teachers who had participated in several iTEC cycles talked about adapting and combining ideas from different learning stories to create new learning and teaching materials:

> *His idea was to take the current Learning Story - Designing a Physics Lesson - and add a few elements from previous cycles to it. (Austria, teacher)*

> *In spring the teacher is planning to mix two scenarios: outdoor study project and creating games. (Estonia, case study report)*

This suggests that, as they become more familiar with the concept, teachers may feel more confident in creating their own Learning Stories.

However, in order to sustain iTEC beyond the project (and to extend approaches to other teachers and schools), interviewees from the case studies identified several issues which would need to be addressed (see Barriers, Challenges and Drawbacks below for more detail).

One was **the lack of equipment and infrastructure** such as reliable Internet access. In a number of schools, students and teachers needed to use their own devices, but this was not seen as a sustainable solution as it disadvantaged those students without access to technology in the home (**digital divide concerns**):

> *There is certainly an unexpected negative outcome: the fact, already mentioned above, that an activity that focuses on the work at home, can become discriminatory against students who do not have access to technology. (Italy, case study report)*

Another concern was staffing and **insufficient ICT support**. Several ICT co-ordinators had devoted extra time to support the teacher involved in iTEC, but this would not be possible on a long term basis, or indeed, if the number of teachers requiring this level of support increased or teachers with poorer IT skills became involved.

Of the 4% of teachers who said they would not implement the LS again, they noted the following. Teachers in this small group were **not convinced of that the benefits outweighed the time and financial costs involved**. Some felt that there were other resources and approaches teachers could use which required less time and resourcing.

## Transferability and scalability

56% of teachers responding to the survey agreed that the LS should be made widely available to other teachers, 40% said that they probably should whilst 4% said that they should not. Of those who said the resources should not be made widely available, five had implemented RS, two had implemented VPS, one had implemented DPS, and four had implemented DMG, with one choosing to design his/her own LS (designing a board game for outside). A variety of reasons were given for this including technical difficulties, the use of ‘complicated scientific language’, the extensive time required for implementation, constraints of the curriculum, and the teacher knowledge required.

When NCPs were asked to judge whether the innovation was likely to be transferred to other classes within the school, or to other schools, the response was reasonably positive. Overall, NCPs believed the innovation was would probably or definitely be transferred in four-fifths of the case study reports (29 out of 36).

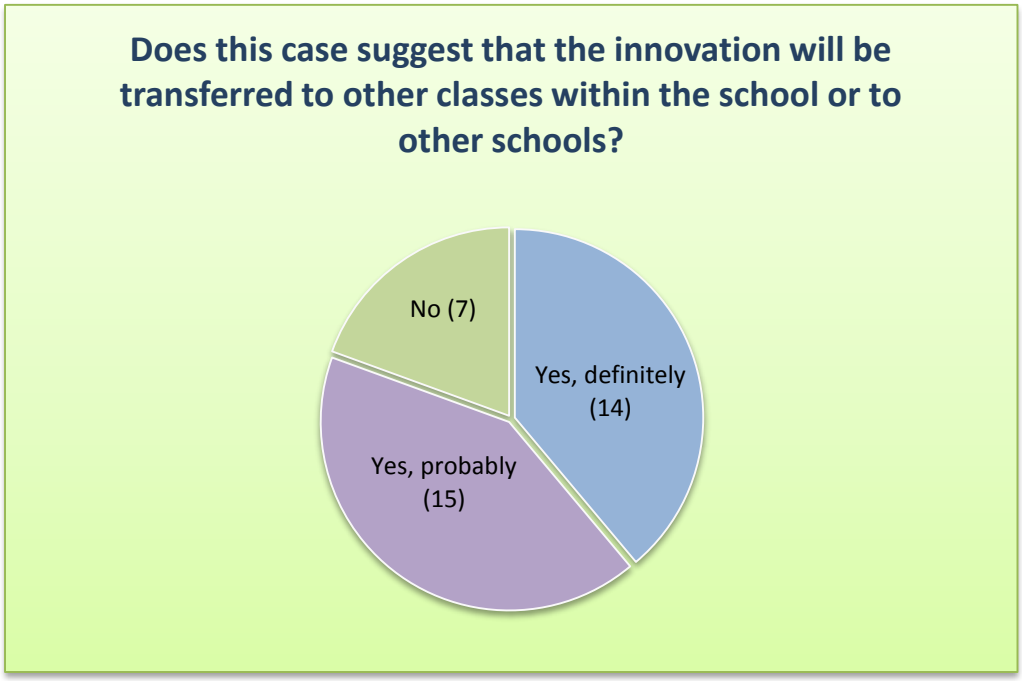



**Figure 12: Does this case suggest that the innovation will be transferred to other classes within the school or to other schools (n=36)?**

## Transferability within school

In the case studies, several interviewees (8) believed that iTEC had already encouraged teachers to work together more collaboratively and share ideas about how to use ICT to support teaching and learning.

> *Teachers talk more to each other about using technology. They work together in an interdisciplinary way using projects. (Belgium, case study report)*

A number of interviewees hoped that this interest would result in other teachers adopting the same approach with their classes:

> *And this was a limited project, so others in some of the grades are saying: "Yes, but if you can manage coding like that, we can use it, we can also just do it ourselves. Yes, but I feel like doing that too!" So you get a third-grade teacher who thinks it could be fun to try out a project activity in his or her grade. And then you have a dissemination effect. So I think that is how this has worked. (Norway, head teacher)*

Certainly, in many case study schools, there appeared to be an interest in iTEC from other teachers:

*All I see is the increasing interest among my teachers concerning iTEC. I am sure it will have an impact in the future. (Austria, head teacher)*

*They were aware of it; K informs us regularly. She talks about it in e-mails, personal conversations and at meetings. Thus, teachers are aware of it, and are curious to know about the latest project K is involved in. This is how far we got. I think later on other colleagues may join too. (Hungary, head teacher)*

However, some teachers (4) felt there would be resistance to using technology amongst colleagues:

*I also think that working with technology it is quite a challenge for a teacher and teachers although they're interested in something they sometimes fear to face something which is really new for them. (Italy, teacher)*

To introduce more teachers to iTEC, some schools (3) planned to include sessions as part of their staff development:

*Yes, we are organizing a small training during the winter holidays, where teachers who have been to interesting trainings introduce them to others, and [name of teacher] is going to talk about the ITEC project. (Estonia, head teacher)*

These were usually sessions led by the teacher who had been involved in iTEC and, as one interviewee pointed out, these types of sessions could be valuable in providing the level of detailed information teachers need in order to integrate technology into their own classrooms:

*Teacher: I feel that it's really important to explain it all to my colleagues. About using TIS, we see lots of things, we only show the nice things that seem impossible for us to carry out, and we forget to tell our colleagues to do smaller things and how to do them. All of the training sessions that I had or that I've seen, it was always about showing but...*

*Interviewer: You don't get to see how everything's done in the background...*

*Teacher: Yes. And for us, the question is how can that be done in my classroom? It's really a point I insisted upon, to show that someone who has never seen this before can still do it. (France, teacher)*

To a large extent, the spread of iTEC methods within a school depends on the support of the head teacher. Some were highly supportive:

*I am going to support activities in that area in the future and iTEC look like something we are easily up to. (Austria, head teacher)*

*Of course I am going to support the continued use. During the next pedagogical conference this will be on the agenda. (Austria, head teacher)*

But others expressed more caution:

*I thought it sounded very exciting and think it is something that works for the students. But then we will certainly have to re-evaluate it. How is this thing working in practice, that is, are there some who get to work on it and others not. And are we getting everyone on board, and how much learning is there in relation to the time spent. And does it cover the subject or cover it only a little, so that it takes up a disproportionate amount of time. I have to evaluate all these things. (Norway, head teacher)*

## Transferability beyond school

In a small number of case studies, NPCs reported that news about iTEC had spread to local schools, and teachers at these are now considering using new approaches, such as learning outside the classroom:

*Many teachers learned about itec after our involvement we shared our experience through media and approached a wide ranges of teachers from different subjects it also helped the promotion of the Dörtyol Arboretum .The website geocaching also helped it. Till our visit nobody heard about this Arboretum so we were the first to visit this place now other schools have started visiting this museum of trees. (Turkey, teacher)*

*There were some primary-school teachers who found this iTEC programme really interesting, and they could imagine making a similar trail for the primary school, with various assignments to do in the forest and such. And I think this will be really exciting, if we can succeed in producing those kinds of ripple effects in-house, to have others latching on. (Norway, teacher)*

Furthermore, several iTEC schools worked in collaboration with others on joint projects and this encouraged teachers to share ideas with their counterparts in other schools.

## Dissemination and wider adoption of iTEC resources

As well as take-up at a local level, participating MoEs and commercial partners and their nominated NPCs/NTCs have undertaken a range of activities to promote the iTEC process. Promethean for example, have established a project page about iTEC on its online community Promethean Planet which reaches 1.5 million teachers worldwide. In addition, the organization has established an iTEC community within Promethean Planet which currently has 60 teachers registered (registration is free) from many countries including some not currently involved in iTEC (eg Latvia, Latin

America). Work undertaken in Work Package 11 (WP11) during the autumn in 2012 explored the impact of iTEC on national ICT strategies and the potential for mainstreaming iTEC resources (Ellis, 2013). It should be noted that by this mid-point in the iTEC project the focus had been on developing the tools, resources and processes. Therefore this reflects an early indication of how iTEC might be exploited at national level in the future. There is some evidence to date that some countries are planning to integrate iTEC outputs and findings into continuing professional development programmes and product development. There is also evidence through WP11 of dissemination beyond participating schools and teachers through social media, online communities, regional authorities, government agencies and national databases.

# EQ3) To what extent are the Learning Stories and iTEC technologies fit for purpose?

## Learning Stories and Learning Activities

As in Cycles 1 and 2, approximately two thirds of teachers responding to the survey (62%, n=334) agreed that with no help they were able to adapt the Learning Story to suit their needs. In almost two-thirds (23 out of 36) of the case study reports, the Learning Stories were felt to fit 'fully with current school policies and plans and in 11 cases, they were believed to fit 'to some extent'. Of course teachers from different countries had different experiences. For example, less than half the teachers in CZ (3 out of 7 teachers), FI (11 out of 25 teachers) and LT (14 out of 29 teachers) agreed or strongly agreed that they were able to adapt the LS without any help. The Learning Stories were a new approach for many teachers; one commented on the fact that the learning stories focused on discovery and creativity in contrast to the more conventional approaches they were used to:

> *Today's simple lesson plans that we use consist of just books, notebooks and other class materials. This learning story has created lessons plans which are full of discovering, thinking, creating and achieving success as well as in the real world around us. (Turkey, teacher)*

It is worth noting that there was variation from country to country in the degree of flexibility which individual teachers were allowed in adapting the Learning Story. The following quotes show two contrasting examples:

> *We looked for a scenario that was innovative and offered real challenges for teachers and students. The teachers and students weren't allowed to change it because we want to roll the scenario out to 70 teachers. (Belgium, NPC)*

> *Each teacher had the four learning stories, and were told it was an option and each teacher could do the learning story as is or modify it to their needs. (Israel, NPC)*

Although it might take teachers a little while to become familiar with the approach, once they had done so, the Learning Stories themselves were seen as enablers, and teachers were motivated by being part of a group testing out this new approach.

> *As in the previous ones, I think the main enabler is... the iTEC structure itself: the Learning Story/Learning Activities paradigm/structure. Teachers feel inspired and engaged by this kind of structure, and also they feel themselves as part of a wider community of "early adopters". (Italy, NPC)*

Several teachers reported that the topics of the Stories were interesting and motivating for students.

> *The best enabler was the topic, which was interesting to students, said the teacher. (Slovakia, case study report)*

Teachers said they liked having *'an example that gives you ideas'* (Estonia, teacher ), but appreciated that the stories allowed them the freedom and flexibility to adapt to the needs and interests of their students, and also allowed the students themselves to be creative:

> *The power of this kind of scenario is that it stays vague on a lot of levels. (Belgium, ICT co-ordinator)*

Some NPCs also felt that the unprescriptive nature of the Learning Stories was motivating for teachers:

> *The fact that the teacher saw these stories as an inspiration and not as something they have to do – helped. (Israel, NPC)*

As another pointed out, it is important to ensure that the Learning Stories are flexible enough to be used in any classroom:

> *…every country and even not every school/class is the same. Accordingly, the stories and the tools suggested must be highly adaptable. (Turkey, NPC)*

While many teachers appreciated the freedom the Learning Stories allowed them, a few were concerned that the stories were not concrete enough to work in practice without further development and support:

> *I think that at first it was not practical enough to work with (redesign the school) but since there are iTEC (EduBIT) coaches it became a lot more concrete. I believe this has been a good adjustment. (Belgium, head teacher)*

In one school (in Italy), the teacher felt that Cycle 3 was less structured than the previous iTEC cycles and this presented challenges as there were fewer limits imposed by the Learning Stories:

> *The teacher also notes that in this cycle scenario, compared to the previous cycle (Creating Resources Students), things were less 'structured', and therefore it was more difficult (the case study teacher said 'because in a certain sense the more limits there are the better it works out: when there are no limits it is difficult even to calculate timing and deadlines…'). (Italy, case study report)*

In Italy, teachers were encouraged to create their own Learning Stories so this comment may reflect the additional demands required in this situation.

On the other hand, one NPC commented felt the Learning Stories were not open enough and adapted them to be less-subject specific:

> *We saw that the description of the learning stories is sometimes too closed. We need more openness in the description. (Belgium, NPC)*

When asked for further explanation, the NPC said that some of the Learning Stories seemed to be focused on a particular subject area, for example maths, when, with slight adaptations, they could be used much more widely than the title might suggest.

In addition, a small number of teachers did not feel that the idea of redesigning the school (RS) was appropriate for their circumstances:

> *We couldn't carry out it by 'observing & redesigning our school.' It seemed totally useless for us due to the situation we were in then. Instead, we decided to observe and re-design the animal rescue centres in our country. (Turkey, teacher)*

A few teachers struggled because the Learning Stories did not obviously fit into their curriculum. They overcame this problem in a number of ways, including adapting the Learning Stories to address topics they needed to cover and teaching the Learning Stories as an addition to normal lessons:

> *Cycle 3 was not so suitable with our curriculum, but it was not a problem, we implemented the project after the lessons. (Turkey, teacher*

> *To better integrate the LS in the curriculum, the teacher worked in a opposite way in comparison with the previous cycle. The teacher said 'instead of adapting the curriculum to the LS, I adapted the LS to the curriculum. In other words, I have written my own LS on the topics I should have dealt with during the target period (creative writing)'. (Italy, case study report)*

## iTEC recommended environments

34% of teachers indicated that they used a virtual learning environment to support the implementation. 90 of these teachers used at least one of the iTEC recommended environments: dotLRN, Moodle, ActivInspire, SMART Notebook (19 of these teachers used two different environments):

- 43 teachers (13%) used SMART Notebook
- 40 teachers (12%) used Moodle
- 20 teachers (6%) used ActivInspire
- 6 teachers (2%) used dotLRN

Respondents were asked about their perceptions of the usability and benefits of the environments (Figure 1Figure 13). They were broadly positive about their experiences with four out of five teachers agreeing that the tools were usable and beneficial.

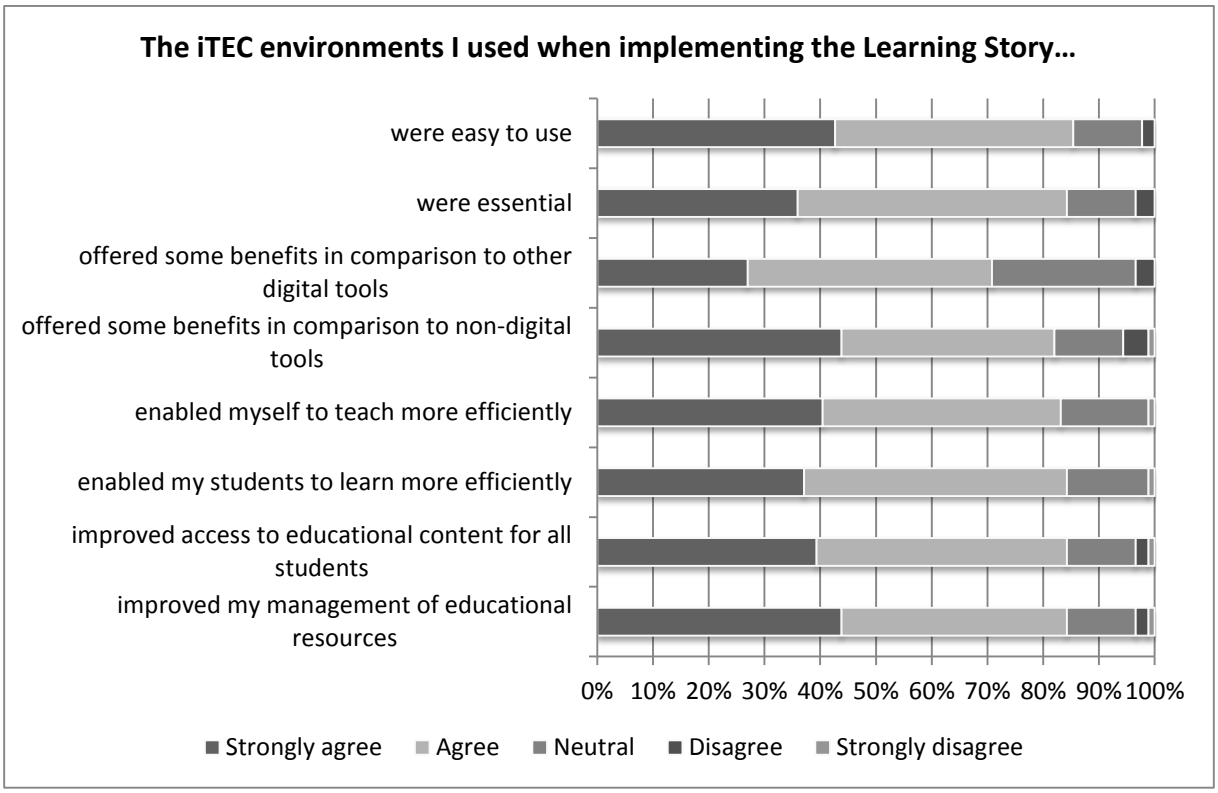



**Figure 13: Teacher perceptions of the environments**

The remaining 24 teachers used other virtual learning environments or interactive whiteboard software environments such as Fronter, dokeos, cleverboard and easiteach.

Teachers responding to the survey were asked to identify the main benefits and main challenges of the environments. The most frequently mentioned benefits and challenges are listed in the table below (Table 13).

**Table 13: Main benefits (n= 78) and main challenges (n=83) of the environments**

| Benefit | No. of teachers | % of teachers responding | Challenge | No. of teachers | % of teachers responding |
|---|---|---|---|---|---|
| The technology itself | 14 | 17% | Technical challenges | 22 | 28% |
| Impact on student attitudes | 8 | 10% | Digital literacy | 21 | 27% |
| Time saved | 8 | 10% | Student attitudes | 8 | 10% |
| | | | Time | 8 | 10% |

In response to this question, 14 teachers (17%, n = 78) frequently referred, in general terms, to the value of the tools and technologies which formed part of the environment:

> *Debate forum on Moodle Sharing resources in Moodle course (Portugal, teacher)*

> *The availability of large quantity and variety, high quality tools for everyday use in the classroom… (Spain, teacher)*

According to eight teachers (10%, n = 78), the environments were viewed positively by students and helped to motivate them:

> *…a more positive understanding of school for students. (France, teacher)*

The environments also had more direct benefits for eight teachers (10%, n = 78) as having resources readily available through the environment meant they were able to organize their lessons more efficiently.

As the numbers of teachers using each type of learning environment were small, it is difficult to comment on any differences between the different environments. However, it is worth noting that the ability to share information was also mentioned as one of the benefits among Moodle users (4 teachers) and group work featured strongly among Moodle (4 teachers) and ActivInspire users (3 teachers).

Technical challenges were the most common problem which 22 teachers faced (28%, n = 83). Some technical challenges were due to the difficulties teachers faced in individual schools, but others mentioned difficulties using specific technologies, such as Team Up (discussed below), and others felt that some of the iTEC interfaces were not user friendly.

Closely linked to the technical difficulties identified, another challenge perceived by 21 teachers was that both students and teachers needed to learn new skills in order to make use of unfamiliar technologies (27%, n = 83):

> *Innovative technologies have required the acquisition of new skills by students and teachers (Italy, teacher)*

A lack of interest in iTEC from some students was another issue faced by eight teachers (10%, n = 83):

> *Little skill / desire for these technologies by students (Portugal, teacher)*

In addition, eight teachers (10%, n = 83) did not feel they had sufficient time to devote to iTEC. A particular factor mentioned by a number was the fact that greater preparation time was required because they were using technologies and approaches which were unfamiliar:

It was difficult to discern differences between users of different types of learning environment, although time seem to be more of a concern for Moodle users (6 teachers) than for other groups.

DotLRN was explicitly mentioned in all three case studies from Austria. In two case studies, interviewees said the dotLRN shell had been used with the iTEC Composer tool and they had found this useful:

> *The DotLRN shell with the [iTEC] Composer tool however, was very useful. (Austria, teacher).*

## TeamUp

TeamUp was mentioned in reports or interviews from 13 of the 47 case studies. The underlying idea of TeamUp was thought to be useful. For example, a teacher thought it helped to improve communication skills and a student said it was a fair way to create teams.

> *By using TeamUp our students' written and oral communication skills have been enhanced. (Turkey, teacher)*
> *The advantage is that it makes the actual teams, otherwise we would have the good ones to one side and the bad ones to the other. I think that's good. (Portugal, student)*

However, there were challenges associated with it including:

- Lack of time to learn how to use it
- Felt to be unreliable
- Technical issues (eg problems using Flash)
- Teachers were accustomed to using other methods of selecting teams.

For teachers in the case studies, technical issues (4) and the availability of alternative methods (2) were the most commonly mentioned barriers.

> *The class used teamup for reflections, but had some technical problems, therefore only some groups were able to make use of the tool. (Israel, case study report)*
>
> *The disadvantage is that – and this happened to me several times but it must be a beta. It happened a few times – it either deleted the images or the recordings. It happened to us a few times –sometimes it deleted the images, others the images appeared several times. (Portugal, student)*
>
> *I didn't use Team-Up, because inserting the names takes time and my option seemed faster to me. (Estonia, teacher)*

As well as using TeamUp to allocate students to teams, teachers attempted to make use of this software to record students' reflections on their learning. Around half of the teachers responding to the survey used a tool to record reflections, with 28% (94 teachers) using TeamUp and 21% (69 teachers) using an alternative tool. Of these 163 teachers, 85% listened to the recordings and 77% asked their students to listen to the recordings.

Although this activity did not necessarily involve the use of TeamUp, the main benefits (n = 143) and main challenges (n = 135) of recording reflections are considered here as this is one of the features of this tool (Table 14).

**Table 14: Main benefits and main challenges of recording reflections (from survey data)**

| Main benefit | No. teachers | % of teachers | Main challenge | No. of teachers | % of teachers |
|---|---|---|---|---|---|
| Able to track progress | 31 | 22% | Technical issues | 51 | 38% |
| Students engage in self-evaluation | 25 | 18% | Time | 25 | 19% |
| Sharing | 20 | 14% | Evaluation | 23 | 17% |

| | | | | | |
|---|---|---|---|---|---|
| between students | | | skills | | |
| Feedback for teachers | 14 | 10% | Student attitudes | 14 | 10% |

One main benefit (mentioned by 22% of teachers responding) was that recording reflections enabled both students and their teachers to monitor the progress of their projects:

> *They and teacher saw their own recordings next time. It was easy to follow projects' progression. (Finland, teacher)*

Closely linked to monitoring progress, teachers (18%) also frequently commented on the way in which recording helped to develop students' skills in self-evaluation; they were able to see how they were developing as individuals:

> *It forces students to think about their work, become aware of the work we have been able to do, and skills they have developed. (Spain, teacher)*

Reflection also offered an opportunity for students to share their experiences (14%). Teachers (10%) benefited directly as they were able to learn from students' reflections on what had been taught. They could use these to better appreciate where students struggled, and to identify where they needed to make changes to their teaching.

Technical issues were, by far, the most commonly reported main challenge for teachers (38%). Eleven specifically referred to problems with TeamUp and other struggled with other tools, or with the infrastructure and equipment available in their schools, for example, poor Internet connectivity or microphones not working.

Finding time was another challenge (19%), particularly setting aside sufficient time to carry out reflection on a regular basis:

> *Difficulty finding time to carry out regularly (Spain, teacher)*

Teachers (17%) reported that students often lacked the evaluative skills necessary to carry out reflection. Many tended to describe the process they had undertaken rather than reflect on successes and challenges. This was something students were not used to doing and many found it difficult to express their thoughts.

Student attitudes could also be a challenge (10%). Some students did not understand the value of reflection and were therefore reluctant to take part in this activity:

> *Convincing students of the usefulness of this type of work. (Portugal, teacher)*

## Participatory design workshop

The participatory design workshop was not mentioned in case studies, but the 141 teachers who indicated that they piloted this Learning Activity were asked to identify the main benefits and main challenges of this activity in the survey. The top five main benefits (n=138) and main challenges (n=124) are shown in the table below (Table 15).

**Table 15: Main benefits and main challenges of participatory design workshops mentioned in survey responses**

| Main benefit | No. of teachers | % of teachers | Main challenge | No. of teachers | % of teachers |
|---|---|---|---|---|---|
| Student collaboration | 36 | 26% | Time | 27 | 22% |
| Product-creation skills | 17 | 12% | Student attitudes | 14 | 11% |
| | | | Evaluation skills | 13 | 11% |

The ways in which the activity encouraged students to co-operate and work together was identified as a benefit by one-quarter (26%) of those responding:

> *The students had to coordinate their work, and create a common "front" to the audience (Norway, teacher)*

Students also gained a better understanding of the process of product design (12%).

> *Getting to know the sequence of the product creation (Hungary, teacher)*

However, there were a number of challenges. Teachers (22%) felt they lacked time to do this activity within the normal curriculum, and to co-ordinate the workshop if other groups were involved. Motivating students was a common challenge (11%).

The evaluation process and receiving feedback on their ideas was new to many students and teachers (11%) reported that they struggled with both giving and receiving feedback.

> *Getting students (especially teenagers) to overcome the [potential] shame and fear so they are able to accept suggestions and ideas for improvement that come from others. (Spain[13], teacher)*

[13] This teacher participated in pilots run by Promethean in Spain.

# EQ4) What are the enablers of and barriers to adoption of iTEC Learning Stories and iTEC technologies?

## Enablers

The main enablers identified through the survey data and case studies are given in the diagram below (Figure 14). Those identified through the survey are listed in the table which follows (Table 16). The enablers centre around the readiness of the school, teachers, students and the community, alongside the support provided through iTEC.

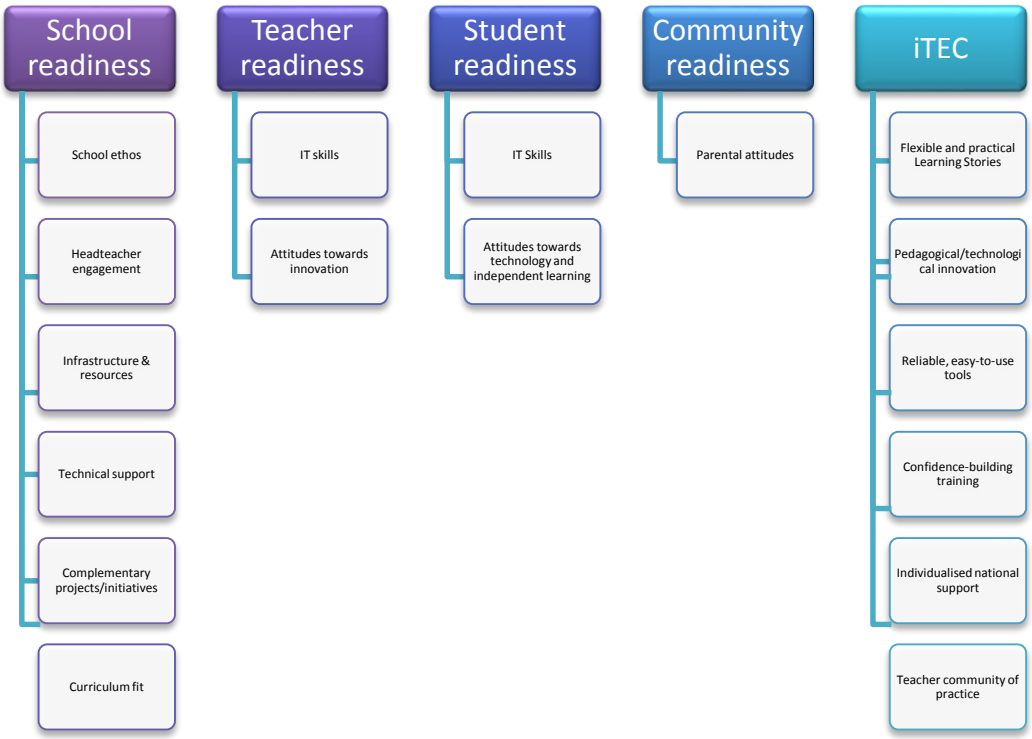



**Figure 14: Enablers of LS implementation**

**Table 16: The main enablers of implementing the Learning Story were … (n=299)**

| Main enabler | Number of teachers | % of teachers responding | Main |
|---|---|---|---|
| Student attitudes | 82 | 27% | EE, ES(SM), FR, HU, IS, IT, LT, PT, SK, TR, UK |
| Infrastructure and resources | 62 | 21% | BE, CZ, ES(SM), HU, NO, SK, UK |

| | | | |
|---|---|---|---|
| Support from other teachers | 49 | 16% | AT, BE, CZ, PT |
| Teacher attitudes | 37 | 12% | EE, ES(SM), IS, IT, LT |
| | | | |
| | | | |

Although they did not feature at the top of the list, it is also worth noting that the national level support provided, and training offered through iTEC were each mentioned as important factors in the implementation of the Learning Stories by around 5% of those responding. However, this also suggests that the support offered through iTEC is not critical in terms of scaling up and mainstreaming.

## School readiness

The school ethos, head teacher engagement, infrastructure support, technical support complementary projects and initiatives, and curriculum fit all have the potential to act as enablers.

The **ethos** in many schools involved in iTEC actively encouraged the use of new technologies to support teaching and learning. There were positive comments about the overall school ethos in reports or interviews from 17 case studies.

> *[name of school] is very innovative and they are using technology a lot. (Estonia, case study report)*

> *We use technologies in education, we use it in great scale, in languages, history, we are technical vocational school, so we use it also on vocational subjects e.g. mechanics and electrician subjects, in all subjects. (Slovakia, ICT co-ordinator)*

A particular aspect of attitudes towards technology mentioned was allowing the use of students' personal devices, which was supported in threeschools:

> *Students are allowed to use their devices at school, in the playground, etc, and they have been taught to use their own devices in class. Use of technology is something natural in this school. (Spain, case study report)*

The Learning Stories approach also fitted well with the existing attitudes in schools where features such as project-based learning, student-centred approaches, cross-disciplinary working and pedagogical innovation were already embedded:

> *As mentioned before, we take great pride in being a very innovative school always looking for improvements of our teaching practices. Therefore being part of ITEC is beneficial for us. (Austria, head teacher)*

> *…we are persuaded that this is where our evolution lies, not in a frontal kind of teaching, but letting students do it for themselves. (Belgium, head teacher)*

A flexible approach to school organization, allowing flexibility in the timetabling of lessons for example, was another factor which acted as an enabler in ten schools:

> *…teachers can easily rearrange the classes and the individual study hours within the day. (Hungary, case study report)*

In one school, the involvement of the school in the wider community was an aspect of iTEC which was felt to fit well with the existing school ethos:

> *By summoning those outside the school. It fits in with our educational project, because we want to open to the community, and we've always perceived this group as an added value to the community. This is a small, deprived, deserted community, and the school will always be an added bonus. By carrying out this sort of activities, we are bringing the local authorities to the school and interacting with them. (Portugal, head teacher)*

The **support of the headteacher** was important, especially when iTEC required teachers to make changes to their normal practices, for example, using resources such as mobile phones which would not normally be permitted in school.

This was identified as an important enabler by 9% of those teachers responding to the survey (n=299). In all, 85% of teachers responding to the survey stated that the senior leaders supported the use of ICT to support teaching and learning. In the case study reports, half of headteachers (18/36) were categorised as being supportive of iTEC, although they were not directly involved. Just under half (16) were see as having 'active involvement'.

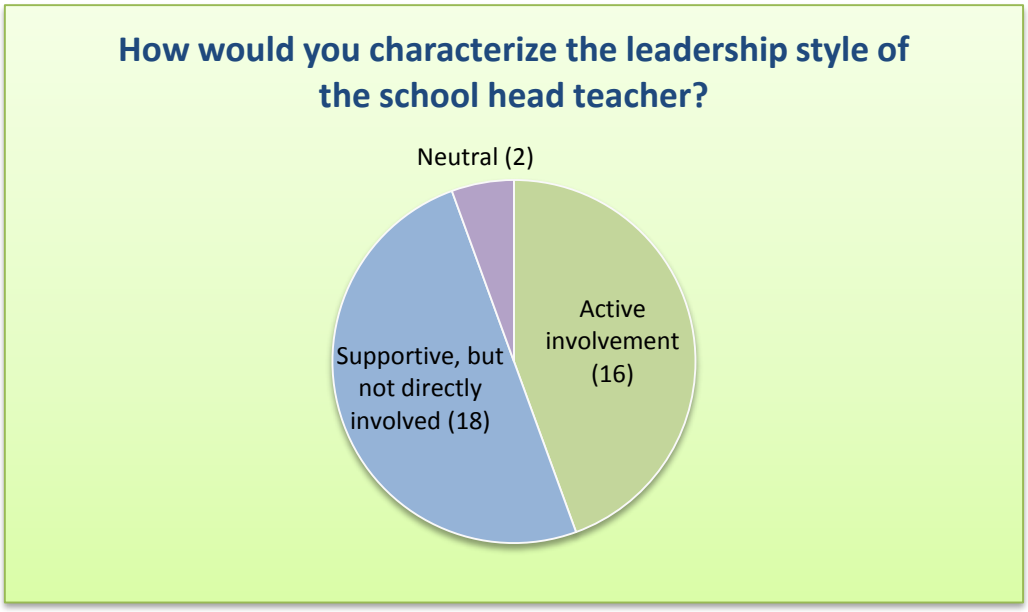



**Figure 15: How would you characterise the leadership style of the school head teacher (n=36)?**

Therefore, most head teachers appeared to be broadly supportive, but a number had a personal interest in the project and became more actively involved:

> *The headmaster researched technologies for use in the pilot, and provided training on use of the GPS app for both the teachers and the students who were to use the app. He also made an instruction video on how to use the app for measurement and how to upload data to the map application. The video was made available to the participants on YouTube. The students had used the map application the year before, but the headmaster gave a 'refreshment' lecture on use of the application to all students before the pilot. (Norway, case study report)*

For more than a fifth of teachers (21%, n=299) who responded to the survey, the digital tools, resources and **infrastructure** needed to deliver iTEC were identified as important enablers. The availability of resources and Internet access were also mentioned as enablers in 14 case studies:

> *My teachers told me that no challenges were faced during the whole pilot. This has got a lot to do with our latest investments in the infrastructure of the school. (Austria, head teacher)*

> *You have to lead. Back to 1990 we already had a computers class, with a simple text processor...our way has been long from there, we won't miss the lead on that, we bet on technology and all our classes have digital whiteboards, we don't have blackboards anymore. (Spain, head teacher)*

**Technical support** for teachers, for example from an ICT co-ordinator (mentioned in 5 case studies) was another important school-related enabler:

> *I was lucky to have The ICT advisor around a lot, actually all the time…It was an enormous level of support. I have to say, that was where there was a lot of support. For example, he made sure that all of the videos had been put online before the students... the whole YouTube part that was kind of technical and that couldn't teach the students anything, he's the one who took care of that. I asked him to do this or that and it was already taken care of two days later. That was really nice. (France, teacher)*

Other types of support mentioned included support from students knowledgeable about the use of technology, peer mentoring for teachers and the support of other colleagues (eg an English teacher). **Support from other teachers** was also an important factor identified through the survey data (16%):

> *There is a related goal in the institutional ICT strategy, plus we included our internal training programs in our five-year-plan…This does not necessarily mean formally organized trainings, since we can cooperate in groups of ten or five, or even as mentoring pairs. There are smaller groups, and colleagues who are better versed in ICT help the others, so this is how we share work among ourselves. In the meantime we are mentoring some colleagues from time to time, and if they need help, we give them suggestions. (Hungary, ICT co-ordinator)*

> *My ICT colleague installed, or it wasn't even him, in one of his ICT classes he told his pupils to install the programmes, KML, Google Earth and so forth, and other things necessary for this cycle. (Portugal, teacher)*

In almost two-thirds (23 out of 36) of the case study reports, the Learning Stories were felt to fit 'fully with current school policies and plans and in 11 cases, they were believed to fit 'to some extent' suggesting that iTEC **complemented the school vision** and linked with other projects and initiatives schools were involved in.

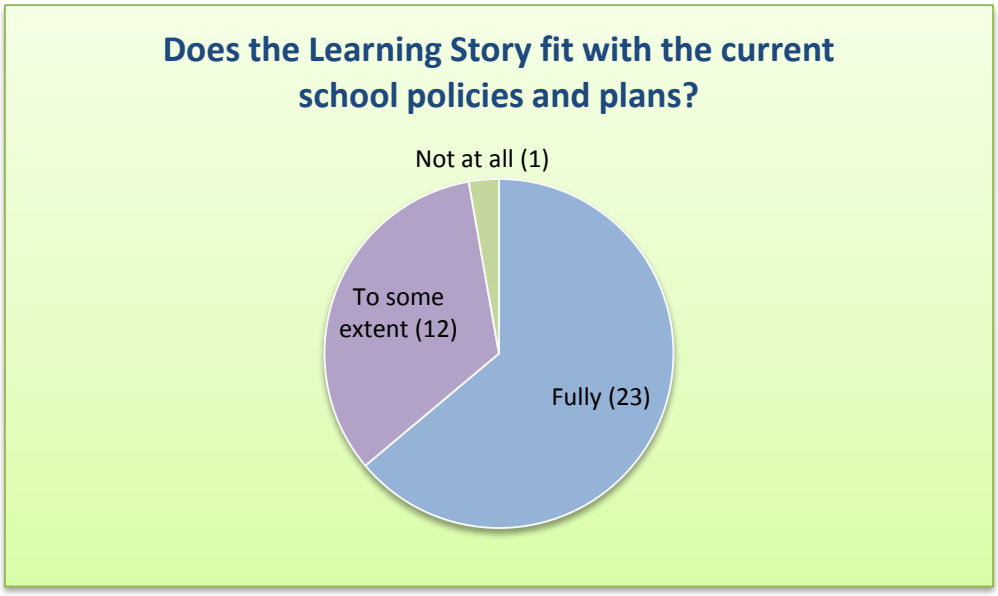



**Figure 16: Does the Learning Story fit with the current school policies and plans (n=36)?**

While these links support the development of iTEC, they also mean it can be difficult to isolate the impact of the project.

Several headteachers and teachers (18) commented that **iTEC fitted well with the school vision** and wider developments within their schools, including responses to national policy, development of ICT policies and other strategic documents and other projects the school was involved in:

> *Being an ELSA advanced school, where eLearning strategies are supposed to be part of the everyday teaching routine, the Learning Story fitted in beautifully. (Austria, ICT co-ordinator)*

> *A new educational project was designed in 2011, and in the meantime redesigned in July this year. The motto - the title of the educational project - is 'Escola participada, espaço de participação' ('Participated school, space for participation'), so the educational project implies the participation of the whole school community, including the students, does it not? And this kind of project, such as iTEC's Learning Stories – I think – I could see that in [name of teacher] work with her students, which is a way for students to participate in the classes. I think it is quite visible. (Portugal, head teacher)*

> *So we've achieved that, so we can use the same groups to avoid a lot of different programmes. They then work interchangeably with iTEC and the rest of 'Around Norway'. And I feel that we have succeeded in integrating our part directly into the project 'Around Norway', I do. So that's good. And I find that the groups are functioning well. (Norway, teacher)*

Although the need to incorporate iTEC into the existing curriculum could be a challenge, where there was perceived to be a **good match between the Learning Stories and the curriculum**, this could act as an enabler:

> *How does the learning story fit in with the school curriculum?*
> *- Very well, because it is connected with the specific school subject and they covered certain topics within this subject. (Estonia, head teacher)*

> *The learning story is based on reading books in English, so it is part of the curriculum. One of the skills that the students have to acquire is reading in a foreign language and to write (Italy, teacher)*

## Student readiness

Student readiness depended on both attitudes and skills.

More than a quarter of teachers (27%, n=299) who responded to the survey identified **positive student attitudes** as an important factor in enabling them to implement the Learning Story. Teachers described students as motivated, eager and enthusiastic:

> *Commitment and creativity on the part of a large group of students. (Portugal, teacher)*

> *The positive attitude of students and their motivation throughout the project as it progressed (Spain, teacher).*

As noted above, the majority of students displayed highly positive attitudes towards the use of technology in lessons. Most saw technology as fun, and easier than traditional methods of learning:

> *All students believe it is easier to learn with ICT than without it. They said that ICT lessons were a more fun way to learn than "normal" lessons. (Portugal, case study report)*

Students' attitudes towards student-centred approaches, and especially teamwork, were also important:

> *We loved the collaboration. Working in groups is a lot of fun and very productive, in our opinion. (Austria, student)*

Where **students had a high level of ICT skills** prior to iTEC, this was seen as an enabler; five teachers or ICT co-ordinators mentioned this as an enabler

> *The school has a culture of using computers from early years, so the students were ready to use technology. (Slovakia, case study report)*

Of course, it was not only in school that students had learnt technology skills which were valuable for work as part of the iTEC project; skills gained through using technology at home could be equally important:

> *They felt at ease with using the blogs because, according to them, they were already familiar with this tool. Three out of the five pupils interviewed say they have already created a personal blog. (France, case study report)*

> *Our teacher K taught us, and I also learned things from my family, my brother and so. (Hungary, student)*

Student focus groups discussed their use of technology outside school, but did not always link this to their use of technology within school. Nevertheless, it was clear that students did not rely solely on their teacher to learn about new technologies. For example, in many classes, there were examples of more IT-literate students helping classmates who were struggling:

> *Initially F was the smartest, he started to do things…then he taught us how to do a little, everything. (Italy, student)*

## Teacher readiness

Like student readiness, both the attitudes and skills of teachers were crucial.

Teachers needed to be creative and innovative in their approaches. Where **teachers had a positive attitude** towards innovation and the use of technology in teaching and learning, this was seen as an enabler, noted by 12% (n=299) of respondents to the teacher survey. The importance of teachers being prepared to experiment in their approaches and adopt new pedagogies was mentioned in 12 case studies:

> *A precondition is that the teacher is innovative enough and willing to adapt his pedagogical routine (Austria, case study report)*

> *He tried to choose an 'eye-catching' topic to motivate his pupils, whence the idea of designing a renewable energy mobile phone charger. (France, case study report)*

Teachers participating in iTEC needed to feel comfortable with allowing students to work in different ways, for example, working outside the classroom and taking an active role in their learning. They also needed to be able to admit they were learning alongside their students, especially when implementing new technologies:

> *I told them, 'I am learning with you, so let's research, let's all search' which takes us to sharing… I challenged them 'Let's see who can publish the first track', 'Let's see who…' and I was also challenging myself. (Portugal, teacher)*

*What has changed a little bit is that until now they used to see me as a heroine of the IWB and during this project that have seen me struggling with blogs and dropbox, they have had the opportunity to explain me things, so it's been very positive for them to have the possibility to help me the same way that I can help them. (Spain, teacher)*

It was clear that many of the teachers engaged in iTEC already possessed **good IT skills**, often better than many of their colleagues; indeed a number were responsible for supporting other teachers in their school:

*"The training did not really do a lot because I am already skilled using this hardware and software. But using eClicker was something new for me." (Belgium, teacher)*

*The teacher was at ease with using educational ICTs because he is 'digital supervisor' in his school, that is to say his role is to advise and support his colleagues in this domain. (France, case study report)*

Teachers were asked to rate their level of competency in using ICT in teaching and learning on a scale from 1 (none) to 10 (very high). The mean response was 7 (SD = 1.8) confirming that the majority of teachers participating in Cycle 3 were confident users of technology.

## Community readiness

Some case studies mentioned the role of parents in driving forward technological developments. If parents see technology as an important aspect of learning, and request their child is in a class which uses technology, or are more likely to send their child to a school with good technology facilities and teaching, this could act as a driver to encourage teachers and head teachers to embrace technology and incorporate it into their pedagogy:

*The head teacher said '…parents begin to request to move their sons and daughters into the classes where the computer is used …' Evidently, 'having lesson with the computer' is perceived by parents as an important value. In particular some parents of the students involved in the pilot, already in the previous cycle, had purchased laptops for their children with the purpose to use it as a learning tool. (Italy, case study report)*

*If the school is not going to adapt, parents and children are going to lose interest in our school. (Austria, head teacher interview)*

*In our region, we have to stay competitive, since a lot of the parents choose different schools for their children. Implementing Learning Stories and taking part in iTEC proves to be very beneficial and suits our school culture beautifully. (Austria, head teacher)*

## iTEC support

While the above enablers would be important in the implementation of any innovation, the support provided via iTEC was important to enable teachers to participate effectively in this project. The fact that the Learning Stories were a new approach was seen as important (survey, 9% of teachers, n=299) as this helped to engage both teachers and students. The Learning Stories and iTEC tools are discussed in further detail in section EQ4 below. The following section examines the ways in which training, and other iTEC support provided, acted as enablers.

Thirteen teachers who had attended the **iTEC training sessions** said these gave them confidence in working with new technologies which were unfamiliar to them:

> *I never worked with this kind of technology, thanks to the training I became more sure of using it. This way I learned to work with it and could use it in class afterwards. (Belgium, teacher)*

> *When we were in Pest /Budapest/ is was a great help, because I have learnt about applications I didn't know before. For example your colleagues showed the 'Webnode' page. (Hungary, teacher)*

Training offered through iTEC was also mentioned as an important enabler in the implementation of the Learning Stories by around 5% (15 teachers) of those responding to the teacher survey (n=299).

As well as the formal training sessions, teachers said they appreciated having an opportunity to meet with colleagues and share knowledge and ideas during these sessions:

> *The teacher appreciated the preparation workshop. The exchanges with teacher colleagues were a source of ideas for the project. (France, case study report)*

Almost all NPCs commented that face-to-face training was essential and highly valued by teachers (mentioned in 10 out of 13 NPC end of cycle questionnaires), although several teachers who could not attend in person made favourable comments about the online materials they had accessed instead. Four teachers commented that webinars were useful, especially if they were available for teachers to review in their own time if they were unable to participate at the designated time.

Teachers in a number of case study schools (16) said they appreciated the **support and guidance provided by the iTEC team nationally,** with 5% of teachers responding to the survey (16 of 299 responding) also identifying this as an enabler:

> *In Mrs L's opinion, the training and the support by the Austrian iTEC team has been essential for implementing the Learning Story. The teacher said: 'Whenever I needed, I got great support from the Austrian iTEC team, in particular from H and A who were able to help me totally unbureaucratically at all times'. (Austria, case study report)*

In particular, nine teachers in the case studies said they valued one-to-one support provided, and those who had not had face-to-face contact felt they would have benefited from this:

> *With a coach (a lot of 1 to 1 conversations) you can counter the problem to transfer these learning stories to real life lessons. (Belgium, head teacher)*

Many case study teachers (14) liked being part of a **community of practice**. They found it reassuring to know that they were part of a group of teachers all facing the same issues:

> *You feel strengthened by the fact that the scenario is being done in other schools and you can talk about it with other ICT coordinators. (Belgium, ICT co-ordinator)*

As mentioned above, training sessions appeared to play an important role in fostering a sense of community:

> *The training have seen as a motivation for teachers too, as they feel part of a group when meeting together with other teachers from other schools that make them to feel that they are not alone in the project. (Spain, case study report)*

Others (3) mentioned national teacher communities, which many used in preference to the iTEC online community:

> *I did [access the iTEC community of teachers], but not as often as I would have liked to. I worked much more with ours, on the Portuguese platform. The other I went in, I watched what was happening, but I was not very interactive nor intervened very often. (Portugal, teacher)*

It is worth noting that, even if they did not contribute, some teachers did read messages posted on the teacher community by others.

## Barriers, Challenges and Drawbacks

Teachers responding to the survey noted a number of organizational, technical and other challenges that they faced when trying to implement the LSs (Table 17). The challenges listed below are those identified by at least 20% of teachers in one or more countries (or at least 2 if less than 10 teachers).

**Table 17: Main challenges identified by teachers in relation to organization, technology and other (n=334)**

| Main challenges | No. of teachers responding | % of teachers[14] | Main[15] |
|---|---|---|---|
| Time required to prepare and undertake the work | 174 | 52% | CZ, DE, EE, ES(SM), FI, FR, HU, IS, IT, LT, NO, PT, SK, UK |
| Unreliable Internet access | 56 | 17% | BE, ES(SM), ES(PR), HU, IT, TR |
| Negative attitudes among students | 47 | 14% | FI, IT |
| Insufficient ICT resources | 38 | 11% | BE, FR, IT, NO, UK |
| TeamUp | 35 | 10% | PT |

**Time** was a barrier for significant numbers of teachers in most countries. Time was an issue because of other demands on students and teachers and because teachers felt that the Learning Story and Activities, ideally, required more time than was available within the curriculum (8%, n = 334). Eightsaid that students needed to do additional work outside class in order to complete the project. In particular, six teachers felt that group work required more time from both students themselves and teachers who needed to monitor the progress of all groups.

The other main barrier for teachers in several countries related to **technical issues**, namely, unreliable Internet access and a shortage of ICT equipment, with insufficient computers, laptops or other devices being available in many schools. Internet connections in schools were described as slow, unreliable and limited in coverage. In some instances, this meant that students had to complete work outside school. **TeamUp** was another common problem (10%). Where further detail about the problem was given, teachers reported that it was unreliable and not always available. Four experienced problems recording reflections.

It is worth noting some other challenges which were mentioned in the survey, although they did not emerge as strongly. The **lack of ICT skills** among students (11%, n = 334), and to a lesser extent teachers (3%, n = 334), was seen as a barrier. There were many new tools and programs which both needed to learn how to use

[14] The percentages use the total number of survey respondents as a base as different numbers of teachers responded to the questions about different types of challenges.
[15] Noted for at least 20% of teachers from one country

before they were able to accomplish the Learning Activities successfully. Areas of particular difficulty included working with images and video, GPS, blogs and Sketch Up. The resources and support available to students for home access was clearly a **concerns about inequalities in student home ICT access** for some teachers (3%, n = 334), especially if limited facilities within the school required students to complete work at home. **Support** for teachers was also mentioned (3%, n = 334); teachers felt that they needed more time, training and ongoing support in order to become confident in the new technologies and methods they were being asked to use.

Based on both the survey and case study data, the main challenges or barriers teachers faced can be categorised into the following areas: technical, organizational, skills, pedagogical and attitudinal (Figure 17). Perhaps unsurprisingly, the challenges most commonly identified were fundamental concerns relating to technical problems and organizational or bureaucratic barriers. More subtle or complex pedagogical and attitudinal challenges were mentioned less frequently.

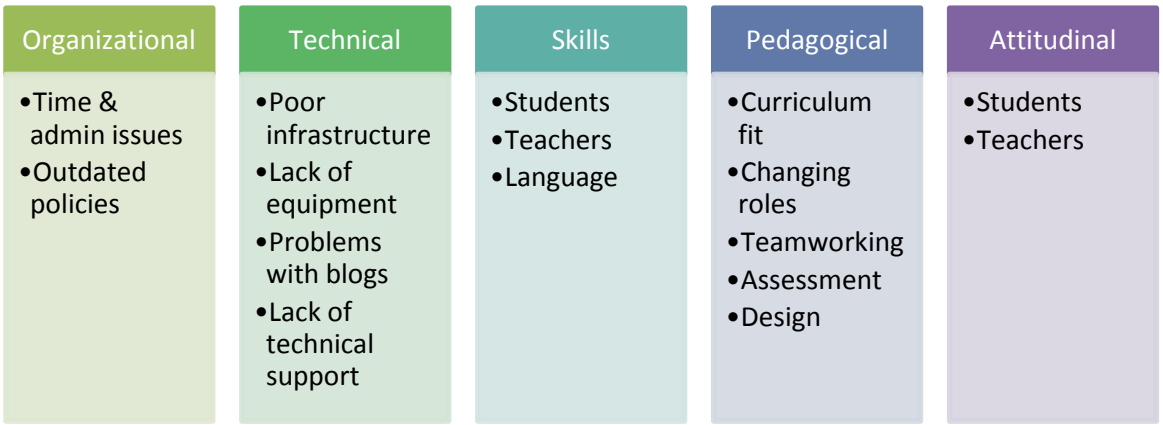



**Figure 17: Summary of challenges faced during implementation**

## Organizational challenges

Many of the problems teachers described related to barriers resulting from the bureaucratic and organizational constraints they faced working in the school sector.

### Time and administration issues

**Insufficient time** was the main organisational challenge. It was identified as such incase study reports and interviews from 28 schools. As the survey highlighted, there were a number of time pressures mentioned in relation to involvement in iTEC. Most obviously, finding time within the curriculum, as discussed above, but also finding time for training, additional preparation and becoming familiar with the technology:

> *…the preparation for the first time is quite huge, but once you have it, it is there. (Austria, teacher)*

> *The webinars are considered very useful but they would like to have smaller webinars, instead of one hour. Also to have the webinars after school is not always easy for all teachers and to have the recordings of the webinars have been very useful too. (Spain, case study report)*

Several teachers also said they required more sessions to deliver the Learning Stories than they had originally planned:

> *The time planned to do the project was not enough and they have to use more sessions as students were very engaged. (Spain, case study report)*

Some teachers said they would have preferred the Learning Stories to have been presented earlier to give them more time to plan their integration into the curriculum:

> *One significant challenge was the time from planning to implementation. Due to the limited time from the presentation of iTEC learning stories to the deadline for completing the pilot, it was not possible to integrate the pilot in the school's semester plans. This was resolved by designing a project that was compact with respect to time, and conducting the pilot at the end of the semester. (Norway, case study report)*

This theme was also frequently mentioned as a challenge in the NPC questionnaires.

In addition to these widely-shared concerns, a range of other organizational and administrative barriers were mentioned in smaller numbers of case studies, including:

- The need to obtain parental consent for some activities
- The need to rearrange classrooms and/or book alternative rooms
- Co-ordinating meetings, presentations etc
- Staff turnover
- Co-ordinating with other school activities (eg trips, exams)
- Financial constraints.

## Outdated policies

Some aspects of iTEC highlighted the limitations of **outdated school policies** which were not suited to supporting the innovative use of technologies. In a number of schools (7), policies relating to the use of technology presented significant barriers, for example, bans on the use of mobile phones or certain websites such as Facebook and Twitter:

> *I would have love to use twitter to communicate but school policy doesn't allow us to use twitter in the classes, well I mean that the communication policy is not decided yet in the school, so meanwhile we can't use it (twitter, facebook, tuenti...) It's such a pity since they are actually using twitter on their daily basis, so include that in the project would have been great. (Spain, teacher)*

In some schools, iTEC was seen as an opportunity to revise such policies, but in many this has not yet been adequately addressed:

> *The technological dotation of the school and the school organization has helped a lot in the project and the project has helped the school policies to finalize to implement the BYOD trends in the school that the school was progressively introducing, being the project an enabler. (Spain, case study report)*

## Technical challenges

Expecting teachers to make regular use of new technologies presented difficulties for many of those participating in iTEC.

### Poor infrastructure

One of the most frequently mentioned technical challenges was **inadequate infrastructure**, in particular, unreliable or limited Internet access, which was a challenge for 25 case study schools. In some cases, this was considered a fairly minor issue, but in others, the lack of infrastructure was a significant challenge. The most common problems were lack of wireless access, limited bandwidth, unreliable Internet connections and few rooms/machines with an Internet connection. This was, understandably frustrating for both teachers and students.

> *The laboratory remains a pillar, but if this teaching practice develops in other classrooms, laboratories may not be enough in term of time of school timetable. (Italy, head teacher)*

> *It would be no use in denying that yes, we do have technological issues, and one of crucial importance is our bandwidth, which is poor. (Hungary, ICT co-ordinator)*

Furthermore, in a small number of schools, a reliable electricity supply could not be guaranteed:

> *We had problems with electricity. Since we are in a new building, we still don't have the proper electricity power installed and sometimes, while working in the project, the light would switch off losing all the work, has been very frustrating sometimes. (Spain, ICT co-ordinator)*

### Lack of equipment

The other important technical challenge was **lack of equipment and resources,** which was, mentioned in case studies from 29 schools.

> *However, she comes up against an equipment problem in her school. With 450 pupils and only 4 computer rooms connected to the Internet (no WiFi available), the usage remains limited. (France, case study report)*

To overcome these problems, a number of schools relied on students bringing their own devices to school (BYOD), or using resources at home, but of course, this could highlight inequalities between students, creating a **digital divide** between those with access to technologies and those without:

> *Working at home has been successful, but has also raised the problem of 'democracy'mentioned earlier. The teacher tried to cut out special tasks for students who did not have access to technology, such as drawing the prototypes. (Italy, case study report)*

A further barrier to accessing a sufficient number of resources was the ban on mobile phones reported in some schools.

## Problems with blogs

The survey asked teachers to identify the challenges (n = 171) of using blogs (Table 10).

**Table 18: Most common challenges of blogs (from survey data)**

| Challenges of blogs | | |
|---|---|---|
| Challenge | No. teachers | % of teachers |
| Time consuming | 29 | 17% |
| Student attitudes | 25 | 15% |
| Communication skills | 24 | 14% |
| Digital literacy | 23 | 14% |
| Infrastructure & resources | 19 | 11% |

One of the main challenges of using blogs was **time**. Blogs were seen as time consuming for three main reasons: students needed to learn how to use them, which required time; it was time-consuming for students to write blog posts; and finding time to keep blogs up to date was a challenge.

> *Students take a long time to build news and comment on them. (Portugal, teacher)*

In addition, not all students were motivated by the use of blogs and many teachers found it **difficult to engage some members of the class**. Students' **limited communication skills** were another challenge; teachers felt that some struggled to write to a standard and in a format suitable for a blog:

> *Poor writing skills of students - a problem with the expression of ideas and a lot of grammatical errors (Slovakia, teacher)*

For some teachers, there were also a number of **technical skills** which students needed to master before they were to use blogs effectively:

> *Learning to use blogs correctly: setting the blog, inviting the authors of the group, creating entries, uploading images and videos ... Ensuring that minicomputers used wifi and work correctly when needed. (Spain, teacher)*

As with other technologies, **infrastructure and resourcing issues** in some schools hampered the introduction of blogs:

> *It was not always possible to work on the blogs in the classroom because the network did not allow (access denied, crashes, unable to attach files), so the work in class was saved on usb / phone and updating of blogs had to be done at home (France, teacher).*

## Lack of technical support

A lack of **technical support staff** less frequently reported, butwas an issue for two schools, and it should be noted that five cases studies did not include ICT co-ordinator interviews. It is also worth noting that, in 31 case studies, **basic technical challenges** were mentioned. The nature of these varied widely from hardware not working to understanding how to use particular functions of programs and websites, but most appear to be the types of issues which could have been addressed if greater technical support and expertise had been available within schools. The following are some examples of the types of issues which frustrated teachers:

> *We had problems during the project. Mostly technical ones. I would have liked it very much if they could develop the site collaboratively, but I didn't find such a function that would have allowed sharing and collaborative view. If I only shared my address and password than only one more computer could log in, the others couldn't. So that's why I collected the data myself. They sent me the materials in e-mail and it became my task to upload. (Hungary, teacher)*

> *…the school's iPads could not be used for GPS tracking as initially planned, because they are not equipped with SIM cards (required outside the school's WLAN. (Norway, case study report)*

## Skill development challenges

### Students

Some students struggled to master the **technical skills** required to participate fully in the Learning Activities. Although not identified as a main challenge by teachers responding to the survey, this was mentioned as an issue in 25 of the case studies. The technology was, therefore, an additional challenge, on top of the skills and knowledge they would normally have been expected to cover:

> *I had stress doing this with the iPad because it was very precise. And we often had to do it all over again. (Belgium, student)*

> *Other challenge was the age of the students (11 years) and their level of competency of the students, as it took a long time for them to learn how to create a blog. (Spain, case study report)*

> *First of all, it depends on how much you are into technology. The use of the technology is the biggest difference between normal lessons and iTEC lessons. If you are not familiar with technology, it can get pretty difficult and harder sometimes. (Austria, student)*

Common issues reported included skills in handling image and sound files, information gathering skills and blog writing, as well as organizational problems such as forgotten passwords.

**Time management** and allocation of work were other skills which some students found difficult to master. These were mentioned in six case studies:

> *Other problem at the beginning of the project was to organize the work and the responsibilities of each of them. (Spain, case study report)*

Many students struggled to appreciate the importance of planning, at least at the start of the project. They wanted to dive in and use the technology or try to create something without planning how they were doing to complete the task. One teacher described this concern in their multi-media story:

> *Motivating students for proper planning. Students were not used to plan things thoroughly. Some just wanted to do the game right away and some were simply just not motivated doing their tasks.*
> *(http://files.eun.org/itec/imms/Fin_TaruKoskinen.pdf)*

### Teachers

In addition to dealing with pedagogical changes, many **teachers needed to develop greater skills and confidence in using technology** in order to participate in the

project successfully. A lack of technical skills was identified as a barrier in 13 case studies:

> *Just the confidence of using technology and gadgets on a daily basis is a huge impact. We must not forget that teacher have a certain time pressure and this is a huge step. (Austria, ICT co-ordinator)*

> *The teacher is very insecure about using technology. The teacher said 'This is something I never did. […] I would like to do it more often but I am not sure I could do everything by myself.' (Belgium, case study report)*

Some were not even familiar with the many of the relatively common technologies used:

> *… I helped her [class teacher] to use it with their pupils. She hadn't use Dropbox before and I also supported her with the creation of blogs. (Spain, ICT co-ordinator)*

And even those with a stronger ICT background needed to learn to use new programs with confidence in order to support students.

> *I had to get familiar with Scratch and learned about it prior to implementing the Learning Story, but other than that, there were no technical challenges. (Austria, ICT co-ordinator)*

Key for teaching was being confident in using technologies and being able to deal with glitches so time was not wasted during lessons dealing with technical issues. Students were obviously aware of the issues some of their teachers faced:

> *…the learner response system. Apart from being useful, it was a lot of fun using it, too. But spontaneously using it in other lessons might be a problem, because most of our teachers are not used to using it on a daily basis. Those tries often end up in chaos, which is why most of our teachers go back to chalk and pencil. A lot of our teachers are reluctant to using it, often because of their principles, often because they do not know how to use it. (Austria, student)*

### Language skills

Finally, three teachers were critical of the fact that much of the project documentation and discussions were in English; **the language barrier** was a challenge for both them and their students:

> *On the website there was a place with examples of design documents, but they were all in English… for me it remained a little abstract… and when it came to explaining to my pupils, I found it a bit more difficult, and yet I really tried to do the design brief, but it was difficult… (France, teacher)*

## Pedagogical challenges

While in other categories, such as organizational barriers and technological barriers, issues such as time and internet access emerged clearly as important barriers, views as to the pedagogical barriers faced were more divided with a variety of issues being identified, but none emerging strongly as universal issues.

### Curriculum fit

In 14 schools, problems were reported because the Learning Stories **did not fit easily into the current curriculum**. Teachers were reluctant to undertake activities which were seen as, "*something extra they had to do on top of their curriculum*" (Belgium-ICT Coordinator interview), and even a few students expressed concern that they would fall behind if too much time was devoted to iTEC:

> *But we should go on with our English curriculum and learn. (Hungary, student)*

### Changing roles

As **the changing role of the teacher** was one of the most significant innovations mentioned, it is not surprising that this also presented one of the major challenges for some teachers (mentioned in nine case studies). Adapting to a more student-centred approach could be a challenge for teachers who were used to teacher-led pedagogies. This is evident from several of the case studies:

> *"You just need to let them do the things and trust them. You are going to be surprised what they come up with." (Austria, teacher)*

> *Some teachers find it difficult to let the students try for themselves. (Belgium, head teacher)*

> *To tell you the truth, I thought they would make a mess of it. But the games turned out to be really good. So, I'm surprised. (Estonia, teacher)*

One teacher described how, while they saw advantages in allowing students greater independence and freedom through the use of technologies, they were uncomfortable not being able to give direct feedback as they had been used to doing:

> *I found the use of blogs quite useful, because it is a place where they can exchange information and talk, and where they felt free to experiment their own way to express. At the same time I cannot directly correct if mistakes has been done. I couldn't really give direct feedback and corrections on what they have written, but at the same time they could have a place where they could write in English without me controlling so they probably felt freer than in class. (Italy, teacher)*

In an example of this dilemma from another school, the NPC notes that the teacher intervened to solve problems the students were experiencing, rather than guiding them to find their own solutions:

> *During the observation session, we noticed that it was the teacher who solved certain problems directly, such as choosing the keywords for a search, identifying the relevant image in a list of Google Images results, and taking photos of and transferring the images of the diagrams drawn by the pupils. (France, case study report)*

Of course, it is not just teachers who need to adapt to their new roles; students need to be supported in becoming more autonomous learners; In 11 case studies, there were examples which demonstrated that students were not used to taking responsibility for their own learning, so struggled to cope with this new pedagogy:

> *Students in Poland are not used to work individually, although group work and individual work, as well as method of project are well known and theoretically promoted, students are not self-reliant. (Poland, NPC)*

How best to provide this support is a further challenge for teachers unused to such an approach:

> *One of the challenges was from the teacher perspective to teach students to do peer evaluation and to learn to assume others evaluations and to learn how to use this evaluation to improve their learning. (Spain, case study report)*

## Group work challenges

Although working in a team was seen as one of the benefits of iTEC, it could also be a challenge for students as this was a new way of working for many:

> *Group work remains a challenge to work on, and to learn. (France, case study report)*

> *As M said, some classmates didn't work harder because of the others... and some of us work as a team, and others tried but... (Portugal, student)*

In the interview transcripts, four teachers and six student groups (from seven case study schools in all) commented on the difficulties of learning to work as a team, particularly ensuring all students contributed.

## Assessment challenges

A common assessment challenge teachers faced was in assessing work produced by a group of students. As working in teams was new to many teachers and student, both were concerned that grades given for work produced by a team would not adequately reflect the input of each individual. One teacher described how involving students in the assessment process could potentially be a solution to this dilemma:

> *Yes, evaluation is certainly a difficult thing, or rather, it is difficult to get students accept it, since this is teamwork. Accepting the evaluation of the teamwork is always harder, since in all cases there is someone who is not as dedicated, or not as diligent. So, students themselves are involved in the evaluation too, and actually, their opinion sometimes differs from mine. These two tasks have to be harmonized, and I need to improve here as well as my students. (Hungary, teacher)*

But as the above quote indicates, including elements of peer feedback could be a further challenge for teachers as they needed to ensure students understood how to give each other feedback effectively:

> *One of the challenges was from the teacher perspective to teach students to do peer evaluation and to learn to assume others evaluations and to learn how to use this evaluation to improve their learning. (Spain, case study report)*

The introduction of **design** in the learning stories for Cycle 3 was a further challenge for some teachers who were not familiar with this process. Three case study teachers commented on this and two NPCs indicated that they expected this to be a common concern for teachers in their country. In particular, the 'design brief' document was seen as a challenge because this was unfamiliar to teachers:

> *The two main difficulties for the teacher were understanding the 'design process' step as well as the 'design brief', and carrying out all the activities within the allotted time. (France, case study report)*

> *The teacher said that, at the beginning, she misunderstood the sense of this pilot […] My feeling is that this misconception was due to a lack of familiarity with the concepts of "product" and "design" by (Italian?) teachers in general. They are used to deal with 'contents' instead. (Italy, case study report)*

> *…the process of design is too far removed from most Norwegian teachers to be meaningful (at least in STEM subjects), so we put in elements of gaming (Norway, NPC questionnaire)*

## Attitudinal challenges

**Student attitudes towards technology and team working** were a challenge for some teachers (mentioned in five case studies). Like teachers, some students were resistant to change in their familiar teaching and learning practices. In particular, three of the student groups interviewed were resistant to the idea of working in teams other than friendship groups:

> *It's better to be in a team with your friends, with people you know and can trust. Otherwise you may never know who lets you down or does things at the last moment and says that he/she doesn't know how to do it. (Estonia, student)*

Also, while the majority of students appeared to enjoy using technology, a few preferred more traditional methods (mentioned in five case studies):

> *The teacher also mentioned the pupils' attitude to new technology as a challenge: The teacher said 'After a certain age pupils are less likely to be open to new technology, they prefer the use of the ones which have already proved to work well.' (Hungary, case study report)*

In addition, those who had not been used to using technology in the classroom previously tended to view technology as fun and recreational and did not equate it with learning:

> *Regarding the attainment of the students, teacher had to teach some students to focus the attention that the computer is for working as there were some students that when having the computer only think in listening to music and play (Spain, case study report)*

In six case studies, **a resistance to change among teachers**, particularly greater use of technology, was reported; this was usually noted by headteachers:

> *The head teacher realizes a certain resistance to innovation by many teachers. The head teacher said 'because the school is a homeostatic system. […] In my experience, the changes in school are always very slow'. (Italy, case study report)*

> *The headmaster sees the pilot as a component in his long-term strategy for introducing more technology-rich practice in his school. He stated that 'we have a group of teachers that are positive towards innovating practice, but we also have a group that are more sceptical to the relevance of technology. I work towards moving individual teachers from one camp to the other'. (Norway, case study report)*

> *It is not difficult to convince the 3 to 4 very IT minded teachers, we should convince the others. (Belgium, head teacher)*

So, although the teachers involved in iTEC were open to the incorporation of technology in their teaching, this might make the involvement of other teachers in the school a challenge.

# EQ5) To what extent was the piloting process effective and what were the challenges faced?

## Preparation, Training and Support

As already noted, five NPCs (HU, IS, SK, SMART, TR) allowed teachers a free choice of LS. Five NPCs (AT, FI, FR, LT, NO) offered teachers a choice of 2 or 3 LSs and two NPCs (BE, EE) selected a single LS to present to teachers. In one country (IT), teachers were encouraged to write their own LS using the learning activities as inspiration. Designing a Maths Game was the most popular LS, but not notably so.

In most cases, the NPCs had to localise the LSs and other resources by translating them into national languages. As they translated the materials, some NPCs (AT, ES, NO) made minor adaptations, such as shortening the LS or suggesting a wider range of software. In two instances (EE, LT), NPCs said they had adapted the Designing a Maths Game (DMG) LS to make it applicable across a range of subject areas. In two countries (IS, NO), NPCs made adjustments to ensure that the LS mapped onto the curriculum. The NPC in one country (BE) where a single LS was offered made significant adjustments to be certain that the LS was suitable for teachers to implement, including ensuring it was realistic, as simple as possible and included genuinely innovative elements. Where a free choice of LSs was offered to teachers, NPCs said that individual teachers could adapt the LS they chose as they saw fit.

Lessons learned in relation to LS selection reported by the NPCs included:

- Time is required to localise the LS, even if this is only translation. (HU, IS, SP)
- Those LSs which are easier for teachers to understand and fit more naturally in the existing curriculum tend to be more successful (IS, NO)
- Students respond well to being involved in the selection process. (AT)
- LSs benefit from being very open so that they can be applied to different topics and levels. (BE)
- If teachers are allowed to select their own LS, they are likely to need support in planning their own local adaptations. (LT)
- Involving teachers in the selection process is crucial to ensure success. (TK)

As in previous cycles, iTEC schools were recruited in a variety of ways, for example, by:

- Schools / teachers known to the NPC (from previous iTEC cycles or other projects) (BE, HU, IT, NO, SK, SP, TR)
- Presentations, workshops or other forms of communication about iTEC (eg blog posts) (AU, EE, NO)
- Suggestions from the Ministry of Education (or local representatives) (FR, IS)
- Colleagues of teachers who have previously participated in iTEC (NO)

- Direct calls for participation via websites etc. (LT, TK)

In a few countries (EE, LT), all volunteers were accepted, but the majority involved some form of selection by the NPC. When selecting case study schools, ten NPCs chose those schools which were most advanced in the project, or were deemed to be interesting examples (AT, BE, EE, FR, HU, IS, IT, LT, NO, SK) . Three (FI, SP, TR) asked for volunteers. Some also looked for teachers with appropriate skills, such as communication skills or multimedia writing skills. Another approach was to ensure the schools selected were diverse in factors such as location and type of school.

Success factors for the selection of teachers included:

- Involving the head teacher (FI, SK)
- Voluntary participation (ensures teachers and motivated and enthusiastic) (HU, TR)
- Involving several teachers in the same school, prompting changes in the whole school environment, rather than the practices of an individual teacher (IT)
- Involving teachers who have participated in previous cycles (ES)
- Involving the MoE and local education authority representatives (IS)
- Maintaining close contact with schools (HU)
- Ensuring teachers feel that they are part of a wider community of practice (HU)
- Checking teachers already possess basic levels of ICT competence and skills required (IT).

Challenges included:

- A lack of support from head teachers in some schools, which could jeopardise the long term sustainability of the approach (HU, IT, NO, SK)
- The lack of incentive/reward for schools and individual teachers (IS, NO, SK, TR)
- Ensuring all teachers have the necessary skills, especially those not previously known to the NPC (ES, IT, NO)
- Finding teachers to participate within a short timescale and with limited resources (FR)
- For countries involving large numbers of teachers in a previous cycle, reducing the number (to fit within budget constraints) (IT)
- The additional workload for teachers (IS)
- Staff absence and/or staff changes (NO).

Participating teachers were trained in various ways, but most were introduced to the project and resources (including iTEC technologies) through an initial face-to-face meeting or workshop. In one case, the initial training took place via a webinar rather than face-to-face. To maintain contact and provide further training and support throughout the project, NPCs used a variety of methods. Some held a second face-to-face workshop, but the majority made use of online tools, including email, blogs,

websites, webinars, videoconferencing, Skype and Moodle/dotLRN. Telephone contact and visits to schools were each mentioned by one NPC.

75% of teachers responding to the survey (n=334) indicated that they had received training and/or support from NPCs and/or NTCs prior to the implementation of the LS. The majority of teachers were satisfied with the training and support provided (Figure 18) with almost four out of five (n=252) agreeing that it was useful and introduced them to new digital tools.

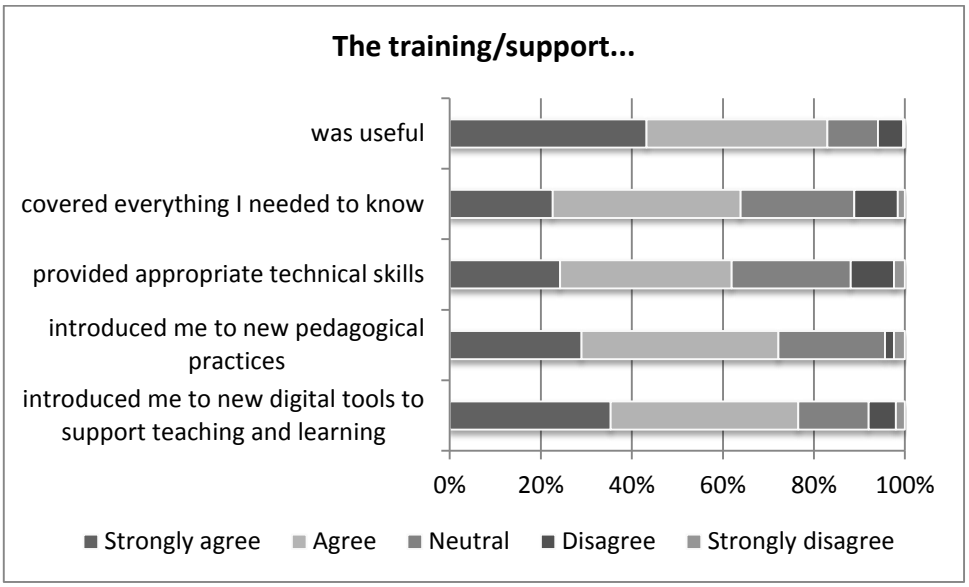



**Figure 18: Teachers perceptions of the training/support provided by their NPC/NTC**

The involvement of other stakeholders (eg head teachers, ICT co-ordinators, parents) in iTEC training was very limited. Five NPCs (AU, FI, HU, IT, NO) provided information about iTEC to head teachers (in one case through a schools network). Two (AU, FR) offered training to ICT co-ordinators and provided information for parents.

In Cycle 3 the iTEC Teacher Community was simplified further and integrated with the iTEC website. As in previous cycles about half the teachers found it easy to use ad useful, discovering new pedagogical practices and new digital tools. However, in Cycle 3 only 34% of the teachers responding to the survey indicated that they visited the website at least weekly (Table 19).

Some teachers experienced technical difficulties, and others struggled to communicate in English:

> *"I could not enter the iTEC Teacher Community. It gives error." (Turkey, teacher)*

> *"The forum wasn't user friendly" (Israel, teacher)*

*She didn't participate very much in the forums because of the language (English) (Spain, case study report)*

NPCs from six countries (BE, EE, FR, HU, LT, NO) mentioned national iTEC websites or online teacher communities as systems they had put in place to support, or communicate with, teachers or schools during Cycle 3. The function of these varied, with some being primarily information sources, while others functioned more as communities for teachers to share experiences.

One teacher commented that they would have been more likely to contribute if the community made use of a forum they already used, such as Facebook:

*The difference between Facebook and the community platform is that you login to Facebook every day for different purposes, so the information goes to you, while the platform is something that is not included in your daily routine and you have to remember to use it, to force yourself a little bit, that's why I think it's easier to use Facebook. (Spain, teacher)*

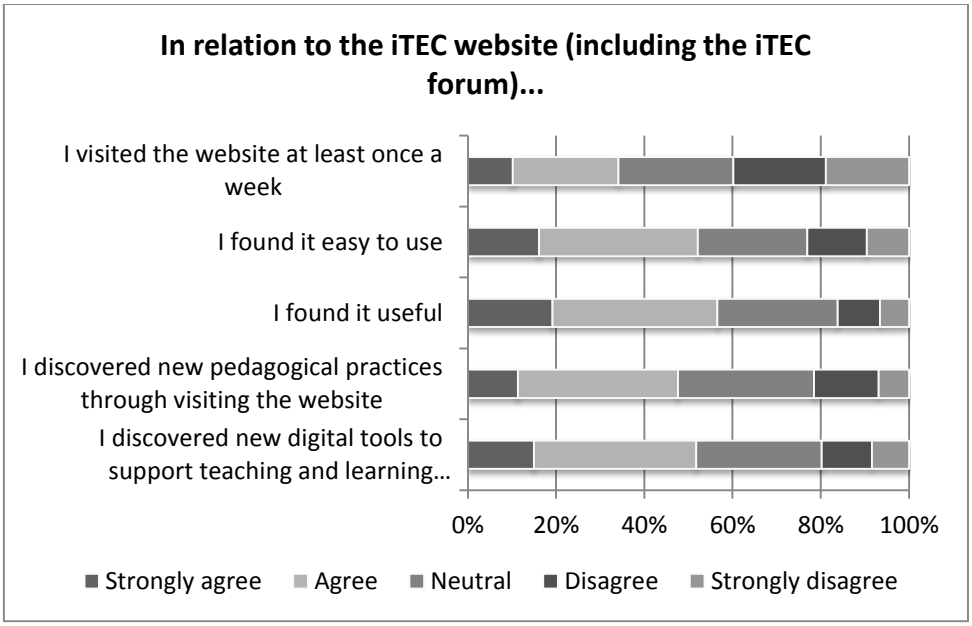



**Figure 19: Teacher perceptions of the iTEC website**

**Table 19: Teacher perceptions of the iTEC Teacher Community (C1 and C2) and the iTEC website (C3)**

| | Cycle 3 (n=334)<br><br>% of teachers agreeing | Cycle 2 (n=261)<br><br>% of teachers agreeing | Cycle 1 (n=67)[16]<br><br>% of teachers agreeing |
|---|---|---|---|
| I visited at least once a week | 34% | 44% | 52% |
| I found it easy to use | 52% | 52% | 60% |
| I found it useful | 57% | 57% | 66% |
| I discovered new pedagogical practices | 48% | 60% | 71% |
| I discovered new digital tools | 42% | 66% | 70% |

A range of success factors relating to preparation and training were noted by NPCs. No particular factors emerged as most important overall:

- Recruiting motivated teachers who are keen to try out new technologies and approaches (HU, IS, SK, TR)
- Teachers with previous experience of iTEC, or similar projects, may find the training easier (ES, NO)
- Face-to-face sessions which are valued by teachers (HU, IT)
- 
- Encouraging teachers to share their stories and experiences (ES, LT)
- The important of including practical examples (LT)
- Use of a national teacher community (in national language) to maintain contact (HU)
- Ensure teachers grasp the aims and approach of iTEC so they can get the most out of the training (IS)
- Having more than one teacher from a school involved means that teachers can support each other throughout the project (IS).

Challenges included:

- Lack of time to teach more advanced skills, eg programming, and to allow teachers time to practise (EE, ES)
- Maintaining contact with teachers after the initial workshop is a challenge as they have many other demands on their time (FR, HU)
- Finding ways to support those teachers unable to attend face-to-face workshops (FR, TR)
- Deciding which technologies to focus on in the training sessions (and the amount of time allocated to each) (HU)

[16] Due to an error in the online surveys for some participating countries only 67 of the 231 teachers participating in Cycle 1 were presented with this question.

- Convincing teachers of the importance of attending the face-to-face workshops (FI)
- Encouraging teachers to ask for help if they need it (FR)
- Technical problems (eg registering with Teacher Community, using iTEC tools) (SK).

## Future iTEC Pilots

Improvements suggested in relation to Learning Story selection and localisation included:

- Make sure all LSs are open and flexible enough to be relevant to all teachers
- Include MoE and teacher representatives to ensure LSs can be used within the existing curriculum
- Include LSs which can be implemented over short timescales to allow teachers who do not have as much time available to take part.

Improvements suggested in relation to school and teacher selection included:

- Encourage teachers to promote their iTEC activities within their own schools to engage other teachers
- Provide rewards and / or recognition for iTEC teachers
- Make better use of school-based iTEC co-ordinators to support teachers
- Ensure teachers have sufficient ICT skills to engage in the project successfully
- Make sure teachers are aware what they are committing to when they become involved in the project
- Provide support for NPCs to ensure the project has the backing of the head teacher (eg a form or procedural document)
- Allow more time to recruit and select teachers.

Improvements suggested in relation to preparation and training included:

- More time to prepare and deliver training by making LSs, Activities and technologies available to NPCs earlier
- Preparing more detailed instructions for teachers
- Provide training for head teachers
- Increase the initial training to 3 days to allow teachers time to practice and experiment with new tools
- Improve follow up with individual teachers after the initial training.

# Next steps for WP5

**More evidence needs to be gathered from teachers on what they find innovative (the pedagogy, the technology, how the technology facilitates the pedagogy).** The teacher interview schedule will be revised to focus more explicitly on what teachers feel is innovative about the iTEC resources. The teacher survey will be revised to include questions focusing specifically on what they found most innovative and how different the implementation was in relation to their previous practice.

**More evidence needs to be gathered from teachers on the impact of iTEC processes and resources on learning outcomes and attainment.** The teacher interview schedule will be revised to elicit more detailed information about perceived impact on learning outcomes. The teacher survey will be revised to include questions on impact on a range of 21st century skills and an open ended question to elicit examples of how the implementation impacted on learning outcomes and attainment.

**The innovation matrix (developed by WP2) needs to inform data analysis from Cycle 4.** Case studies will be analysed using the innovation matrix and radar diagrams produced enabling comparison of implementation with the original scenario. The innovation matrix will be used to identify radical innovation in the case study data.

**The forthcoming Scenario Development Toolkit and Learning Activity Development Toolkit require systematic evaluation.** The toolkits will be evaluated through observation at workshops, focus groups with NPCs and the collection of data from teachers who have engaged in the process (a short email survey).

**More evidence needs to be gathered at a national level in relation to scaling up iTEC processes and the use of iTEC resources.** National case studies will be undertaken through interviews with the NPC, an MoE representative and a high level decision maker (preferably a policy maker) to explore their perceptions of the evaluation evidence, what (if any) actions have been taken to date with regards to scaling up and what needs to be in place to roll out the iTEC process.

**More evidence needs to be gathered on the use of iTEC technologies such as the widget store and the composer.** The teacher survey will be revised to include questions on the widget store, widgets and reflex. NPCs will be asked to conduct a focus group with teachers at the end of each cycle to discuss the potential of the iTEC technologies for innovation in learning and teaching.

# Conclusions and recommendations

As in previous cycles, most teachers found the iTEC resources to be a source of inspiration and felt that participation in the project led to innovation at some level. The iTEC resources were perceived to be beneficial, leading to new pedagogical practices supported through technology. Teachers reported using a wide variety of digital tools to support the activities, including some that they had not used previously. It is difficult to make comparisons between countries due to small numbers of teachers participating in some countries but where possible differences are described.

There were five evaluation questions in Cycle 3, assessing the extent to which iTEC Learning Stories and technologies **benefited teaching and learning** and **were sustainable and scalable** and **fit for purpose,** assessing the **barriers and enablers to implementation,** and evaluating the **piloting process** itself.

The main conclusions are as follows:

1. To what extent do the iTEC Learning Stories and relevant iTEC technologies benefit learning and teaching?
    a. There was a positive impact on learning outcomes: student attainment, motivation and 21st century skills (including digital literacy, creativity, autonomy, group working, communication, presentation and design skills).
    b. There was a positive impact on teacher competences, attitudes and motivation.
    c. The iTEC resources were perceived to inspire an innovative approach to learning and to have potential to lead to innovation in the classroom on a wider scale.
    d. There was an increase in the effective use of technology in the classroom.
    e. 60% of teachers said that they used digital tools that they had not used before.
    f. The iTEC resources led to changes in pedagogy enabled through the technology including increased collaboration, and greater student autonomy.
2. To what extent are the iTEC Learning Stories and iTEC technologies sustainable, transferable and scalable?
    a. There is some evidence that participating teachers will continue to use the iTEC resources in the future.
    b. There is some limited evidence of bottom-up spread of ideas through case study teachers sharing their experiences and iTEC resources with colleagues and others.
3. To what extent are the Learning Stories and iTEC technologies fit for purpose?
    a. The Learning Stories and Learning Activities are considered to be fit for purpose.

   b. The teachers who used a recommended iTEC learning environment felt that it was usable and offered some benefits in relation to supporting learning and teaching.
   c. The concept of TeamUp for forming groups and recording reflections is considered to be beneficial.

4. What are the enablers of and barriers to adoption of iTEC Learning Stories and iTEC technologies?
   a. The enablers seen to be most important were:
      i. A positive student attitude (27%)
      ii. Support of other teachers (16%)
      iii. A positive teacher attitude (12%)
      iv. The Learning Stories and Learning Activities (9%)
      v. Support of the head teacher (9%)
   b. The barriers/challenges seen to be most important were:
      i. Finding time to prepare and implement the iTEC LAs (52%)
      ii. Unreliable internet access (17%)
      iii. A negative student attitude (14%)
      iv. Insufficient access to technology (11%)
      v. Technical problems with TeamUp (10%)
      vi. Difficulties facilitating group work (6%)
5. To what extent was the piloting process effective and what were the challenges faced?
   a. NPCs found it easy to select and localise iTEC resources.
   b. Recruitment of teachers for piloting exceeded expectations.
   c. Teachers were satisfied with the training and support provided through the project.

A number of recommendations arise from the findings reported in this report.

## Scenario development (WP 2)

1. MoEs in iTEC should:
   a. Develop – with teachers and students and other stakeholders – more open-ended scenarios and Learning Activities which can be adopted across a wide range of subject areas and which meet national needs.
   b. Offer teachers innovative ideas which can be applied using commonplace technologies (including some that are not reliant on networking capabilities) and low-tech resources, alongside the more pioneering and disruptive ideas.
   c. Make materials produced (scenarios, Learning Activity) accessible for teachers through different media formats (text, video, podcast etc).

## Learning Activity development (WP 3)

2. Aalto should provide detailed guidance on known TeamUp problems (with outdated browsers for example) and how to install it on a local server.

## Piloting (WP 4)

3. WP4 partners should:
    c. Support MoEs and NPCs to include Initial Teacher Education providers/trainees in a pilot for C5;
    d. Consider alternative (additional) platforms to the iTEC website/forum.

## Scaling up (WP 11)

4. At European level, WP11 partners should:
    b. Work with other partners to document visually the iTEC process to facilitate scaling-up. Simple visualisations and videos of the process and links to more detailed explanations of aspects of the process would enable teachers to develop an understanding of the iTEC approach.

5. At national level, iTEC MoEs should:
    i. Analyse WP4 data in relation to website visitors (unique visits, by country) to determine the reach of iTEC beyond project participants.
    j. Scale up the iTEC process to national level. Evaluation of the iTEC process has shown that it can lead to change and innovation classrooms and that teachers have been enthusiastic and inspired.
    k. Ensure that national support structures are in place to maximise the benefits offered through iTEC processes and resources. Around one third of teachers needed support to adapt the resources to meet their needs.
    l. Nominate and support teachers who have been involved in several cycles as iTEC ambassadors sharing their experiences and supporting other teachers, thus ensuring the approach spreads in their own school and other schools.
    m. Facilitate national dissemination and events, led by iTEC ambassadors
    n. Encourage the development of national and local online communities as they support the uptake of iTEC processes and resources. Local communities of practice provide opportunities for local support and dissemination of practices. This is more likely to happen when there are several teachers from a single school (or cluster of schools) engaged in scenario implementation.

o. Consider offering national teacher incentives, including release from classroom teaching, supporting training and opportunities for accreditation. Time is the biggest barrier for 50% of teachers; teachers need to be rewarded for their investment.
p. Translate iTEC case studies disseminate them widely through national online communities and CPD networks to maximise reach.

Finally, in order to support scaling–up, investment may be required at national level in order to address all or some of the following barriers identified in iTEC pilots:

8. Infrastructure and technical support:
    a. Invest in the development of ICT infrastructure including the provision of reliable and sufficient access to the internet
    b. Prioritise the provision of ICT technical support and ICT pedagogical support within schools (or across clusters of schools);
    c. Review national/regional/local school ICT policies to encourage the use of student-owned devices (BYOD) in school contexts;

9. Teacher competence development:
    a. Develop national/regional/local pre- and in-service programmes to increase teachers' ICT technical and pedagogical skills. Provide training/guidance for teachers on: managing group working, supporting students' reflection and peer feedback, and supporting students in online environments.
    b. Produce national resources to facilitate the development of teachers' ICT skills (guides, screencasts, video tutorials, online helpdesks);
    c. Create opportunities for teachers to meet in face-to-face settings (the inclusion of dissemination/training activities in national teacher conferences through presentations/workshops for example);
    d. Foster positive teacher and student attitudes to change and the use of technology to support teaching and learning, and develop strategies to engage head teachers and senior managers;
    e. Liaise with other projects that are similar in mission in order to seek mutual benefit and enhancement of impact.

The above recommendations support those made by the iTEC Higher Level Group in October 2012 (Dykes & Ayre, 2012):

- The development of a review framework would ensure that appropriate actions are prioritised to maximise the impact at school level of any MoE investment in infrastructure, technical support and teacher competence development (see for example recommendations 6 and 7).

- A review of initial teacher training programmes would ensure that teachers develop appropriate technical and pedagogical competences, enabling them to adopt and adapt iTEC resources (see for example recommendation 7a).
- Develop a community of iTEC ambassadors to stimulate uptake of iTEC resources and participate in national events promoting the benefits of iTEC as part of a blueprint for mainstreaming (see for example recommendations 5d and 5e).

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## Appendix A: Case Study Stories

# Case Study Story: Austria

**THE LEARNING STORY:** Designing Maths Games (DMG)

**THE TEACHER**

The teacher is the ICT co-ordinator at the school. He is relatively new to iTEC, but the school is considered to be one of the most innovative in Austria and has a strong focus on e-learning. In the teacher's view, the technical aspects of a project such as iTEC are fairly straightforward in a school such as this. However, the introduction of new pedagogies presents a much greater challenge for teachers.

**THE CLASS**

**Age of students:** 8th grade (13-14 years) (who produced games for 9-10 year olds)
**Number in class:** 12 students

**THE LESSON/S**

**The subject:** ICT/Computer studies
**Aims/Objectives:**
-To design a maths game for primary school students.
-To program the game using Scratch
**Over what period of time** 16 lessons over 2 months
**Location of lessons?** In the classroom, in the computer lab and outside the school outside normal school hours

**RESOURCES**

**iTEC:**
**Other technology/software:**

| | | | |
|---|---|---|---|
| Desktop computer | Laptops | Digital media tools | Collaboration tools |
| Dropbox | Scratch | Corkboard | Virtual experiments/simulations |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Use of new learning spaces | Constructivist pedagogies | Effective use of digital tools |
| Social/collaborative learning | Creativity | Expressiveness |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

The teacher divided the class of 12 students into groups of three. Each group was tasked with developing a maths games for primary school students, using the programming language Scratch. The end result of the process was to be a number of maths games for third grade students at the local primary school.

A key aspect of the activity was creating something which has an actual use outside the school. In this task, the students faced a technical challenge in developing their programming skills, as well as a pedagogical and design one, namely, ensuring the games they created were suitable, in terms of interest, topics and ability levels, for primary school students.

**Developing technical skills**

The project started in November, when the teacher presented his students a Scratch tutorial which they worked on individually to acquire the skills needed for the task.

**Developing a game**

Following this, the students were divided into groups of 4 according to their personal strengths; this meant that more creative students were mixed with those skilled at programming. The next step was to gather ideas and design a game in theory. Students used a program called Corkboard to help them to develop a concept; this tool allowed students to write and share ideas simultaneously. They also searched the web for existing maths games suited for primary schools, with those students with more developed programming skills looking at the programming codes and screening each program. Files were shared among the group using a Dropbox folder.

As the groups worked, the teacher rarely intervened, allowing the students to be creative and to explore for themselves. Student were allowed to walk around the classroom and help each other. The teacher's role was one of a coach, supporting the students whenever necessary, but at the same time allowing them to design and produce their own product.

An important element was the healthy level of competitiveness between the student groups which was observed during the lesson; this gave the groups impetus, while still maintaining a co-operative atmosphere in the classroom.

**TEACHER'S COMMENTS (+/-)**

**On student motivation and behaviour**: "This class is usually louder and unfocussed because they are that good. Giving them something real to work on really increases their motivation and concentration"

**On changes to pedagogy:** "Being a teacher since 1988, iTEC gave me some ideas to take new approaches in my pedagogy. It did not change it, but it broadened it quite a bit and after 20 years in school, you, as a teacher, are tired of telling the same stories over and over again."

**MAIN ENABLERS?**

**School infrastructure**: Teacher opinion: "Being blessed with this kind of infrastructure and being used to having it, the implementation enabler was the existing IT infrastructure in our school".

**Supportive classroom atmosphere:** The level of co-operation in the classroom was highlighted by the NPC who felt it was relatively unusual to observe such a "good social climate".

**STUDENTS' COMMENTS (+/-)**

The students felt that creating something which had a real use outside the school increased their motivation. They cared deeply about getting every detail of the game they were creating right as they wanted it to be appropriate for the target audience of primary pupils. However, this way of working was not particularly new for students in this school; they were used to innovative approaches: "We normally work that way in school. Our teachers try very hard not to stand in front of the class and act like experts. We do not like when knowledge is just thrown at us and we have to learn it and deal with it. In a lot of our classes we need to actively research and discover the knowledge."

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Student attitudes**: According to the teacher, the class is normally quite loud and sometimes the students are not as motivated and concentrated as they should be, but the introduction

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| of the iTEC learning story led to a noticeable change in their attitudes. The teacher believes that this is partly because they needed to create something real.<br>**Role of the teacher:** The changed pedagogical setting is something the teacher has to become familiar with, especially the notion of allowing students the freedom to explore and develop their own individual approach. "You just need to let them do the things and trust them. You are going to be surprised what they come up with." |
| **LINKS:** Examples of students' games: http://scratch.mit.edu/galleries/view/189005 |

# Case Study Story: Belgium

**THE LEARNING STORY:** Other: Visiting the Doctor

**THE TEACHER**: The use of more innovative approaches to teaching were relatively new to this teacher. She was keen to use technologies in the classroom, but uncertain as to how well it would work.

**THE CLASS**
**Age of students:** 14-16 years
**Number in class:** 13 students

**THE LESSON/S**
**The subject:** Foreign languages (French)
**Aims/Objectives:**
-To complete and correct a dialogue about visiting the doctor in French.
-To learn and perform a dialogue
-To record a dialogue and assemble a video
-To develop skills in using iMovie and iPads
-To evaluate the movies produced by other groups constructively.
**Over what period of time?** 4 hours over 2 weeks
**Location of lessons?** In the classroom and adjacent corridor

**RESOURCES**
**iTEC:**
**Other technology/software:**

| | | | |
|---|---|---|---|
| iPads | iMovie | Blogs | Virtual Learning Environment |

**This case study provides evidence of:**

| | | |
|---|---|---|
| New assessment procedures | Constructivist pedagogies | Creativity |
| Effective use of digital tools | Expressiveness | Social/collaborative learning |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

**Introduction to iMovie**

The first lesson was devoted to students learning how to assemble movies and pictures in iMovie, following a 'quick start' guide.

**Listening activity**

During the second lesson, students watched a film posted on the VLE by their teacher, filled in the gaps in the dialogue and corrected errors. They then planned, as a group, how they would organize the filming of their corrected version for the next lesson. When selecting the groups, the teacher had deliberately mixed stronger and weaker students.

**Speaking activity**
In the next two lessons, students practised acting out their dialogue before filming their final versions. They then assembled the movies and wrote a correct version of the dialogue. Finally, they watched and evaluated the films created by the other groups in the class.

**TEACHER'S COMMENTS (+/-)**
**On improved student motivation**: "I did not think I would accomplish a lot with them in but the way they practised speaking French today is really good…They are often hard to motivate. If you do this with the whole class and make some traditional exercises, they experience it as boring…Doing this in a more creative fashion, I notice that they learn a lot, that they speak and do more."
**On student attainment**: "I believe the final result will be better, than if I would have let every student do it in front of the whole class…I really believe so."
**Overall comments**: The teacher was initially apprehensive, but the success of the activity exceeded her expectations, "It was pretty successful. I believe that I will do this more often…I was shocked it went so well. And you notice that they really want to do well."

**MAIN ENABLERS?**
**Technical support available in the school:** The ICT Co-ordinator is actively involved in supporting iTEC teachers in this school. He provides training and one-to-one support and motivation for teachers and tries to "lower the bar" to make it as easy as possible for more teachers to become involved.
**Support of the headteacher:** The headteacher is actively involved, supportive of teachers using technology in the classroom, and is keen for the innovation to continue in a self-sustaining way beyond iTEC: "That is what we want to do. We want to develop projects of our own and stimulate them so that there is a more support in our school."
**School ethos**: The ethos of the school is to focus on technology for learning, not just teaching, "not toys for teachers, but toys for the students to learn" (ICT Co-ordinator). An example of this is in the use of iPads by students rather than IWBs by teachers.

**STUDENTS' COMMENTS (+/-)**

**On the benefits of using technology to practise dialogues**: "When you read a dialogue in a traditional lesson then it does not go that easy, but with the iPad you can try more often and the teacher can correct you more so you learn better."

**On improved motivation and outcomes:** "My French is not very good, I cannot read and speak it that well. But in this course it went better because I was being filmed. I wanted to do it really well."

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**
**Use of technology:** The key difference in this class was the use of technology and its impact on the way in which students approached learning. Although the teacher often asked students to do a similar exercise, the use of technology made a noticeable difference to the way they approached it. They were less afraid to make mistakes and more willing to attempt the dialogue because they knew they could redo it as often as necessary: "Students who are less sure of themselves speaking, dare to speak more because they can start over. This

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| way there is no problem making errors…Because they can correct it afterwards.” |
| **LINKS:**<br>Student videos:<br>http://www.youtube.com/watch?v=aK8xnh_ejfE&feature=youtu.be<br>http://www.youtube.com/watch?v=-9XJfqUYjC8&feature=youtu.be |

# Case Study Story: Estonia

| |
|---|
| **THE LEARNING STORY:** Designing a Maths Game (DMG) |
| **THE TEACHER** The teacher has been involved in iTEC through all of the first three cycles, but using technology is a challenge in this school as there is limited access to the computer suite and students do not have ICT lessons. |
| **THE CLASS**<br>**Age of students:** Form 8 (14-15 years)<br>**Number in class:** 16 |
| **THE LESSON/S**<br>**The subject:** Maths<br>**Aims/Objectives:**<br>-To design a maths game (board or computer game)<br>-To evaluate the games designed by other students.<br>**Over what period of time?** 3 lessons<br>**Location of lessons?** Classroom |
| **RESOURCES**<br>**iTEC:**<br>**Other technology/software:** None |
| **This case study provides evidence of:**<br>Constructivist pedagogies Creativity Social/collaborative learning Expressiveness |
| **WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**<br>In the first lesson, students were introduced to the project and told they could choose whether to make a computer game or a board game. As there is only one computer lab at the school and students do not have ICT lessons, it was difficult for them to make a computer game, although one student managed to do so.<br>Students were divided into groups and asked to come up with ideas for a game. The groups were selected simply by drawing lots. Once the groups had agreed on an idea, they prepared a draft version to present to the rest of class for feedback. They then worked on a final version of the game and, at the end of the project, the class had an opportunity to play each other's games. |
| **TEACHER'S COMMENTS (+/-)**<br>**On the positive reaction from students**: "Just now, form 8 came to see me to tell me that they would like to take part in the next scenario as well."<br>**On changes to learning activities**: "I don't think I would have started making games without this scenario. At the same time, I got very positive feedback and I'm surprised by the results." |
| **MAIN ENABLERS?**<br>**Curriculum fit:** The activity fitted well within the existing curriculum: "…all the topics in the games can be found in the curriculum" (Teacher)<br>**Enthusiasm of the teacher**: The commitment and interest of the teacher was essential and this has been recognised more widely: "The every year the Ministry of Education asks |

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| schools to submit candidates for various awards and we put forward [name of teacher] as the Innovative Teacher of the Year, which she also received because of the ITEC project." (Headteacher) |
| **STUDENTS' COMMENTS (+/-)**<br>Students saw the activity as fun and interesting: "…because it's exciting", "We should use it more often", "It makes lessons more interesting." |
| **KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**<br>Although this case study made very limited use of technology, the students felt that the overall approach was very different from the types of lessons they were used to, "Usually we take notes in our exercise books and then do exercises in the workbook." In particular, presenting their work to each other and receiving feedback was something novel, "Usually we don't present our projects, which we have done at home, in front of the class. We have presented our homework this way only in maths lessons." |
| **LINKS:**<br>Project blog: http://iteceesti.wordpress.com/ |

# Case Study Story: France

**THE LEARNING STORY:** Designing a Physics Simulation (DPS)

**THE TEACHER** This physics teacher is also the 'digital supervisor' for the school.

**THE CLASS**
**Age of students:** 14-15 years
**Number in class:** 18 students

**THE LESSON/S**
**The subject:** Physics
**Aims/Objectives:**

- To produce a design for a charger that uses a renewable energy source (except solar energy in order to use the principle of an alternator)
- To investigate renewable energies (definition, examples)
- To understand the principle of an alternator
- To distinguish the different types of voltage (direct/variable/alternating)

**Over what period of time?** 1 or 2 hours a week from 30th Nov to 11th Jan
**Location of lessons?** Computer room and homework

**RESOURCES**
**iTEC:**
**Other technology/software:**

| | | |
|---|---|---|
| PCs with internet access | Bicycle alternator | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Constructivist pedagogies | Individualisation | Collaborative learning |
| Engagement with parents | Engagement with students from other schools | Creativity |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

The teacher creative some activity sheets, with specific instructions for the pupils. The initial design brief proved to be quite abstract for the teacher and for his pupils, so these sheets picked up the core idea of the design brief, but expressed it in the form of "step-by-step" questions, so that the pupils could better understand what they had to do.

The task was divided into 5 "workshops". Each one corresponded to one of the iTEC activities.

Students worked in groups of between 2 and 4. First, they searched for examples of renewable energy chargers on the Internet. They then chose a type of energy for their charger, tested out the principle of electricity production, looked at how an alternator works and at the distinction between direct and alternating voltage. They then presented their work to friends from other schools or parents, and drew up a sketch of the charger they would like to construct and finalised their design

Throughout the task, they recorded their progress on a blog and saved their work to the school's digital workspace.

**TEACHER'S COMMENTS (+/-)**

**On why the project was engaging for students:** "It's a type of work that I had never done… by project, which lasts over several sessions, is longer and incorporates more ideas… it sparked the pupils' interest… in particular the topic about the mobile telephones… and to see everything that already exists in terms of technological items, to do an observation… that was the aim of the comparative workshop"

**On problems experienced in blogging due to a lack of student skills**: "I gave them the task of setting up the blogs at home. As far as I was concerned, it would be quite straightforward, but only one group out of the six managed it… some used an email account inbox that was full, for others the password didn't work… I took a 2hr session with them and we created the blogs slowly but the work progressed in a very uneven way from one group to another and in the end this had a knock-on effect on the activities".

**MAIN ENABLERS?**

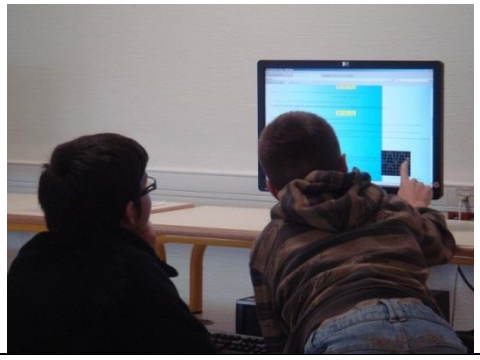
**Thorough preparation:** The teacher prepared the details of his teaching sequence in advance, including written instructions for creating blogs, a description of each workshop and demonstrations using objects (alternator, shock charger etc.) to help his pupils understand how a renewable energy charger works.

**Teacher's ICT skills**: The teacher is "digital supervisor" in his school, so he has good ICT skills and advises and supports his colleagues in this domain.

**STUDENTS' COMMENTS (+/-)**

**On reasons for engagement:** "It makes you want to get more involved because it's different from usual lessons; it's another way of looking at physics"

**On the practical nature of the task**: "It enables us to put things into practice, because when we're in the lesson we don't do that at all"



**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Using technology for an extended project**: The school has only 4 computer rooms and no wifi, so activities which require a class to have regular use of the technology are unusual. Working on a design project: The design brief and design process were new concepts for both the teacher and students, so both needed to work to understand what these meant in more concrete terms which could be applied in the classroom.

**LINKS:**

Multimedia story: http://files.eun.org/itec/imms/C3_FR_RB.pdf

Students' work and supporting documents: http://projet-cer-3pst3.overblog.com/

# Case Study Story: Israel

**THE LEARNING STORY:** Designing a Physics Simulation

**THE TEACHER** This teacher is particularly interested in working with gifted children

**THE CLASS**
**Age of students:** 5th and 6th grade(10-12 years)

**THE LESSON/S**
**The subject:** Science & Technology
**Aims/Objectives:**

- Developing skills and in the context of collaborative network learning.
- Experience in using online resources for a deeper familiarity with the study material
- Providing means for using network tools (as a user and as a designer) which support learning.
- Becoming familiar with web tags, in the context of preparing the product to search –related situations.
- Explicit teaching of thinking processes: focusing on aspects of creative thinking involved in the processes of searching for information and using search keywords.
- Developing a higher order of thinking through planning and design process in the context of the learning material
- Developing a higher order of thinking in the context of ICT literacy.

**RESOURCES**
**iTEC:** iTEC community forum
**Other technology/software:** Moodle/Haifa Net, SIXQS scenario generator

**This case study provides evidence of:**
Collaborative learning Constructivist pedagogies Creativity
Effective use of digital tools Individualisation

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**
Fifth graders prepared activities on the topic of Metals, while sixth graders prepared activities on the topic of Energy. Both groups created activities which were posted on the gallery of the scenarios generator application, sixqs.com, in both Hebrew and English versions.

**TEACHER'S COMMENTS (+/-)**
**On reflection:** "The reflective activity gave me the opportunity for contemplation on teaching methods for gifted students…this introduction was a very beneficial infrastructure."
**On connecting with other teachers**: "The concept and the activity of preparing a learning story inspired me to connect with online communities of teachers who are engaged in optimal pedagogy."
**On using new tools and techniques:** "Preparing projects linked to learning stories has encouraged me to use a variety of tools both from the field of ICT and from the field of pedagogy."
"My experience with the idea of learning stories, has led me to a place in teaching which is

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| new for me.” |
| **MAIN ENABLERS?**<br>Enthusiasm of the teacher and commitment to developing innovation and new approaches through iTEC. |
| **STUDENTS’ COMMENTS (+/-)**<br>**On ICT and teamworking:** “I think our work on a computer with connectivity, made it very easy on us and we were able to communicate very well. It was worthwhile to work as a team because working alone might have been more difficult. As a team, we were able to consult and study together."<br>**On authentic learning activities:** "It's very nice to know that what you do affects someone in the world. But then again, it's a bit stressful and confusing to know that someone is going to use what you've created, and it also makes you want to improve it." |
| **KEY INNOVATION/S … WHAT’S NEW/DIFFERENT OVERALL?**<br>**Students’ work gains a wider audience**: "We have uploaded, for other people, stuff from which they can learn, and I think this way is very interesting and unique." (Student) |
| **LINKS:**<br>SIXQS: Metals<br>SIXQS: Mining<br>SIXQS: Goldrush<br>SIXQS: Measures units task<br>SIXQS: 6th grade science mission<br>SIXQS: Discoveries in radioactivity<br>SIXQS: Energy and technology |

# Case Study Story: Italy

**THE LEARNING STORY:** Benchmark and Design package of LAs

**THE TEACHER**

A Maths and Science teacher who had been involved in previous iTEC cycles along with this class of students. She had never before dealt with the concept of "prototypes" in her teaching and she felt that it would have been useful to have role-played the part of the student as a kind of rehearsal before launching into the topic with her own students.

**THE CLASS**

**Age of students:** 12yrs - 13yrs **Number in class:** 28 (14 boys and 14 girls)

**THE LESSON/S**

**The subject:** Earth Science: volcanoes (the school's curriculum topic at the time the class was engaged in iTEC Cycle 3)

**Aims/Objectives:**

- To design and produce a prototype of a "learning object"; a product that, in its use, conveys knowledge and skills related to certain aspects of the subject matter, ie in this case, volcanoes
- To collaborate and work in teams
- To communicate and present prototypes

**Over what period of time?** 2hrs/week over 6 weeks "plus many hours of homework!" (Teacher) **Location of lessons?** In the classroom and also outside school outside normal school hours

**RESOURCES**

**iTEC:** TeamUp

**Other technology/software:**

Desktop computer Laptops Telephone Learner response device

YouTube Unity 3D Prezzi Hot Potatoes

Facebook (closed) eMail Thinglink Interactive Whiteboard

**This case study provides evidence of:**

New assessment procedures Constructivist pedagogies Creativity

Effective use of digital tools Expressiveness Engagement with parents

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

The study of volcanoes is covered within the curriculum in this school, as the town where it resides is very close to the slopes of Mount Vesuvius. The class was introduced to the topic and to the iTEC C3 "Benchmark and Design" brief. Students described themselves through the mental notes of TeamUp and 7 groups were formed. Each group had access to a computer. The first homework for each group was to create its own identity and Blog. Subsequently, the students were briefed about the project and how it focused on "process" and "designing a prototype" rather than on content. The groups defined their own group's

design brief, each coming up with different proposals but with a common thread: playing games to cover the topic.

**Contextual Inquiry and Benchmarking**

During this phase, the groups concentrated on research using the web. The groups' proposals attracted a huge amount of interest within the class. Debates and proposal comparisons were dealt with via telephone, email and Facebook (closed group) and there was a considerable amount of discussion about how best to use their Blogs and Facebook to best effect within the project. Many proposals became better defined and some briefs were changed as a result of shared debates.

**Product Design**

In order to plan their prototypes, groups were required to discuss their plan and to consider what tools would be necessary to accomplish their task. They developed strategies to carry out their plans and were encouraged to consider anomalies, potential errors, advantages and disadvantages of their designs. The teacher felt that these aspects of "Product Design" affected not only the learning process positively, but also the overall motivation to learn. However, the time factor was underestimated and it was necessary to have some extra classes that had to be undertaken beyond the school time.The groups produced prototypes such as: a crossword puzzle (on volcanoes) produced with the software "Hot Potatoes", a quiz to do through IWB responders, a physical interactive model (made with traditional materials), a videogame (made with Unity 3D software), etc.

**Participatory Design Workshops (PDWs)**

For the PDW, the groups invited students from other sections of the school to judge their prototypes. The chosen setting for the PDW was clearly inspired by TV formats such "Italia's Got Talent", with a desk of 5 student judges (the assessors) in front of the 'contenders' (those being assessed). The "jury" either had to watch a prototype presentation, or to test a prototype in order to come up with a "verdict" (an assessment) and provide feedback.

**1. Group presentation of a prototype**

As noted by the teacher and the students, the jury provided real, effective, "harsh but well-argued" feedback. Some judges focused on the poor presentation skills of a team ("We would have better understood the product if you'd have better communicated!"), others on the quality of the products.

**2. Team members observing the jury while testing its prototype (a crossword puzzle)**

The crossword on volcanoes (one of the prototypes) was liked a lot by the jury who said it presented "the right degree of difficulty." Students from the various groups found that "the most successful prototypes have been those that could be directly tested", not the ones that were only presented to the jury. Students also noted that, the jury was "more favourable with the most difficult to use prototypes"

One of the prototypes, a videogame on Unity volcanoes created by a student with 3D (a not-so-easy-to-use software for a thirteen year old boy!) was strongly criticized because it was perceived as being "too slow" and "poor fun." Conscious of having done something very difficult (technical game development), the boy was very hurt by this review. However, he subsequently realized that the criticisms were constructive and that "he could build on them".

For one of the earlier PDWs, the class played host to an external expert; an eminent geologist who shared her thoughts and ideas with the groups about their prototypes. The students felt very privileged to have the advice of an expert.

Another early PDW had taken place with the Head Teacher, other teachers and some parents. The students and teacher noted the different kinds of feedback received from these various participants and it was agreed that the student jury were the most "critical but effective".

**TEACHER COMMENTS (+/-)**

Facebook: "This school would not allow the use of Facebook, but we knew that ALL the kids … have a FB account. The risk of using FB in this LS was that… maybe kids would have ended up using it for non-school things … as the teacher, you need to check it. But there's a way to prevent it: you must give clear tasks, clear deadlines. Above all, it must change the way the teacher behaves in the classroom!"

About her teaching style during the LS implementation, the teacher said she “wanted to be a faded presence". She believed in her students’ autonomy and intervened only when absolutely necessary.

One of the main issues for the teacher was to organize the classroom for group work: "you have to the reorganize the students’ desks, and often the janitors don't like it. Spaces are what they are … “

**MAIN ENABLERS?**

**Head Teacher support:** (1) allowing the teacher to change lesson schedules and move pc's around school. (2) HT opinion: “I consider the teachers’ participation in this kind of initiative - and the subsequent transfer of good practice – is one of the strategic dimensions through which to promote and support innovation in school".

**Parental support:** Parents were very interested in PDWs and also many bought computers for their children so that learning activities could take place at home. The teacher said that by the end of the project “almost every student has their pc at home".

**STUDENTS’ COMMENTS (+/-)**

According to students, the technologies are central to this process: "Because we study with more interest and fun, more than books. With the latter you learn the subject, but with the technologies you can look into it [the subject] … and, what's more, with technologies we can

work in teams!"
Students were clearly pleased to use Facebook, otherwise denied in the school.
One of the main challenges for students was to learn how to use software they didn't already know. In order to overcome these problems … they found very useful tutorials on YouTube.

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Teacher:** "The LS has proved to be a 'tool' that can facilitate collaboration and social development within students, improving their learning experience by the use of more familiar (to the students) communication modes (blogs, FB, YouTube etc) …"

**Head Teacher:** The LS has "fostered the development of metacognitive processes, critical thinking and autonomy" and it has helped students to see alternative points of view through the PDWs. Students have also experienced a "different organization of their school and homework, in terms of space, time, work method and individual study".

The HT noted a growing interest by other teachers in the iTEC experience: "some teachers not participating in the pilot cycle started to do some "iTEC-like" activities, copying some pilot features" … "This gives me hope that this methodological approach can be extended to others inside the school." … "It's my intention to make sure that the experience of the teachers involved in iTEC may be the subject of discussion within the Teachers Board for dissemination that really works."

**LINKS:** **Teacher's Story Map:**
http://prezi.com/o4hoa5vumfla/itec-cycle-3-map_cdonnarumma/?kw=view-o4hoa5vumfla&rc=ref-5631483
**Teacher's iTEC Multimedia Story (iMmS):**
http://prezi.com/tnq2673k2bqy/imms_itec-cycle-3-genesi-di-un-vulcano/

**Final products:** Group blogs and final designs can be viewed via the following group links:

- **Group1. "Vulcanoidi"** Questionnaire designed for IWB and Response devices. http://ivulcanoidi.blogspot.it/p/prodotto-finale.html
- **Group2. "Il più grande spettacolo"** Volcano model made with the aid of archiCAD http://ilpiugrandespettacolodopoleruzione.blogspot.it/p/final.html
- **Group3. "Vulcanologi"** Interactive test created in PowerPoint http://vulcanologi.livejournal.com/
- **Group4. "Techonolgical Boys"** Volcano made with recycled materials http://boystechnological3f.blogspot.it/p/prodotto-finale.html
- **Group5. "Le terre emerse"** 3D Game http://leterreemerse.blogspot.it/p/prodotto-finale.html
- **Group6. "The Vesuvius boys"** Interactive Map using Thinglink http://bfdc99.blogspot.it/p/prototipo.html
- **Group7. "Explosive girls"** Crossword using Hotpotatoes http://explosivegirls3f.blogspot.it/p/prodotto-finale.html

# Case Study Story: Lithuania

**THE LEARNING STORY:** Designing Maths Games (DMG)

**THE TEACHER** The teacher also took part in the second iTEC cycle and plans to take part in Cycle 4. She is enthusiastic, but her IT skills are fairly limited.

**THE CLASS**
**Age of students:** 8-10 years old
**Number in class: 18**

**THE LESSON/S**
**The subject:** Maths
**Aims/Objectives:**
-To improve students' mathematical knowledge
-To develop IT skills (eg programming)
-To improve team working skills
**Over what period of time?** One lesson a week over 6-8 weeks
**Location of lessons?** Computer lab

**RESOURCES**
**iTEC:**
**Other technology/software:**
Scratch Blogs Google Translate Primary Wall Corkboard

**This case study provides evidence of:**
Constructivist pedagogies Social/collaborative learning Effective use of digital tools
Creativity New assessment procedures

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**
Older primary students created games on the subject of geometry for younger primary students in grades 2-4 of primary school. The games were based on the topics covered under the primary curriculum. Students searched the web for ideas for their game (including English language sites using Google Translate). Students could choose to work in a team, in a pair or alone. Students presented their games to each other and received feedback from their peers on their blog and face to face in their classes.

**TEACHER'S COMMENTS (+/-)**
**On student motivation:** Students created games by themselves, which impacted on their motivation to learn. "Games creation and construction encourages students as well. Good mood and positive attitudes easies learning, helps to unblock the brain. Therefore students become more open-minded. They learn easier, feel free and useful to another students, and able to pass good feelings while presenting work to their classmates."
**On developing students' maths knowledge through technology:** "Technology, as the way to teach, helped [students] to learn math. The curriculum provides what students should learn, but we can use different methods and technologies as a method to teach how to improve math knowledge."
**On a lack of IT support:** "We have no ICT coordinator, however administration supports LS

implementation. Speaking about the technologies, it could be helpful to get some support from IT teacher."

**MAIN ENABLERS?**

- **Flexibility of the Learning Story**: "Description of the LS is very comprehensive, detailed and could be used for different subjects and different ages. Its methodological introduction is very clear and easy to follow and implement LS into the learning process." (Teacher)
- **Support of headteacher:** The headteacher is clearly very supportive of the project and intends to participate in future cycles and to involve other teachers in the school: "I know about the 4 cycle, and we will ensure our teacher will participate in this. I can propose for more teachers in our school to participate in iTEC project and older classes as well."(Headteacher)

**STUDENTS' COMMENTS (+/-)**

- **On developing their skills using new software:** "It was difficult at first to use Scratch. We didn't know how figures could move, how manage movement, sizes, how to arrange chat, or where to find players, use buttons programs, etc. We watched, explored how to do something and we understood and performed it."
- **On engagement in learning**: "We learnt to work together, communicate, agree, share ideas, learnt new software ant to create games. Students will be more engaged in learning while playing such games."

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**New methods of assessment and assessment tools**: The teacher used Primary Wall, Corkboard and blogs to support assessment. Students offered feedback on each other's games.

**Teacher better able to select most appropriate technologies for particular tasks**: "First we used very simple devices (during the 2nd cycle). Now we are more familiar with different software. Different kind of software could be chosen for different kind of learning activities, and teacher is able to choose tools purposefully for presentation, or narrative activities." (Teacher)

**LINKS:**

Geometry blog: http://geometrija-pradinukui.blogspot.com/

Video: http://youtu.be/0ib1s-UBB7I

- Students' games:
- http://scratch.mit.edu/projects/rytuku/2918805
- http://scratch.mit.edu/projects/rytuku/2975214
- http://scratch.mit.edu/projects/rytuku/2985968
- http://scratch.mit.edu/projects/rytuku/2975236
- http://scratch.mit.edu/projects/rytuku/2975241
- http://scratch.mit.edu/projects/rytuku/2970350
- http://scratch.mit.edu/projects/rytuku/2985981
- http://scratch.mit.edu/projects/rytuku/2985992
- http://scratch.mit.edu/projects/rytuku/2986405
- http://scratch.mit.edu/projects/rytuku/2918839

# Case Study Story: Norway

**THE LEARNING STORY:** Visualising the Planet Surface (VPS)

**THE TEACHER** Two teachers, plus the school's headteacher were engaged in this project on 'Measuring and calculating on triangles and rectangles with different digital and analogue tools, and comparing the results.'

**THE CLASS**
**Age of students:** 14 years
**Number in class:** 3 classes (80 students)

**THE LESSON/S**
**The subject:** Maths and Geography
**Aims/Objectives:**

- To compare measurements obtained using various digital and analogue measuring tools
- To provide opportunities for more enhanced use of the digital map, www.kartiskolen.no
- To implement the use of GPS

**Over what period of time?** The main activity was carried out during one three-hour session.
**Location of lessons?** Football field and computer lab

**RESOURCES**
**iTEC:**
**Other technology/software:**

| | | | |
|---|---|---|---|
| Smart phones | MotionX GPS iPhone app | BOSCH laser measurement instrument | www.kartiskolen.no (web-based map application) |
| PCs | | | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Use of new learning spaces | Effective use of digital tools | Social/collaborative learning |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**
Combining learning goals from the mathematics curriculum related to geometry and measurements, the students conducted measurements using various instruments, and applied these for calculating areas, circumferences, etc.

The students were organized in groups of 4-6. Each group was assigned one of three tasks, where the tasks were of varying levels of difficulty and various measurement instruments were used. In addition, one group called the media group was given the task of documenting the other groups' activities. The groups took measurements of two football fields located near the school. The measurement instruments included students' iPhones with the MotionX GPS app, a BOSCH laser instrument, and a tape measure.

After performing the measurements, the groups shared their results for comparison. The GPS groups uploaded the tracks to a high-resolution map application for Norwegian schools

(www.kartiskolen.no), and made a map layer on top of a satellite photo of the area they measured. They were then able to compare their measurements with the satellite photo using the built-in measurement tool in the map application.

The headmaster researched technologies for use in the pilot, and provided training on use of the GPS app for both the teachers and the students who were to use the app. He also made an instruction video on how to use the app for measurement and how to upload data to the map application. The video was made available to the participants on YouTube.

**TEACHER'S COMMENTS (+/-)**

**On unreliable technology:** "One of the most important barriers, as far as using technology in schools are concerned, is technology that does not work every time. I have seen too many examples of lessons at the computer lab that are destroyed due to hardware or software that does not work properly. We all know how irritating it is when our personal or job- computer is lagging or is dysfunctional. It is a completely different ballgame when this happens in a classroom with 25 pupils. One or two «sleepy» computers are potential bombs for the teacher and the lesson. It is therefore absolutely crucial that programs and computers work as they shall."

**On deciding how best to form student groups**: This project was a success but it did mean extra work for the teacher. In particular considerations concerning how to build groups. We chose to separate in three groups where the pupils had more or less the same skill-level. We can obviously discuss whether or not this is the best or most proper way of organizing the students, but we do feel that it worked well in our project.

**MAIN ENABLERS?**

**Support of the headteacher:** The main enabler behind the implementation was the headmaster. In addition to initiating the iTEC participation at the school, he also took on the role as technological support and as a teacher for one class during the pilot.

**School culture**: "An important enabler of changing of practises is the school culture concerning failure ! Is it ok to fail ? How will my colleagues react if the project is a failure? I as a headteacher try to show my teachers that it is ok to fail. Without failure, no progress. If we shall implement new and exciting technology into our classrooms, we will have to accept a lot of failures, a lot of things that does not work out the way we wished they would. But if such failures makes it easier for us to plan and proceed in our next project, than it is worthwhile. As a school-leader i do think it is vital that you show your teachers that this is the way to look at piloting pedagogy." (Headteacher)

**STUDENTS' COMMENTS (+/-)**

**On learning outside the classroom**: "Several of the pupils mentioned that they liked to work with mathematics that had to do with the real world outside school" (Headteacher)

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Students use their own devices (and their expertise in using those devices) within lessons**: "To give pupils at the age of 14 a lesson concerning their smartphones, is a rewarding experience. They are very skilled smartphone-users and grasp everything very quickly, and soon starts to inform the teacher about new functionality that they discover. I am convinced that it would be easy to let a pupil be the GPS-teacher next time we run this project !" (Headteacher)

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| The use of student's smartphones provided an opportunity to reflect on BYOD policies and practicalities for the school.<br>**Use of new learning environments**: Headteacher reported that pupils found it "Fun to have mathematics outdoors and to calculate with objects in the real world is motivating". |
| **LINKS:**<br>Teacher's multimedia story: http://files.eun.org/itec/imms/NO_Venke%20Nesse.pdf<br>Video: http://www.youtube.com/watch?v=7ntStOued5E&feature=youtu.be<br>Tasks:<br>https://skydrive.live.com/?cid=0cb209e06fc37525&id=CB209E06FC37525%212098&authkey=!ANx--SJcSH9u2ww |

# Case Study Story: Portugal

**THE LEARNING STORY:** Visualising the Planet Surface (VPS)

**THE TEACHER** The teacher had also participated in the second iTEC cycle. She describes herself as being, "very open to innovation" and tries to use technology as much as possible.

**THE CLASS**
**Age of students:** 13-16 years
**Number in class:** 17

**THE LESSON/S**
**The subject:** Natural Sciences
**Aims/Objectives:**
-To raise awareness of the surrounding natural world and develop a sense of wonder, enthusiasm and focus on science;
-To analyse, interpret and assess evidence collected either directly, or from secondary sources;
-To plan and execute work or projects that require the involvement of different scientific fields, which are traditionally separated.
**Over what period of time?** 34.5 hours: 16.5 hours in the computer suite + 18 hours homework
**Location of lessons?** In the computer suite, outside the school in the local environment, plus homework and out of class support (including online support)

**RESOURCES**
**iTEC:** TeamUp
**Other technology/software:**

| | | | |
|---|---|---|---|
| Moodle | Google Earth | GPS | Google Maps |
| KML | Webcam | Dropbox | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Engagement of a wider range to stakeholders | Creativity | Use of new learning spaces |
| Social/collaborative learning | Effective use of digital tools | Constructivist pedagogies |
| Expressiveness | | |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**
The project required students to georeference three tracks in the local area. The class was divided into three groups of 5-6 students.
**Research/Observation:** Following the initial preparation for the project. The students and teacher went on fieldtrips where they were joined by members of the community, for example, a representative of the parish council and an engineer. These external stakeholders offered advice and suggestions, and helped to place the learning in a real-life context. During the field trips, students gathered information through a variety of methods (eg notes, photos, georeferencing).
**Prototype design**: The students used Google Earth and associated tools to plot geo-referenced tracks**.**
**Participatory Design Workshop:** As in the research/observation stage, members of the local community were key to the workshop. This fits with the school's aim of working

closely with the local community. Following feedback from the participatory design workshop, students made changes to their prototypes.

**Reflection:** Throughout the project, students were guided by a weekly checklist which, "gives them a sense of what they must do and the relevant deadlines, and a sense of process" (Teacher) and they recorded their progress each week on a blog.

The end product will be disseminated in the school and community through blogs, the school webpage and the stakeholders.

**TEACHER'S COMMENTS (+/-)**

**On extending learning beyond the classroom:** "Sometimes we teach, but knowledge seems watertight, it is separated in boxes. No, they had a holistic idea that everything is related and knowledge is not retained here, it goes beyond the walls of the classroom. I think this is where we can measure success."

**Impact on student creativity: "**The chance to contact with new things and to put their ideas into practice, because they can also be creative here. They can and should have the chance. Some are not creative, because they are not given the chance, and others aren't because they lack the motivation. To be creative, autonomous, I think is essential."

**MAIN ENABLERS?**

**Enthusiasm of the teacher:** The teacher was highly enthusiastic about iTEC, the Learning Story approach and especially the use of new technologies, "I am always on the lookout, I'm always waiting for more. And hope to have the time and opportunity to embrace and explore them suitably. And if possible in the context of enhancing my action with the students and that they may take advantage of it."

**Class size:** Classes in this school are small, making the management of groups and provision of sufficient technology less of a problem than in some larger schools.

**Curriculum fit:** The Learning Story allowed the teacher to cover the topics required under the science curriculum, "So this is what happened. With this Learning Story, and without them noticing, we addressed all of the topics, from the ecosystem, abiotic factors, sustainability, human intervention in ecosystems, natural resources. Somehow, we ended up discussing this." (Teacher)

**STUDENTS' COMMENTS (+/-)**

**On the practical nature of iTEC:** "Maybe if we had more of these practical lessons, maybe those students could become more interested and put more effort into it."

**On the importance of using technology in school:** "Mainly mastering technology, since iTEC is the classroom of the future, in the future all will be about technology and so we will be ready for what's coming. I think it was very good."

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Changing role of the teacher**: The teacher describes how students took greater responsibility for their own learning and, as a consequence, her role shifted to that of a fellow learner/explorer: "iTEC allows them to also take the initiative of searching for the knowledge, researching, using Google Earth. I told them, «I am learning with you, so let's research, let's all search»"

**Changes to assessment**: Although the process of assessment did not alter, the components of learning which the teacher was able to assess did change: "…it allowed me to assess some things which are not always easy to measure in a normal class. For example, autonomy, creativity, critical thinking…".

**LINKS:**

Teacher and students' blog: http://itecsaboia.blogspot.pt/
School website: http://www.ebi-saboia.rcts.pt/
Facebook pages: http://www.facebook.com/pages/Agrupamento-de-Escolas-de-Saboia/121140991237020)
Mira Clara Group's blog: http://projectorios-miraclara.blogspot.pt/ ( a local group of environmentalists)

# Case Study Story: Slovakia

**THE LEARNING STORY:** Redesigning School (RS) & Designing Maths Games (DMG)

**THE TEACHER** Although the teacher is computer literate, iTEC represented a new way of working for her, especially the introduction of team work and more student-centred approaches.

**THE CLASS**
**Age of students:** 12-13 years
**Number in class:** 24

**THE LESSON/S**
**The subject:** Maths, Technology & Art
**Aims/Objectives:** To design games for younger students to play in after school activities in the school yard:

- To investigate possible games
- To design a game using SketchUp
- To present the design to younger students and obtain feedback
- To produce a final design incorporating responses.

**Over what period of time?** 5 crosscurricular lessons: 1 lesson in mathematics, 2 lessons in informatics and in 2 art lessons.
**Location of lessons?** Classroom, computer lab, elsewhere in school buildings, school yard

**RESOURCES**
**iTEC:**
**Other technology/software:**
Word Excel SketchUp

**This case study provides evidence of:**

| | | |
|---|---|---|
| New assessment procedures | Use of new learning spaces | Effective use of digital tools |
| Social/collaborative learning | Creativity | Expressiveness |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**


The Grade 7 students (13 years old) had to design games for younger scholars (age 6-11) for after school activities in the schoolyard. Working in teams, the student prepared pictures-graphics of the boards or figures used in game, and developed rules and simple instructions which could be understood by younger pupils.

After an initial discussion to introduce the project, students were divided into teams. They took measurements of the schoolyard and met with the headteacher to get his suggestions and reactions.

The students then searched for appropriate games which they presented and selected those which match the criteria they had been given. They organized this data in Excel.


The next stage was to create a 3D model of their game using SketchUp. Some students took on the role of graphic designers who had to compile all drawings and pictures into SketchUp and one student was an 'editor-in-chief', who had to document the progress and outcomes of all teams on the class website.

They introduced these games to the young students and observed their reactions and preferences. The students then presented their designs to the headteacher and made a case to get permission to bring their ideas into reality. They also worked with art teachers to for input into the aesthetic aspects of their designs.

**TEACHER'S COMMENTS (+/-)**

**On the difficulties of teamwork**: Teamwork is not a regular activity at this school and the teacher found it difficult to engage less self-motivated students to work. The more responsible students were frustrated because their peers did not contribute adequately. Some students were resistant to working with those who were lower achievers.

**On continuity of learning:** The teacher would like to have the project implementation organized as a one-day project. She said that students did not remember much from one lesson to another one.

**MAIN ENABLERS?**

**Student-centred approach:** Students found the topic interesting. They completed a lot of the work on their own, and they could show their creativity through design; the result was not prescribed, but students could develop their games as they wished. The teacher felt that using SketchUp helped some students to work more autonomously.

**Student skills**: Students at this school have worked on computers from the grade 1 and they enjoy working with computers. While they often use computers for games, music and school exercises, this project was something different and more interesting to students because it had a real life application.

**STUDENTS' COMMENTS (+/-)**

**On working on something with a real life application:** "We are working on the project, which will be implemented." The ICT coordinator said, that students prefer this real life assignment much more than academic assignments.

**On the challenges of working in teams:** The students said that they did not like when somebody of the team did not fulfil his task on time.

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Changing role of the teacher**: In this learning story, students have more freedom to work on

| |
|---|
| their own, and teacher did not instruct them, she just supported them by discussing what was going well and what could be improved, but she did not intervene in their learning process.<br>**Cross-curricular working**: Instead of the traditional organization of the curriculum where each subject is taught separately, this project allowed the combination of multiple subjects (computer science, mathematics and visual arts) within a cross-curricular topic taught over an extended period. |
| **LINKS:** |

# Case Study Story: Spain (SMART)

**THE LEARNING STORY:** Designing Maths Games (DMG)

**THE TEACHER** The teacher had taken part in cycle 2 so already had an understanding of the iTEC approach.

**THE CLASS**
**Age of students:** 13- 14
**Number in class:** 15

**THE LESSON/S**
**The subject:** Maths
**Aims/Objectives:**

- To employ critical thinking (to choose their game model)
- To take part in online collaboration
- To create prototypes from ideas
- To improve their understanding of mathematical concepts
- To create a game using technological design tools.

**Over what period of time?** 10 weeks (1 h/week)
**Location of lessons?** Computer suite, school library, homework

**RESOURCES**
**iTEC:** TeamUp
**Other technology/software:**

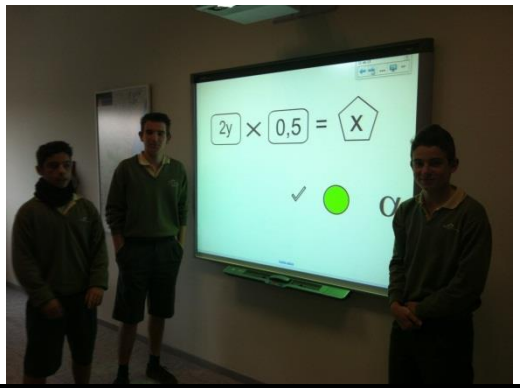
| | | | |
|---|---|---|---|
| Facebook | Scratch | Blogger | SMART Document camera |
| SMART Notebook | Dropbox | Apps | Learner response systems (SMART Response) |
| SMART Widgets | SMART IWB | | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Constructivist pedagogies | Social/collaborative learning | Effective use of digital tools |
| Creativity | Expressiveness | |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

**Preparation:** During the first few lessons, students prepared for the project by setting up the technologies they would require, for example, a Dropbox account and a blog. Teams were created using TeamUp.




**Idea generation:** The next stage was to search for existing games on the Internet to help them to produce their own idea. Students analysed the advantages and disadvantages of the games they found.

**Design:** Students then designed their own games, initially on paper and then later using

SMART Notebook.

**Peer feedback and review**: Students presented their designs to the rest of the class who offered feedback using Learner Response System handsets. In the following lesson, the groups reflected on this feedback and made any changes to their design.

**Reflection**: Students maintained a blog of their progress throughout the project and at the final stage, they reflected on their experience overall.

**TEACHER'S COMMENTS (+/-)**

**On the changing role of the teacher and increased student engagement in learning**: "What has changed a little bit is that until now they used to see me as a heroine of the IWB and during this project that have seen me struggling with blogs and Dropbox, they have had the opportunity to explain me things, so it's been very positive for them to have the possibility to help me the same way that I can help them."

**On the students' response:** "Amazing, not only in my class, but the other classes of the same level were demanding to work like that, to participate in the project."

**On school restrictions on the use of social media:** "I would have love to use twitter to communicate but school policy doesn't allow us to use twitter in the classes…It's such a pity since they are actually using twitter on their daily basis, so to include that in the project would have been great...Blogging was allowed but under control, so we have to check every time something is published."

**MAIN ENABLERS?**

**Involvement of headteacher**: The headteacher was highly supportive and obviously aware of many of the issues involved in the introduction of technology into teaching and learning, "…they need skills to find the information and decide which information is relevant by using their critical thinking. And then, learning how to process that information, this is not about "copy and paste".

**A flexible approach:** The teacher had to contend with several infrastructure and organizational problems, so a flexible approach was needed. "Electricity problems, changing sessions due to exams, or planned trips, where the computer class was full and we had to change it on the way. But the library has saved me on that since we had all the software also installed there so they could use those computers instead."

**STUDENTS' COMMENTS (+/-)**

**On enjoying greater autonomy:** "The differences are that during this project all the students have used a computer not like the rest where only the teacher uses the computer. And that instead of answering questions, we have created our own questions. We have chosen the exercises done in the classroom. More autonomous."

**On group work and greater personal responsibility :** "It also implies personal responsibility, your work affects the group work, it can slow down the group work and that would be ok if you don't understand it but not if its caused because of a lack of responsibility."

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

**Using technology for peer evaluation and sharing:** "I have learned a lot about the power of blogging and how sharing their improvements improve their self-esteem and motivation. " (Teacher)

**Using technology in subjects where this is not commonplace**: "It has been a nice change. The pilot here has been done in maths and usually ICT is not used in maths classes." (ICT Co-ordinator)

**Using technology for a 'real' purpose, rather than for its own sake**: "before the project, in ICT class, they've used blogs but not with a real use, the project has allowed them to really see what it means

| |
|---|
| to publish information and work through a blog, they could see how many people would visit them and really understand that their information was public. Checking the visits was very motivating for them.” |
| **LINKS:** |

# Case Study Story: Turkey

**THE LEARNING STORY:** Designing Maths Games (DMG)

**THE TEACHER** This teacher is an ICT teacher.

**THE CLASS**
**Age of students:**
**Number in class:** 20 (project class of students who were interested in participating)

**THE LESSON/S**
**The subject:** Maths
**Aims/Objectives:** To investigate maths game and design their own game.
**Over what period of time?**
**Location of lessons?** Classroom, computer lab

**RESOURCES**
**iTEC:** TeamUp
**Other technology/software:**

| | | | |
|---|---|---|---|
| Weebly | Gmail | Sumdog virtual classroom | Scratch |
| VoiceThread | | | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| Constructivist pedagogies | Use of new learning spaces | Effective use of digital tools |
| Individualisation | Social/collaborative learning | Creativity |
| Expressiveness | Engagement with parents | |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

Four groups of students were generated, with 5 pupil in each group. Each group was given a name: addition, subtraction, multiplication and division.

The students were then how to create a blog with Weebly tool. Team-Up was also explained to the students and all students were added to Team-up environment and the first comments recorded.
Gmail accounts were created for all students who had already been learning about email. During project, by using Team-Up and Gmail environment students constantly exchanged ideas.

A virtual classroom was created on the site http://www.sumdog.com/ and all the students were added to this class. Students investigated the various games available on this site and also examined sample games in Scratch. Based on this investigation, students decided the kind of game they wanted to design and made drawings of the game.

Students learnt how to use the tool https://voicethread.com/. At this stage, all the work done and the difficulties encountered were recorded by using the Team-up tool.

Students then learned how to use the Scratch program and passed to the construction phase of the game they designed.

| |
|---|
| The product designs and the prototypes prepared by students were presented to other students and teachers. They were generally well-received.<br><br>The students added all documents, drawings, photos and videos used in their blogs and they shared comments on the studies conducted. Team-Up, Gmail and Voicethread environments were also used at this stage.<br><br>The design of the games continued using Scratch, taking into accounts all views and comments received. |
| **TEACHER'S COMMENTS (+/-)**<br>**On technical difficulties experienced**: "We have experienced serious difficulties in terms of time and hardware. The slowness of the internet was also among the difficulties encountered. Internet was slow and cut off from time to time. We didn't have an adequate number of computers. Since some sites are blocked by the Ministry of National Education some studies were also blocked... The number of computers we have was very poor. Students had to use computers in groups.<br>Some of the necessary web 2.0 tools were prevented by internet service offered by the Ministry of Education to schools."<br>**On the potential use of blogs as student portfolios: "**Their blog pages can serve much more long-lasting as a portfolio storage." |
| **MAIN ENABLERS?**<br>**Curriculum fit:** "The activities were necessary and compatible with the topics. It was consistent with the curriculum one to one. We also have made the application by selecting one of the topics in the curriculum." |
| **STUDENTS' COMMENTS (+/-)**<br>**On increased confidence in maths skills:** "We have learned many things at the same time. I saw increase in my performance in the lesson."<br>On learning about new technologies: "Everyone at school is introduced with these technologies for the first time." |
| **KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**<br>**A student-centred approach:** "A fully student-centred educational program was held in our school in which generally teacher-centred education was made." (Teacher) |
| **LINKS:** |

# Case Study Story: UK (Promethean)

**THE LEARNING STORY:** Redesigning the School (RS)

**THE TEACHER** An Advanced Skills Teacher in Design & Technology at a Specialist Science College.

**THE CLASS**
**Age of students:** 13-14 years
**Number in class:**39 (2 classes)

**THE LESSON/S**
**The subject:** Product Design (GCSE course)
**Aims/Objectives:**

- To redesign an aspect of the school for a student with different needs
- To encourage students to use mobile devices in their research and designing.

**Over what period of time:** 10 lesson (2 per week)
**Location of lessons?** In the classroom and around the school

**RESOURCES**
**iTEC:** TeamUp
**Other technology/software:**

| | | | |
|---|---|---|---|
| iPads | Flip video cameras | ActivInspire | MacBooks |
| Edmodo | Planet user group | | |

**This case study provides evidence of:**

| | | |
|---|---|---|
| New assessment procedures | Constructivist pedagogies | Creativity |
| Effective use of digital tools | Expressiveness | Social/collaborative learning |

**WHAT HAPPENED? TEACHER AND STUDENT EXPERIENCES**

The school is moving towards a 1:1 mobile device learning environment. At the start of Cycle 3, nearly a third of students had iPads which they were being encouraged to use independently during lessons.

Team Up was used to allocate students to groups of 3. Students then decided on their own role within the team.

The teacher set up an Edmodo group to allow students to share their work. The teacher created alerts to the group and posted links to useful websites and documents in the 'library' and students were responsible for uploading their work. Students recorded their reflections throughout the design process.

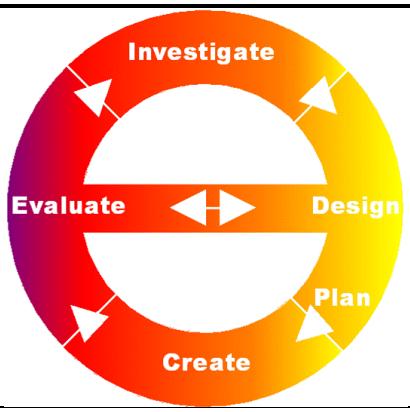
The teacher viewed the design process as a cycle, as shown in the diagram below.

**Investigation:** After being presented with the design brief, students were allowed around the school with mobile devices to record the issues they found. Before they went, students agreed as a class on the ground rules that they must follow. Students used iPads to record photos, videos, make notes and record their thoughts throughout the project. Students

without iPads were loaned FlipVideos.

**Design**: Students created a prototype and then took part in a participatory design workshop, where they discussed their design with future users.

**Final product design**: Based on the feedback, students then created their final design prototype which they presented to the class.




**TEACHER'S COMMENTS (+/-)**

**On students taking on the role of the teacher**: "Students were quite excited to be using ActivInspire - it has always been seen as 'teacher software'!"

**On increased creativity:** "I think students really benefitted from completing this project using the new technologies and mobile devices. Completing the investigation and research around school and then having the internet to search other sources meant students work was more creative than normal."

**MAIN ENABLERS?**

**TeamUp:** TeamUp was seen as a quick, easy and fair way to allocate students to teams.

**Other technologies**: iPads were valuable to this project, particularly at the research stage where students were taking photographs, recording videos, writing notes and recording their voices. Being able to upload these instantly to Edmodo and email them to other members of the group was a real strength to the project as was the use of ActivInspire software to present their work.

**STUDENTS' COMMENTS (+/-)**

**On a more active approach to learning**: "I feel the new approaches to learning are a lot better as it is a hands on thing".

**On the value of mobile technologies**: "The MacBooks helped because we have been able to go on the Internet and search".

**KEY INNOVATION/S … WHAT'S NEW/DIFFERENT OVERALL?**

The key innovation is that students are working as producers, in a way which emulates the way in which professional designers work, for example:

- Students have improved their ability to **work in a team**, reflecting the ways in which designers work outside of schools. The teacher felt that using Team Up to help create the teams was really important in achieving this.
- Students' research skills have improved as they used the iPads and flipvideos to help them **collect information in video and photo formats** which they were then able to search through and select the best options.
- Students have understood the importance of **showing a range of different design ideas** rather than just choosing the first one that they produce.

**LINKS:**

Multimedia Story:

Teacher's blog posts:

http://community.prometheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2012/10/26/fabia-39-s-story-so-far.aspx

http://community.prometheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2012/11/08/the-first-lessons.aspx

http://community.prometheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2012/12/02/half-way-through.aspx

http://community.prometheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2013/01/20/cycle-3-is-finished.aspx

# Appendix B: Contextual information about participating teachers and their schools

**Table 20: Overview of pilots and evaluation responses**

| Country | No. pilots | No. evaluations | No. pilots represented by evaluations | Response rate (%) | RS | VPS | DPS | DMG | Other |
|---|---|---|---|---|---|---|---|---|---|
| Austria | 20 | 11 | 20 | 100% | 5 | 0 | 1 | 5 | 0 |
| Belgium | 84 | 44 | 49 | 58% | 44 | 0 | 0 | 0 | 0 |
| Czech Republic | 14 | 7 | 14 | 100% | 4 | 0 | 0 | 3 | 0 |
| Estonia | 38 | 21 | 36 | 95% | 0 | 0 | 0 | 21 | 0 |
| Finland | 26 | 25 | 26 | 100% | 11 | 2 | 2 | 10 | 0 |
| France | 15 | 14 | 14 | 93% | 0 | 8 | 3 | 3 | 0 |
| Germany (SM) | 8 | 5 | 6 | 75% | 1 | 1 | 1 | 2 | 0 |
| Hungary | 54 | 43 | 46 | 85% | 11 | 15 | 7 | 10 | 0 |
| Israel | 9 | 5 | 8 | 89% | 1 | 1 | 0 | 0 | 3 |
| Italy | 14 | 10 | 10 | 71% | 1 | 0 | 1 | 1 | 7 |
| Lithuania | 70 | 29 | 47 | 67% | 17 | 0 | 0 | 12 | 0 |
| Norway | 23 | 15 | 16 | 70% | 0 | 9 | 0 | 6 | 0 |
| Poland (SM) | 2 | 2 | 2 | 100% | 2 | 0 | 0 | 0 | 0 |
| Portugal | 33 | 35[17] | 33 | 100% | 0 | 14 | 8 | 13 | 0 |
| Slovakia | 25 | 12 | 13 | 52% | 7 | 0 | 3 | 2 | 0 |
| Spain (SM) | 29 | 20[18] | 22 | 76% | 10 | 1 | 3 | 6 | 0 |
| Spain(PR) | 3 | 2 | 2 | 67% | 0 | 0 | 0 | 1 | 1 |
| Turkey | 82 | 27 | 28 | 34% | 15 | 3 | 5 | 4 | 0 |
| UK (PR) | 29 | 7 | 11 | 38% | 1 | 0 | 2 | 1 | 3 |
| Totals | 578 | 334 | 403 | 70% | 130 | 54 | 36 | 100 | 14 |

Due to changes in the registration process from Cycle 2, information about teacher gender, subject taught and age range of the cohort was collected via the pilot management tool provided by Work Package 4.

[17] In each of two pilots, two teachers co-taught the class
[18] In each of two pilots, two teachers co-taught the class

71% of the 334 teachers who responded to the survey in Cycle 3 were female, with 29% male. As in previous cycles, the majority of teachers who participated were experienced (Figure 20) with only 20% of respondents indicating that they had been teaching for five years or less. In addition 50% of teachers responding to the survey indicated that they had been involved in other national or international ICT initiatives recently, suggesting that they had positive attitudes to technology and innovation. Teachers were asked to rate their level of competency in using ICT in teaching and learning on a scale from 1 (none) to 10 (very high). The mean response was 7 (SD = 1.8) suggesting that the majority of teachers participating in Cycle 3 were confident users of technology.

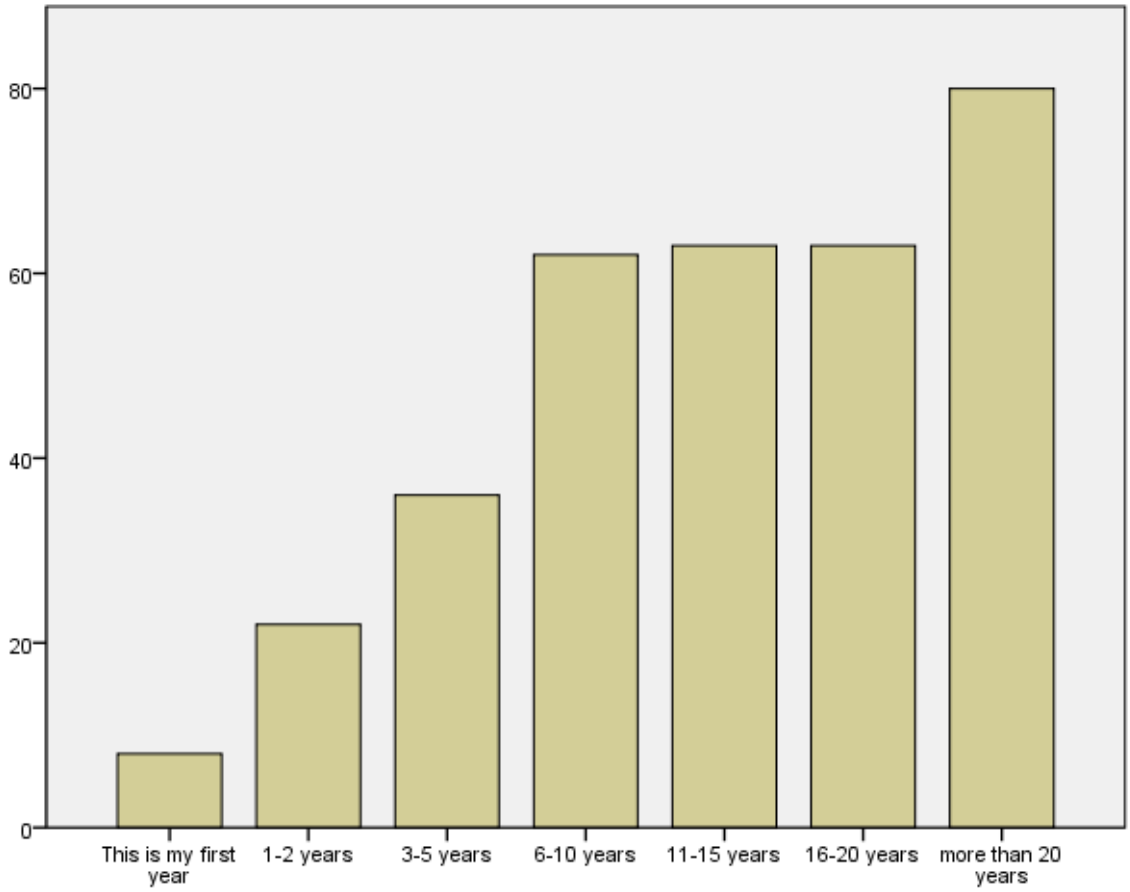



**Figure 20: Length of service of teachers responding to survey**

15% of teachers (n=334) indicated that they had received no formal technical training in the use of ICT during the previous 2 years. The majority of teachers had between 1 and 10 days training (58%). 15% of teachers (n=334) also indicated that they had received no formal training in ICT pedagogical skills during the previous 2 years. Again, the majority of teachers (n=334) indicated that they had received between 1 and 10 days training (58%). They had also engaged in a range of other professional development activities in addition to ICT technical skills training and ICT pedagogical skills training (Table 21).

**Table 21: Professional development activities in addition to ICT technical and pedagogical skills training**

| Type of professional development | % of teachers |
|---|---|
| Informal support from colleagues | 76% |
| Other courses/workshops | 64% |
| Education conferences/seminars | 60% |
| Teacher professional development communities | 43% |
| Mentoring/peer observation | 37% |
| Observation visits to other schools | 37% |
| Qualification programme | 28% |
| Individual or collaborative research | 34% |

62% of teachers indicated that their school participated in national or international ICT initatives (for example, eTwinning, other research projects). 85% of teachers indicated that the senior leaders at their school supported the use of ICT for teaching and learning.

Reflecting the focus of the learning stories, the most popular subject areas were:

- Languages (62 teachers)
- Science (62 teachers)
- Mathematics (55 teachers)
- ICT/informatics (41 teachers)
- Primary (23 teachers)
- Design and technology (19 teachers)

**Table 22: Overview of data collected in Cycle 2**

| Country | No. case study reports | Raw data | iMmS (optional) | Videos | NPC Q | NPC AQ |
|---|---|---|---|---|---|---|
| **Austria** | 2 | 3 (3 Teacher interviews, 3 IT Co-ordinator interviews, 3 Headteacher interviews, 3 Student interviews + documentation) | 0 | 1 http://itec.eun.org/web/guest/teacher-stories | Yes | Yes |
| **Belgium** | 2 | 1 (Teacher, ICT Co-ordinator, Headteacher, Student interview, + lesson plan, photos and videos) | 0 | 6 | Yes | Yes |
| **Czech Republic** | N/A | N/A | 0 | 1 http://itec.eun.org/w | No | Yes |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | eb/guest/teacher-stories | | |
| **Estonia** | 2 | 1 (Teacher, Headteacher, 2x Student interviews) | 4<br>http://iteceesti.wordpress.com/<br><br>http://iteclillekyla.blogspot.be/search?updated-min=2011-01-01T00:00:00%2B02:00&updated-max=2012-01-01T00:00:00%2B02:00&max-results=6<br><br>http://sikuitec.wordpress.com/2011/<br><br>http://laukaitec.blogspot.be/search?updated-max=2012-12-31T11:32:00%2B03:00&max-results=7 | 0 | Yes | Yes |
| **Finland** | N/A | N/A | 1<br>http://files.eun.org/itec/imms/Fin_TaruKoskinen.pdf | 0 | Yes | Yes |
| **France** | 3 | 1 (Teacher, ICT-Co-ordinator, Student interviews) | 3<br>http://files.eun.org/itec/imms/C3_FR_CC.pdf<br><br>http://files.eun.org/itec/imms/C3_FR_RB.pdf<br><br>http://files.eun.org/itec/imms/C3_FR_WB.pdf | 0 | Yes | Yes |
| **Hungary** | 2 | 1 (Teacher, ICT Co-ordinator, Headteacher, Student interviews) | 3<br>http://files.eun.org/itec/imms/C3_HU_Katalin_Skultety.pdf<br><br>http://files.eun.org/itec/imms/C3_HU_Zoltan_Farkas_EN.pdf<br><br>http://files.eun.org/itec/imms/C3_HU_Krisztina_Varga-hun.pdf | 0 | Yes | Yes |
| **Israel** | 2 | 1 (Teacher interview, 2 Teacher's logs, photo) | 0 | 0 | Yes | No |
| **Italy** | 2 | 1 (Teacher, | 0 | 1<br>http://itec. | Yes | Yes |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Headteacher and Student interviews) | | eun.org/web/guest/teacher-stories | | |
| **Lithuania** | 2 | 1 (Teacher, ICT Co-ordinator, Headteacher and Student interviews) | 0 | 0 | Yes | Yes |
| **Norway** | 2 | 1 (Teacher, Headteacher and Student interviews, + photo) | 1 http://files.eun.org/itec/imms/NO_Venke%20Nesse.pdf | 0 | Yes | Yes |
| **Portugal** | 1 | 1 (Teacher, Headteacher, Student interviews + planning documentation) | 0 | 0 | No | Yes |
| **Slovakia** | 2 | 1 (Teacher, ICT Co-ordinator, Headteacher and Student interview + NPC notes) | 5 | 0 | Yes | Yes |
| **Spain (SMART)**<br><br>**(also Germany Poland)** | 2 | 1 (Teacher, ICT Co-ordinator, Headteacher and Student interviews + lesson plan and photos) | 0 | 0 | Yes | Yes |
| **Turkey** | 12 | 2 (2 Teacher interviews, 2 Headteacher interviews, 4 Student interviews + lesson plans) | 0 | 0 | Yes | Yes |
| **UK (Promethean)**<br><br>**(also Spain)** | N/A | N/A | 3 http://www.prometheanplanet.com/en/Resources/Item/173852/cycle-3-itec-interactive-mulitmedia-story-fh<br><br>http://community.prometheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2013/01/19/carrie-39-s-cycle-3-evaluation.aspx<br><br>http://community.prom | 0 | No | Yes |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | etheanplanet.com/en/user_groups/itecprom/b/itecprom_teacher_blog/archive/2012/11/19/flipped-classroom.aspx | | | |
| **Totals** | 36 | 16 | 20 | 9 | 13 | 15 |

# Appendix C: Analysis of data by country

| | | 13.4a) I intend to implement the Learning Story again in the future: | | | Total |
|---|---|---|---|---|---|
| | | Yes - definitely | Yes - probably | No | |
| Country | Austria | 9 | 2 | 0 | 11 |
| | Belgium | 16 | 25 | 3 | 44 |
| | Czech Republic | 3 | 4 | 0 | 7 |
| | Estonia | 8 | 13 | 0 | 21 |
| | Finland | 6 | 16 | 3 | 25 |
| | France | 7 | 7 | 0 | 14 |
| | Germany | 1 | 4 | 0 | 5 |
| | Hungary | 22 | 20 | 1 | 43 |
| | Israel | 4 | 1 | 0 | 5 |
| | Italy | 5 | 5 | 0 | 10 |
| | Lithuania | 17 | 11 | 1 | 29 |
| | Norway | 5 | 8 | 1 | 14 |
| | Poland | 2 | 0 | 0 | 2 |
| | Portugal | 18 | 15 | 2 | 35 |
| | Slovakia | 8 | 4 | 0 | 12 |
| | Spain | 12 | 8 | 0 | 20 |
| | Spain PR | 1 | 1 | 0 | 2 |
| | Turkey | 18 | 7 | 1 | 26 |
| | UK | 5 | 2 | 0 | 7 |
| Total | | 167 | 153 | 12 | 332 |

| | | 13.5a) I would recommend that this Learning Story should be made widely available to other teachers: | | | |
|---|---|---|---|---|---|
| | | Yes - definitely | Yes - probably | No | Total |
| Country | Austria | 8 | 3 | 0 | 11 |
| | Belgium | 16 | 24 | 4 | 44 |
| | Czech Republic | 4 | 3 | 0 | 7 |
| | Estonia | 8 | 13 | 0 | 21 |
| | Finland | 5 | 18 | 2 | 25 |
| | France | 5 | 9 | 0 | 14 |
| | Germany | 2 | 3 | 0 | 5 |
| | Hungary | 31 | 12 | 0 | 43 |
| | Israel | 4 | 1 | 0 | 5 |
| | Italy | 7 | 3 | 0 | 10 |
| | Lithuania | 23 | 6 | 0 | 29 |
| | Norway | 6 | 5 | 3 | 14 |
| | Poland | 2 | 0 | 0 | 2 |
| | Portugal | 22 | 12 | 1 | 35 |
| | Slovakia | 9 | 3 | 0 | 12 |
| | Spain | 16 | 4 | 0 | 20 |
| | Spain PR | 1 | 0 | 1 | 2 |
| | Turkey | 17 | 7 | 2 | 26 |
| | UK | 2 | 5 | 0 | 7 |
| Total | | 188 | 131 | 13 | 332 |

## Austria

The survey data for Austria are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Teachers disagree |
|---|---|---|---|
| Redesigning School | 5 | 0 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 1 | 0 |
| Designing a math learning game | 4 | 1 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| IWB | 2 |
| Time | 2 |
| Resources | 1 |
| Organization | 1 |
| Curriculum | 1 |
| Student attitudes | 1 |
| Curriculum fit | 1 |
| School infrastructure | 1 |
| Incompatibility of devices/ software | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 5 |
| Student attitudes | 2 |
| Tools | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| New approach | 2 |
| Relevant | 1 |
| Student-centred | 1 |
| Use of technology | 1 |
| Seen to be successful | 1 |

| Enablers in implementation of LS | Number of teachers |
|---|---|
| Support from other teachers | 3 |
| Resources & infrastructure | 2 |
| New pedagogy | 2 |
| Student attitudes | 1 |
| Realistic approaches | 1 |

## Belgium

The survey data for Belgium are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Teachers disagree |
|---|---|---|---|
| Redesigning School | 23 | 20 | 0 |
| Visualising the planet surface | | | |
| Designing a physics simulation | | | |
| Designing a math learning game | | | |
| Other | | | |

| Barrier | No of teachers |
|---|---|
| Resources | 13 |
| Internet connection | 10 |
| Infrastructure | 8 |
| Student attitudes | 6 |
| Lack of resources/equipment | 6 |
| Time | 5 |
| Teacher skills | 5 |
| Student skills | 5 |
| Lack of ipads | 5 |
| Class size | 5 |
| Home resources/support | 4 |
| Using video | 3 |
| Installing software | 3 |
| Curriculum fit | 3 |
| Teacher support | 2 |
| School infrastructure | 2 |
| Lack of software/apps | 2 |
| Incompatibility of devices /software | 2 |
| Administrative barriers | 2 |
| Technical issues | 1 |
| Pressure on students | 1 |
| New pedagogies | 1 |
| iTEC (organizational barrier) | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 14 |
| New learning approaches | 5 |
| Tools | 4 |
| Creativity | 4 |
| Attainment | 4 |
| Student collaboration | 2 |
| Authentic learning | 1 |
| 21st Century skills | 1 |
| Teacher collaboration | 1 |
| Teacher skills | 1 |
| Depth of learning | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| New approach | 10 |
| Relevant | 5 |
| Student-centred | 5 |
| Student response | 4 |
| Not suited to all | 3 |
| Use of technology | 2 |
| Lack of resources | 2 |
| Diversification | 2 |
| Creative | 1 |
| Seen to be successful | 1 |
| Depth of learning | 1 |
| Technical difficulties | 1 |
| Time consuming | 1 |
| Not all aspects | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Resources & infrastructure | 16 |
| Support from other teachers | 13 |
| Student attitudes | 4 |
| National support | 4 |
| Time | 3 |
| Teacher attitudes | 2 |
| Teacher skills | 2 |
| Headteacher/senior support | 1 |
| Training | 1 |
| Flexibility | 1 |
| Student skills | 1 |
| Class size | 1 |
| Involvement in previous projects | 1 |
| Planning | 1 |

## Czech Republic

The survey data for the Czech Republic are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 4 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 2 | 1 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 4 |
| Installing software | 2 |
| Lack of resources/equipment | 1 |
| Organization | 1 |
| Poor quality resources /equipment | 1 |
| Student skills | 1 |
| TeamUp | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student collaboration | 6 |
| New learning approaches | 1 |
| Tools | 1 |
| Independent learning | 1 |
| 21st Century skills | 1 |
| Communication skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 1 |
| Relevant | 1 |
| Student-centred | 1 |
| New approach | 1 |
| Lack of resources | 1 |
| Depth of learning | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Resources & infrastructure | 2 |
| Support from other teachers | 2 |
| Headteacher/senior support | 2 |
| New pedagogy | 1 |
| Teacher skills | 1 |
| Student skills | 1 |
| Communication | 1 |

## Estonia

The survey data for Estonia are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | | | |
| Visualising the planet surface | | | |
| Designing a physics simulation | | | |
| Designing a math learning game | 10 | 10 | 1 |
| Other | | | |

| Barrier | No of teachers |
|---|---|
| Time | 14 |
| Student skills | 5 |
| Student attitudes | 3 |
| Group work | 2 |
| TeamUp | 2 |
| Administration | 1 |
| Communication | 1 |
| Internet connection | 1 |
| Lack of resources /equipment | 1 |
| Organization | 1 |
| Poor quality resources /equipment | 1 |
| Student skills | 1 |
| Teacher skills | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 7 |
| Student collaboration | 5 |
| Student attitudes | 3 |
| Independent learning | 2 |
| Creativity | 2 |
| Authentic learning | 2 |
| 21st Century skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 4 |
| Relevant | 4 |
| New approach | 4 |
| Use of technology | 3 |
| Student-centred | 2 |
| Collaborative | 1 |
| Creative | 1 |
| Diversification | 1 |
| Depth of learning | 1 |
| Interdisciplinary | 1 |
| Sustainability | 1 |
| Design process | 1 |

| Enablers in implementing LS | No of teachers |
|---|---|
| Student attitudes | 8 |
| Teacher attitudes | 5 |
| Support from other teachers | 3 |
| Resources & infrastructure | 2 |
| Headteacher/senior support | 1 |
| National support | 1 |
| Training | 1 |
| Curriculum | 1 |
| Involvement in previous projects | 1 |
| Realistic approaches | 1 |

## Finland

The survey data for Finland are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 2 | 9 | 0 |
| Visualising the planet surface | 0 | 2 | 0 |
| Designing a physics simulation | 0 | 2 | 0 |
| Designing a math learning game | 3 | 7 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | Number of teachers |
|---|---|
| Time | 16 |
| Lack of resources/equipment | 6 |
| Student attitudes | 6 |
| Student skills | 5 |
| ipads | 3 |
| Teacher skills | 3 |
| Communication | 2 |
| Curriculum | 2 |
| Internet connection | 2 |
| Organization | 2 |
| TeamUp | 2 |
| Technical issues | 2 |
| Class size | 1 |
| Group work | 1 |
| Home resources | 1 |
| Incompatibility of software /devices | 1 |
| Poor quality resources /equipment | 1 |
| Using video | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 6 |
| Student attitudes | 4 |
| Tools | 3 |
| Teacher skills | 2 |
| Student collaboration | 1 |
| Student-centred | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Simple | 3 |
| Student response | 2 |
| Use of technology | 2 |
| Seen to be successful | 2 |
| Relevant | 1 |
| Student-centred | 1 |
| New approach | 1 |
| Collaborative | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Support from other teachers | 4 |
| Resources & infrastructure | 3 |
| Student attitudes | 2 |
| Teacher attitudes | 2 |
| New pedagogy | 1 |
| Headteacher/senior support | 1 |
| National support | 1 |
| Training | 1 |
| Time | 1 |
| Flexibility | 1 |

## France

The survey data for France are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 0 | 0 |
| Visualising the planet surface | 6 | 1 | 1 |
| Designing a physics simulation | 1 | 2 | 0 |
| Designing a math learning game | 1 | 2 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 8 |
| Lack of resources/equipment | 5 |
| Student skills | 4 |
| Group work | 3 |
| Blogs | 2 |
| Class size | 2 |
| Organization | 2 |
| Poor quality resources /equipment | 2 |
| Assessment | 1 |
| Communication | 1 |
| Curriculum | 1 |
| Infrastructure | 1 |
| Internet connection | 1 |
| iPads | 1 |
| Lack of software/apps | 1 |
| School infrastructure | 1 |
| Staffing | 1 |
| Teacher skills | 1 |
| Teacher support | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 5 |
| Tools | 3 |
| New learning approaches | 2 |
| Student collaboration | 2 |
| Student-centred | 2 |
| Independent learning | 1 |
| Authentic learning | 1 |
| 21st Century skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 3 |
| Student-centred | 3 |
| Relevant | 2 |
| Use of technology | 1 |
| New approach | 1 |
| Creative | 1 |
| Lack of resources | 1 |
| Curriculum restraints | 1 |
| Time consuming | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 4 |
| Support from other teachers | 2 |
| Teacher attitudes | 2 |
| New pedagogy | 2 |
| Curriculum | 2 |
| Resources & infrastructure | 1 |
| Headteacher/senior support | 1 |
| National support | 1 |
| Training | 1 |

## Germany

The survey data for Germany are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 1 | 0 |
| Visualising the planet surface | 0 | 1 | 0 |
| Designing a physics simulation | 0 | 1 | 0 |
| Designing a math learning game | 1 | 1 | 0 |
| Other | | | |

| Barrier | No of teachers |
|---|---|
| Time | 3 |
| Curriculum fit | 3 |
| Student skills | 2 |
| Organization | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 1 |
| Student attitudes | 1 |
| Tools | 1 |
| Creativity | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 1 |
| Creative | 1 |
| Lack of resources | 1 |
| Complexity | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| New pedagogy | 2 |
| Student attitudes | 1 |
| Teacher attitudes | 1 |

## Hungary

The survey data for Hungary are now summarised.

| Learning Story | Majority of teachers confident | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 5 | 6 | 0 |
| Visualising the planet surface | 7 | 8 | 0 |
| Designing a physics simulation | 4 | 3 | 0 |
| Designing a math learning game | 8 | 2 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 24 |
| Internet connection | 13 |
| Student attitudes | 8 |
| School infrastructure | 7 |
| Home resources/support | 5 |
| Lack of resources/equipment | 5 |
| Time | 5 |
| IWB | 4 |
| Teacher skills | 4 |
| Communication | 3 |
| Group work | 3 |
| Organization | 3 |
| Curriculum | 2 |
| Lack of software/apps | 2 |
| Language | 2 |
| Student skills | 6 |
| Technical issues | 2 |
| Administration | 1 |
| Age of students | 1 |
| Class size | 1 |
| Staffing | 1 |
| Student absence | 1 |
| Teacher skills | 1 |
| TeamUp | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student collaboration | 13 |
| Independent learning | 10 |
| New learning approaches | 8 |
| Student attitudes | 7 |
| Tools | 5 |
| 21st Century skills | 4 |
| Authentic learning | 3 |
| Student-centred | 3 |
| Creativity | 2 |
| Attainment | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Creative | 6 |
| Relevant | 5 |
| Use of technology | 5 |
| Lack of resources | 4 |
| New approach | 3 |
| Curriculum restraints | 3 |
| Student response | 2 |
| Student-centred | 2 |
| Seen to be successful | 2 |
| Depends on school ethos | 2 |
| Collaborative | 1 |
| Diversification | 1 |
| Not suited to all | 1 |
| Design process | 1 |
| Flexible | 1 |
| Technical difficulties | 1 |
| Low level of innovation | 1 |
| Problem-solving | 1 |
| Lack of student skills | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 14 |
| Resources & infrastructure | 11 |
| Headteacher/senior support | 5 |
| Support from other teachers | 4 |
| New pedagogy | 4 |
| National support | 2 |
| Training | 1 |
| Curriculum | 1 |
| Flexibility | 1 |
| Student skills | 1 |
| Class size | 1 |
| Involvement in previous projects | 1 |
| Communication | 1 |

## Israel

The survey data for Israel are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 1 | 0 | 0 |
| Visualising the planet surface | 1 | 0 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 0 | 0 | 0 |
| Other | 2 | 1 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 3 |
| Student skills | 2 |
| Class size | 1 |
| Communication | 1 |
| Curriculum | 1 |
| New pedagogy | 1 |
| Lack of resources/equipment | 1 |
| School infrastructure | 1 |
| Student attitudes | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 1 |
| Creativity | 1 |
| Attainment | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student-centred | 4 |
| Simple | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 2 |
| Teacher attitudes | 2 |
| Headteacher/senior support | 2 |
| Training | 1 |

## Italy

The survey data for Israel are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 1 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 1 | 0 |
| Designing a math learning game | 1 | 0 | 0 |
| Other | 6 | 1 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 8 |
| Internet connection | 6 |
| Lack of resources/equipment | 5 |
| Student attitudes | 5 |
| Infrastructure | 2 |
| Student skills | 2 |
| Blogs | 1 |
| Communication | 1 |
| Group work | 1 |
| Home resources/support | 1 |
| Organization | 1 |
| TeamUp | 1 |
| Wider involvement | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student-centred | 3 |
| Student collaboration | 2 |
| Independent learning | 2 |
| Creativity | 1 |
| Authentic learning | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Relevant | 4 |
| Use of technology | 2 |
| Collaborative | 2 |
| Depth of learning | 1 |
| Design process | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 4 |
| Teacher attitudes | 2 |
| New pedagogy | 1 |
| Time | 1 |
| Student skills | 1 |

## Lithuania

The survey data for Lithuania are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 14 | 2 | 1 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 8 | 3 | 0 |
| Other | 0 | 0 | 0 |

| Barriers | No of teachers |
|---|---|
| Time | 12 |
| Student skills | 6 |
| Student attitudes | 4 |
| Organization | 3 |
| Teacher skills | 3 |
| Technical issues | 3 |
| Blogs | 2 |
| Curriculum | 2 |
| Home resources/support | 2 |
| Incompatibility of devices/ software | 2 |
| Internet connection | 2 |
| Lack of resources/equipment | 2 |
| Lack of software/apps | 2 |
| School infrastructure | 2 |
| Age of students | 1 |
| Communication | 1 |
| Group work | 1 |
| Home resources | 1 |
| Language | 1 |
| New pedagogy | 1 |
| Poor quality resources /equipment | 1 |
| Staffing | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 8 |
| New learning approaches | 6 |
| Student collaboration | 4 |
| Creativity | 4 |
| Tools | 3 |
| Authentic learning | 3 |
| Attainment | 2 |
| Teacher skills | 2 |
| Independent learning | 1 |
| Student-centred | 1 |
| Communication skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 6 |
| Diversification | 3 |
| Relevant | 2 |
| New approach | 2 |
| Collaborative | 2 |
| Creative | 2 |
| Depth of learning | 2 |
| Flexible | 2 |
| Student-centred | 1 |
| Use of technology | 1 |
| Lack of resources | 1 |
| Seen to be successful | 1 |
| Inflexibility | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 9 |
| Teacher attitudes | 6 |
| New pedagogy | 4 |
| Support from other teachers | 3 |
| Training | 2 |
| Flexibility | 2 |
| Resources & infrastructure | 1 |
| Headteacher/senior support | 1 |
| National support | 1 |
| Planning | 1 |

## Norway

The survey data for Norway are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 0 | 0 |
| Visualising the planet surface | 4 | 5 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 0 | 4 | 1 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 11 |
| Lack of resources/equipment | 5 |
| Curriculum | 3 |
| Student skills | 3 |
| Internet connection | 2 |
| Class size | 1 |
| Financial | 1 |
| Infrastructure | 1 |
| Installing software | 1 |
| Organization | 1 |
| Poor quality resources/ equipment | 1 |
| Pressure on students | 1 |
| School infrastructure | 1 |
| Student attitudes | 1 |
| Teacher skills | 1 |
| Teacher support | 1 |
| Video | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 4 |
| Tools | 4 |
| New learning approaches | 3 |
| Student collaboration | 1 |
| 21st Century skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Relevant | 4 |
| Use of technology | 3 |
| Student response | 2 |
| Student-centred | 1 |
| New approach | 1 |
| Interdisciplinary | 1 |
| Time consuming | 1 |
| Too soon to say | 1 |
| Poor attainment | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Resources & infrastructure | 4 |
| Training | 3 |
| Teacher skills | 3 |
| Teacher attitudes | 2 |
| National support | 2 |
| Student attitudes | 1 |
| Support from other teachers | 1 |
| Headteacher/senior support | 1 |
| Time | 1 |
| Flexibility | 1 |
| Class size | 1 |

## Poland

The survey data for Poland are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 1 | 1 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 0 | 0 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Lack of resources/equipment | 2 |
| Infrastructure | 1 |
| lack of software/apps | 1 |
| Student attitudes | 1 |
| Student skills | 1 |
| Time | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Tools | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 1 |
| Collaborative | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Teacher attitudes | 1 |
| National support | 1 |

## Portugal

The survey data for Portugal are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 0 | 0 |
| Visualising the planet surface | 7 | 7 | 0 |
| Designing a physics simulation | 4 | 4 | 0 |
| Designing a math learning game | 9 | 4 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 25 |
| TeamUp | 18 |
| Student skills | 11 |
| Infrastructure | 8 |
| Curriculum fit | 5 |
| Internet connection | 5 |
| Teacher skills | 5 |
| Lack of resources/equipment | 4 |
| Student attitudes | 4 |
| Class size | 3 |
| Organization | 3 |
| School infrastructure | 3 |
| Administration | 2 |
| Group work | 2 |
| Home resources/support | 1 |
| iTEC (organizational barrier) | 1 |
| Poor quality resources/ equipment | 1 |
| Pressure on students | 1 |
| Teacher support | 1 |
| Technical issues | 1 |
| Wider involvement | 1 |

| Benefits of LS | No of teachers |
|---|---|

| | |
|---|---|
| Student collaboration | 11 |
| New learning approaches | 10 |
| Tools | 9 |
| Independent learning | 7 |
| Student attitudes | 6 |
| Authentic learning | 3 |
| 21st Century skills | 2 |
| Student-centred | 2 |
| Teacher collaboration | 2 |
| Creativity | 1 |
| Communication skills | 1 |
| Depth of learning | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 6 |
| Relevant | 5 |
| Use of technology | 5 |
| Student-centred | 4 |
| Lack of resources | 4 |
| Collaborative | 3 |
| Creative | 2 |
| Diversification | 2 |
| Not suited to all | 2 |
| Teacher attitudes | 2 |
| New approach | 1 |
| Interdisciplinary | 1 |
| Curriculum restraints | 1 |
| Too soon to say | 1 |
| Low level of innovation | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 10 |
| Support from other teachers | 9 |
| Resources & infrastructure | 6 |
| Teacher attitudes | 4 |
| New pedagogy | 3 |
| Headteacher/senior support | 2 |
| Training | 2 |
| National support | 1 |
| Teacher skills | 1 |

| | |
|---|---|
| Time | 1 |

## Slovakia

The survey data for Slovakia are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 7 | 0 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 3 | 0 | 0 |
| Designing a math learning game | 1 | 1 | 0 |
| Other | | | |

| Barrier | No of teachers |
|---|---|
| Time | 5 |
| Curriculum | 3 |
| Lack of resources/ equipment | 2 |
| Student attitudes | 2 |
| Student skills | 2 |
| TeamUp | 2 |
| Age of students | 1 |
| Assessment | 1 |
| Group work | 1 |
| Teacher support | 1 |

| Benefits of LS | No of teachers |
|---|---|
| New learning approaches | 4 |
| Student collaboration | 4 |
| Authentic learning | 4 |
| Tools | 2 |
| Creativity | 2 |
| Student attitudes | 1 |
| Independent learning | 1 |
| Teacher collaboration | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Relevant | 3 |
| Collaborative | 3 |
| New approach | 2 |
| Student response | 1 |
| Student-centred | 1 |
| Seen to be successful | 1 |
| Interdisciplinary | 1 |
| Simple | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 5 |
| Resources & infrastructure | 5 |
| Support from other teachers | 1 |
| New pedagogy | 1 |
| Headteacher/senior support | 1 |
| Training | 1 |
| Curriculum | 1 |
| Student skills | 1 |
| Realistic approaches | 1 |

## Spain

The survey data for Spain are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 6 | 4 | 0 |
| Visualising the planet surface | 1 | 0 | 0 |
| Designing a physics simulation | 3 | 0 | 9 |
| Designing a math learning game | 2 | 4 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Time | 11 |
| Internet connection | 6 |
| Curriculum fit | 5 |
| Student skills | 4 |
| Group work | 3 |
| Installing software | 3 |
| Teacher skills | 3 |
| TeamUp | 3 |
| Poor quality resources/ equipment | 3 |
| School infrastructure | 3 |
| Age of students | 2 |
| Incompatibility of software/ devices | 2 |
| New pedagogy | 2 |
| Organization | 2 |
| Student attitudes | 2 |
| Language | 1 |
| Pressure on students | 1 |
| Staffing | 1 |
| Student absence | 1 |
| Teacher support | 1 |
| Technical issues | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student collaboration | 6 |
| New learning approaches | 4 |
| Independent learning | 4 |
| 21st Century skills | 3 |
| Student attitudes | 2 |
| Tools | 2 |
| Authentic learning | 2 |
| Creativity | 1 |
| Student-centred | 1 |
| Teacher collaboration | 1 |
| Communication skills | 1 |
| Depth of learning | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student response | 5 |

| | |
|---|---|
| Use of technology | 3 |
| Collaborative | 3 |
| Interdisciplinary | 3 |
| Relevant | 2 |
| Student-centred | 2 |
| New approach | 2 |
| Diversification | 1 |
| Too soon to say | 1 |
| Bureaucracy | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 6 |
| Resources & infrastructure | 5 |
| Teacher attitudes | 5 |
| Headteacher/senior support | 5 |
| Support from other teachers | 3 |
| New pedagogy | 2 |
| Curriculum | 1 |
| Student skills | 1 |

## Spain (Promethean)

The survey data for Spain (Promethean) are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 0 | 0 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 0 | 0 |
| Designing a math learning game | 1 | 0 | 0 |
| Other | 0 | 1 | 0 |

| Barrier | No of teachers |
|---|---|
| Infrastructure | 2 |
| Internet connection | 2 |
| Organization | 1 |
| Group work | 1 |
| Poor quality resources/ equipment | 1 |
| Home resources/support | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 1 |
| 21st Century skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Student-centred | 1 |
| Technical difficulties | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Resources & infrastructure | 1 |
| Headteacher/senior support | 1 |

## Turkey

The survey data for Turkey are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 10 | 4 | 1 |
| Visualising the planet surface | 2 | 1 | 0 |
| Designing a physics simulation | 3 | 1 | 0 |
| Designing a math learning game | 3 | 1 | 0 |
| Other | 0 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| School infrastructure | 8 |
| Time | 7 |
| Internet connection | 6 |
| Student skills | 6 |
| Teacher skills | 5 |
| TeamUp | 5 |
| Teacher support | 4 |
| Communication | 3 |
| Curriculum fit | 3 |
| Lack of resources/equipment | 3 |
| Student attitudes | 3 |
| Poor quality resources/ equipment | 2 |
| School ethos | 2 |
| Technical issues | 2 |
| Financial | 1 |
| Group work | 1 |
| Home resources/support | 1 |
| Language | 1 |
| New pedagogy | 1 |
| Organization | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Independent learning | 6 |
| Tools | 4 |

| | |
|---|---|
| Creativity | 4 |
| New learning approaches | 2 |
| Student collaboration | 2 |
| Student-centred | 2 |
| Student attitudes | 1 |
| Authentic learning | 1 |
| Teacher collaboration | 1 |
| Depth of learning | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Use of technology | 7 |
| Student-centred | 5 |
| Student response | 3 |
| New approach | 2 |
| Relevant | 1 |
| Creative | 1 |
| Lack of resources | 1 |
| Seen to be successful | 1 |
| Depth of learning | 1 |
| Not suited to all | 1 |
| Bureaucracy | 1 |

| Enablers in implementation of LS | No of teachers |
|---|---|
| Student attitudes | 8 |
| New pedagogy | 4 |
| Teacher attitudes | 3 |
| Headteacher/senior support | 2 |
| Curriculum | 2 |
| Resources & infrastructure | 1 |
| Support from other teachers | 1 |
| National support | 1 |
| Training | 1 |
| Time | 1 |
| Flexibility | 1 |

## UK

The survey data for the UK are now summarised.

| Learning Story | Teachers confident it has potential to lead to innovation | Teachers positive but cautious | Small number of teachers disagree |
|---|---|---|---|
| Redesigning School | 1 | 0 | 0 |
| Visualising the planet surface | 0 | 0 | 0 |
| Designing a physics simulation | 0 | 2 | 0 |
| Designing a math learning game | 0 | 1 | 0 |
| Other | 3 | 0 | 0 |

| Barrier | No of teachers |
|---|---|
| Resources | 2 |
| Incompatibility of devices / software | 2 |
| Time | 2 |
| School infrastructure | 1 |

| Benefits of LS | No of teachers |
|---|---|
| Student attitudes | 2 |
| New learning approaches | 1 |
| Student collaboration | 1 |
| Independent learning | 1 |
| Teacher skills | 1 |

| Potential for innovation in LS | No of teachers |
|---|---|
| Depth of learning | 2 |
| Student response | 1 |
| Student-centred | 1 |
| New approach | 1 |
| Seen to be successful | 1 |
| Simple | 1 |
| Design process | 1 |
| Problem-solving | 1 |
| Enablers in implementation of LS | No of teachers |
| Student attitudes | 3 |
| Resources & infrastructure | 2 |
| Teacher skills | 2 |
| National support | 1 |

# Appendix D Dimensions of Innovation

| | | Dimensions of innovation | | | | |
|---|---|---|---|---|---|---|
| | | Educational Outcomes | Educational processes | | | Educational resources |
| | | Learning Objectives | Pedagogy | Learner role | Management of teaching, learning & assessment | Underpinning Technology |
| 1 | **Stage 1 Exchange Localised use** | Activities address isolated learning objectives targeting specific pieces of subject content within the curriculum *such as the life cycle of an insect, or prime factors*. | Technology is used within current teaching approaches as a direct substitute for well established resources, *such as using an IWB as a substitute for a chalkboard, or an e-Book as a substitute for a text book*. | Learner as 'consumer' of learning content and resources, where the content or resources determine the learner's activity. | Learning is directed by the teacher and located within the classroom, with all learners following instruction in step. Technology is used to generate assessment evidence. | Standard technology, such as interactive whiteboards, linear courseware, and websites. |
| 2 | **Stage 2 Enrich Internal Coordination** | Activities address sequences of learning objectives addressing related areas of content | Technology used interactively in support of familiar pedagogical approaches, with | Learner as 'user' of technology tools and resources, *such as office tools and search* | Technology and systems support differentiated provision within the classroom by | Interacting with technology, for example, adding to blogs or wikis, using apps within |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | within a subject domain. | a variety of resources being matched to different learners' needs. | *engines.* The learner chooses the appropriate resources or tools for the task. | providing a variety of entry and exit points to tasks and offering alternative routes through the tasks. Assessment evidence is generated throughout. | a learning platform |
| 3 | **Stage 3 Enhance Process redesign** | Activities address learning objectives that include higher order thinking and key subject specific process skills *such as inquiry skills in science or presentational skills in languages*. | Teaching and learning 'redesigned' to incorporate technology, building on research in learning and cognition. The teacher uses new pedagogies *(such as the learner as teacher or concept mapping)* to develop competences. | Learner as 'producer' and collaborator using networked technologies to model and make *such as learners developing their understanding of a physical, economic, or social process by creating a computer model*. | Technology is used to allocate learning tasks and to track learners progress through a task to assess process skills alongside knowledge and understanding. | Using software to programme, create websites, games, video clips, animations, 3D models etc. 1:1 computing |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | **Stage 4 Extend Network redesign & embedding** | Activities address learning objectives that go beyond traditional subject competencies to include cross-cutting 21st Century Skills *such as collaborative problem solving*. | Teaching and learning distributed, connected and organised around the learner, bridging the gap between formal and informal learning, through extended productive inquiry based learning. | Learners take control of learning using technology to manage own learning, choosing the appropriate resources or tools to support their learning, *such as choosing to join a MOOC to further develop their understanding of a topic.* | Institutionally-embedded technology supports the flow of activities, content and data, providing an integrated approach to teaching, learning and assessment giving the teacher and learner timely data on learners' experiences and achievements. | Use of innovative technology, e.g. 3D printing, Alternate Realities. Using technology across boundaries, for example, integrating products made at home with that in school |
| 5 | **Stage 5 Empower Redefinition & innovative use** | Activities address personalised learning objectives that are negotiated with students and are reviewed and revised throughout. | Ubiquitous, integrated, seamlessly connected technologies support learner choice and personalisation beyond the classroom. | Learner as co-designer of the learning journey, supported by intelligent content and analytics. | Technology supports new learning services that go beyond institutional boundaries, allowing the school to broker services provided by others, such as learner communities of practice. | Mobile and locative technologies supporting 'agile' teaching and learning, that is, responding to situation |

# Appendix E Methodology

## Analytical approach

The data elicited through the teacher survey has been dealt with in two ways.

The country analyses in Appendix C present a summary of the survey responses to the closed question on whether or not the chosen Learning Story had potential to lead to innovation, and open questions on barriers, benefits, reasons for potential for innovation (irrespective of Learning Story) and enablers (coded thematically using NVivo). Data in relation to the open-ended questions have been analysed on a country-by-country basis and then a cross-case analysis has been undertaken.

Open ended questions were phrased as 'What were the main benefits…' and 'What were the main challenges….' Therefore, respondents have not listed all benefits and challenges but the ones that they feel are most important. This has resulted in a wide range of responses to all open ended questions as individuals perceive the relative importance of benefits and challenges differently. In relation to aggregated data any responses given by at least 10% of the respondents have been identified. At country level (where the numbers involved are much lower) the themes arising have been judged to be 'main' (of most importance) if they are referred to in relation to at least 20% of the responses. In countries where data has been collected from fewer than 10 teachers, a theme has only been considered to be 'main' if at least two references are identified.

Country-by-country analysis in relation to the Learning Stories has only been reported (Table 8) when at least five teachers from the same country have piloted one Learning Story.

In the main report, additional analyses have included descriptive summaries of aggregated data from survey questions, acknowledging that there may be bias in the data at the country level due to different numbers of teachers participating in each country. However, it is likely that the variation within a country in terms of teacher practices is large, although of course at the country level (and in some cases regional level) policies and the curriculum will influence teachers.

Qualitative data from the case study interviews and case study reports were coded thematically using a conceptual framework adapted from the SITES2 study (Kozma, 2003, p13). Selected quotations have been used to exemplify the reported findings.

## Amendments to data collection in Cycle 3

In order to minimize the burden on teachers and simplify the administration, the 'About You and Your School' (AYYS) survey was amalgamated with the 'Teacher Questionnaire' (TQ). The administration was also changed from a general link to the survey presented via the iTEC Teacher Community to individual links for each respondent issue via email from SurveyMonkey.

Questions included from the AYYS concern teaching experience, teachers' use of digital tools, recent professional development and school level support. The question about the use of the iTEC online Teacher Community was amended to 'the iTEC website (including the iTEC forum)' to reflect the development of this form of support. Questions on the Learning Story and Learning Activities were amended to reflect the new resources provided for Cycle 3. A question on the participatory design workshop was included as this Learning Activity was considered to be novel for teachers. In keeping with the evaluation approach teachers were asked about the main benefits and challenges.

Teachers were asked about their use of iTEC recommended shells, including questions about the impact of the shell on learning and teaching, and the main benefits and challenges. In addition as blog tools were one of the main technologies recommended to support the implementation, a series of questions were inserted to find out which tools were used, and teachers perceptions about the main benefits and challenges. Teachers were also asked an additional question about the main benefits and challenges of listening to reflections.

A question on the amount of time spent implementing the Learning Story was deleted as in Cycle 1 and Cycle 2 the responses did not appear to be reliable perhaps due to national cultures and the ways in which the question had been translated and/or interpreted. A question on what the teacher would and would not do if implementing the Learning Story again was also deleted as it was considered to overlap with responses to other questions and therefore not provide any useful additional information.

# Appendix F NPC Workshop Minutes

**Flash meeting/recording**: http://fm.ea-tel.eu/fm/b830a5-31234

**Presented by**: Cathy Lewin

**Attendees**: Monica (CNDP), Karine (CNDP), Ildiko (Hungary), Ainhoa (SMART), Jorund Hoie Skaug (NCIE), Jose (DGE), Axel Zahlut (Austria), Pasi Kurtilla (FBE), Viera (Slovakia), Limor (Israel), Andrea (INDIRE, joined towards the end of the meeting)

**Apologies**: None

**INITIAL PRESENTATION**:

**Points covered included**:

Changes to the pilot management tool (inclusion of age range taught, subject, gender, email address). Preference is for one classroom per teacher. A teacher cannot be involved in more than one pilot (country). No 'About You and Your School' questionnaire - some questions have been amalgamated into the Teacher Questionnaire (which has been shortened). The Teacher Questionnaire will be sent by email, reminders to non-responders will be sent automatically. We may ask NPCs to nudge after two reminders. Expect to finish surveys in late November.

Ethics have been strengthened. Countries can act as Data Controller for case study data. Must be registered with the Data Protection Authority in your country, following national institutional ethical approval procedures. Take responsibility for all data collected. Send MMU anonymised data. Follow national guidelines for consent and data handling. Countries can act as Data Processor for case study data (strongly recommended). Consent forms must be signed by participant and NPC - best to send form prior to visit but take spares. Collect from teacher, head teacher, students aged 11 or over, ICT co-ordinator. Parental consent for young people below the age of 16 (11-15 - obtain consent from parents and students). There is now an information sheet for all participating teachers (including non-case study teachers). Raw data should be destroyed once receipt by MMU is confirmed (delete email copies, shred paperwork). Raw data for case study reports should be held in password protected files (securely) and destroyed once analysis of data by MMU is complete.

Separate consent is required for photographs/video. Participating schools may have policies in place that cover this, otherwise parental consent is required. If there are any changes that are required to meet national policies please contact MMU.

Section 6.1, Interview Guidance. Just a reminder that 'probing' should take place particularly if someone gives a 'yes' or 'no' response to a question. You need to ask more to get the detail. For example, 'why' or 'please give me an example'. The interview schedules already have some probes. Ask each question separately not together.

Case study report. Just a reminder that there should be 2-3 paragraphs for each sub-heading. Please use verbatim quotations to evidence the claims.

NPC questionnaire now has an additional question on technical support - please answer with the support of the NTC (if a different person).

iMmS. Remind teachers that it is about their experience and should be reflective. Draw their attention to purpose 1 in the teacher guidance. Remind them that teacher guidance is available.

**ISSUES RAISED**:

Consent forms: Ildiko asked if it is okay to continue to use consent forms that have been developed locally. Cathy recommended scanning exemplar consent forms and amending national ones as necessary. Monica suggested that consent form exemplars could be shared across countries. Jose asked if consent could be obtained orally. Cathy said that a signature is required and therefore oral consent is not adequate.

Ainhoa asked for clarification on how to complete the pilot management tool if more than one teacher was involved.

Monica asked about the advantage of being Data Controller. Cathy clarified and re-iterated recommendation that countries operate as Data Processors.

Case study reports: Ildiko asked if all data should be raw data or if two case study reports should be generated as in previous cycles. Cathy

confirmed the latter. Monica asked for confirmation that it should be 3 case studies altogether. Cathy confirmed.

Surveys: Limor asked if there would be updates about the numbers of teachers completing the surveys as in previous cycles. Cathy confirmed this would be easier to do and therefore could be done more regularly.

Monica suggested that it would be helpful to have examples of good practice.