

iTEC

Designing the future
classroom

Internal Deliverable 5.7

Evidence of the impact of iTEC on learning and teaching

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INTRODUCTION

Decades of research and investment in Europe have demonstrated some key drivers and mechanisms for improving standards in schools by making effective use of technology. Technology enhanced learning remains high on European agendas, embedded throughout Europe 2020, the EU growth strategy for 2010-20¹. The two targets for education are reducing the rates of early school leaving and increasing completion of tertiary education. Another target is to increase employment and this in turn relates to ICT through the recognition of the imperative to develop e-skills and digital literacy through education and training. Indeed, the success of Europe 2020 is considered to be 'dependent on the strategic and effective use of ICT'².

Each country has its own examples of excellent, leading edge schools producing impressive results. However, a clear challenge remains - the mainstreaming gap. The Digital Agenda for Europe, one of the seven flagship initiatives of Europe 2020, highlights the importance of mainstreaming eLearning in national policies (EC, 2012). The use of ICT in teaching and learning is promoted across all subject areas and it has long been argued that technology has the potential to act as a lever for pedagogical innovations (Law, 2008). Yet use of ICT in classrooms is still limited (EACEA P9 Eurydice, 2011; EC, 2013) and where it is used it does not always lead to changes in pedagogical practices (Law, 2009; Shear, Novais et al, 2010).

Since September 2010 the iTEC partnership of leading education suppliers, researchers and European education ministries has been working on overcoming this challenge, through the European Commission supported iTEC project. The outcome is the development of a systemic approach to ensuring that school innovation and advanced teaching practices can be adopted and exploited by all European schools.

Initial project impact has been provided through development and piloting of learning and teaching scenarios in more than 2,000 classrooms in over 17 countries. Through this work the partnership has developed effective mechanisms for ensuring that the advancement of schools, and of teaching practice, keeps pace with changes in society and technology. The evaluation has demonstrated, through 3 cycles of pilots, the positive impact the iTEC process can have. In the final years of the project the evaluation is investigating how iTEC partners are preparing to exploit the outcomes of the iTEC project, and overcome the barriers that may exist to mainstreaming the iTEC process.

The purpose of this document is to highlight, for discussion, evidence from the evaluations of iTEC pilots that supports the hypothesis that iTEC products and processes can impact on key educational policy areas. This summary presents a meta-analysis of the main findings from the evaluation of the first three cycles.

¹ http://ec.europa.eu/europe2020/index_en.htm

² <http://ec.europa.eu/enterprise/sectors/ict/e-skills/>

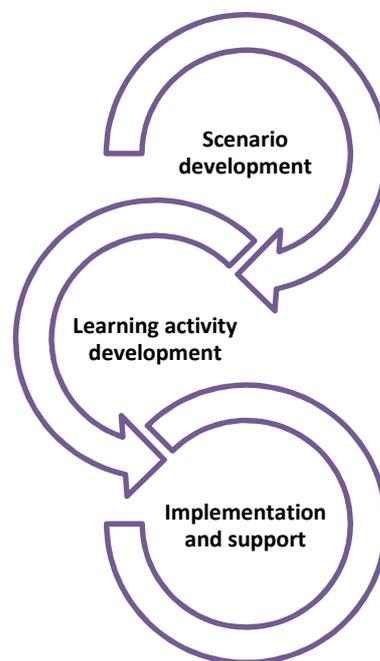
The number of cohorts, teachers and countries participating in the evaluation varied between cycles.

Cycle	No. cohorts	No. teachers	No. countries
1	278	231	17
2	298	262	15
3	403	334	18

At the end of each cycle, all participating teachers were asked to complete an online questionnaire and the national co-ordinators in each country conducted approximately three case studies involving lesson observation and interviews with teachers, head teachers, ICT co-ordinators and students. Full analyses can be found in the full evaluation report for each of the three cycles³.

This summary presents a brief overview of the iTEC process and iTEC resources that have been piloted so far. A meta-analysis of the evaluation data are presented with selected quotations illustrating how teachers, students and others have experienced impact in the first three cycles of the project. Finally, the conditions for success which emerge from analysis of barriers and enablers are briefly described.

Exploitable Results of the iTEC Project



The iTEC process has involved the development of ‘Future Classroom Scenarios’ and ‘Learning Stories and Activities’ to inspire teachers to change their pedagogical practices supported through ICT. Scenarios have been developed through identifying current educational trends (drawing on perceptions of stakeholder groups such as

³ <http://itec.eun.org/web/guest/evaluation>

teachers and students) together with collaborative workshops tasked with developing responses to such trends. Learning Activities and Learning Stories have been developed through a participatory design process with teachers. During this process design challenges have been identified and addressed through the development of prototype resources. Finally the Learning Activities and Learning Stories have been localized and piloted by teachers across Europe, supported by pedagogical and technical coordinators who have provided training and facilitated online and face-to-face communities and workshops.

The central valuable output of the iTEC project is a library of resources that describe innovation in learning and teaching supported by ICT and encouraging advanced pedagogical practices.

iTEC has also provided a package of other outputs (now being piloted) which stakeholders can adopt and use to sustain the work in iTEC and increase the impact of the project.

- **Future Classroom Scenario Toolkit** - The toolkit consists of a set of resources and practices which allow partners and other stakeholders to carry out scenario design at a national, local or community level. The toolkit provides an opportunity for the ongoing development of scenarios tailored to the needs of specific communities and organisations. Within the toolkit there are many elements that can be used or adapted by Ministries of Education (MoE) to support policy initiatives. At the end of the project, EUN intends to utilise the toolkit in order to provide opportunities for MoE to continue to collaborate on international scenario development, perhaps within a dedicated working group that is jointly funded by MoE and industry partners.

The commitment required from ministries here is to promote the use of the toolkit nationally and adopt elements of it in national strategy initiatives. One opportunity, which requires particular consideration, is the value of the toolkit with a “self review framework” for schools, with a process of ICT adoption maturity modelling.

- **Learning Activity Design Toolkit** - iTEC Future Classroom Scenarios are used to develop Learning Stories and Activities that can be used by teachers. The iTEC evaluation of classroom pilots has provided good evidence that iTEC Learning Stories and Activities can promote innovative pedagogical practices in the classroom. Adoption of iTEC Learning Activities has demonstrated increased levels of learner motivation, and greater opportunities for the acquisition of 21st Century Skills and competences by learners, and teaching competencies by practitioners. To provide a sustainable process for the development and sharing of iTEC Learning Activities, the Learning Activity Design Toolkit that can be disseminated to the education community through training.

- **iTEC Teacher Training** - Widespread up-take of iTEC results will require the project to find new ways to provide ongoing training and support beyond the end of the project. With this in mind, the European Schoolnet CPDLab project, in collaboration with iTEC, has produced a five-day CPD course that supports “Implementation of teaching and learning activities for the future classroom based on scenarios that have been developed and evaluated in iTEC”. This includes a suite of iTEC modules and training materials that are currently being delivered face-to-face within the Future Classroom Lab in Brussels. These face-to-face courses can also be localised and adapted for use at national and regional level by educational ministries and other partners. As part of the exploitation plan, further investigation into the integration of this training programme into teacher training is required.

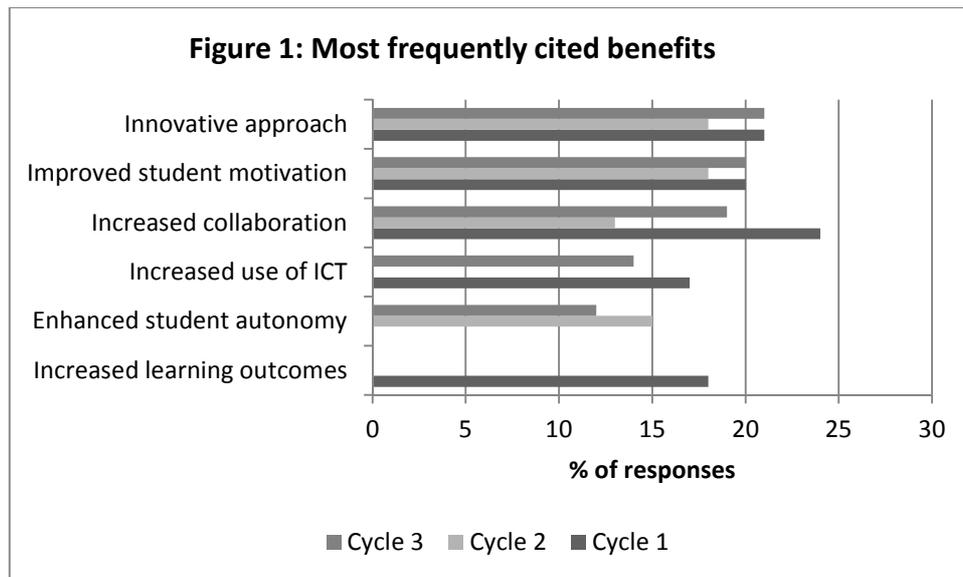
The course is also now being developed for online delivery for unlimited user numbers in the style of a MOOC. This large scale, easy to access and flexible CPD opportunity could successfully result in bottom up impact across the European education landscape if given sufficient support by EUN partners.

- **Widget Store** – This iTEC technology provides an innovative approach to providing teachers and learners with access to learning tools and resources through widgets. The project ‘Widget Store’ can be accessed through a number of platforms. The output of this work is an open source Widget Store. This could be deployed at a number of levels, from a European service, to an individual school.

The Widget Store fills a critical niche within the, now familiar, concept of a content/resource ecosystem. There are a number of possible ‘business’ models that can be explored for its future sustainable exploitation, but it will take a degree of ministry and supplier collaboration and commitment to ensure that the potential of this service is realised, by extending it to work within a larger number of learning environments, and with larger numbers of widgets.

The impact of iTEC

A detailed meta-analysis of the evaluation data over the first three cycles of iTEC shows that there is a positive impact on *students’ knowledge, skills and understanding* – in particular **21st century skills**, their **motivation, engagement and attitudes** and their **learning practices**. iTEC has also had a beneficial effect on *teachers*, impacting positively on their **technology-supported pedagogy, digital competence, and their motivation, engagement and attitudes**. Moreover iTEC is seen as scalable, having the potential to **support pedagogical and technological innovation, to increase the effective use of ICT and to encourage experimentation with innovative technologies and tools**.



In the following sections some of the evidence behind these assertions is set out.

1. iTEC has positively impacted on students

There is a positive impact, ascribable to iTEC, on *students'*

- A. Knowledge, skills and understanding
- B. 21st century skills
- C. Motivation, engagement and attitudes
- D. Learning practices.

A. Knowledge, skills and understanding

63% of teachers (n=826) agreed that the process positively impacted on their students' attainment as evidenced by their assessment data. This assertion was also confirmed in 16 of 47 Cycle 3 case studies.

The students said:

We remember and know more about what we learned – because we had to do newflashes which means that we had to summarise and learn by heart what we learned through the lesson. (Israel. student. C2)

We had possibilities to improve our practical skills. We liked working together, collaborating, creating web-pages, photos, film. We have got a lot of positive assessment, high scores – it's especially inspired us. (Lithuania, student, C1)

The teachers said:

The most obvious main benefit is the incorporation, by means of ICT, of oral work in Physics/Chemistry teaching, subjects where the focus is more usually on written work. This approach allows pupils who struggle with written work, but perform better orally to show their true merit. Taking oral work into account is important in Science because it allows learners to assimilate knowledge better by using several working modes, and it can equally be used within an assessment framework. (France, teacher, C2)

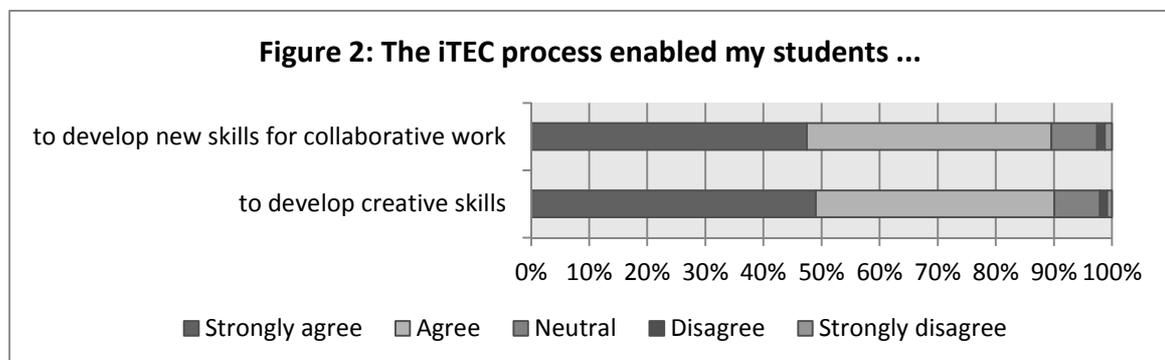
I see [the impact of the iTEC process] from the point of view of the students' attainments. (Italy, head teacher, C3)

And let me say, they do remember the concept of Ohm's law better than anything I have taught them before. (Austria, teacher, C3)

B. Development of 21st Century skills⁴

90% of teachers (n=826) agreed that the process enabled students to develop creative skills. This assertion was also confirmed in 31 of 36 case study reports in Cycle 3 (Figure 2).

90% of teachers (n=826) agreed that the process enabled students to develop new skills for collaborative work (Figure 2).



The development of students' digital literacy skills was identified as a benefit in 30 of 47 case studies in Cycle 3.

⁴ Drawing from the Partnership for 21st Century Skills (<http://www.p21.org/>) and the Assessment and Teaching of 21st Century Skills (<http://atc21s.org/>) the key skills we focus on here are creativity, collaboration and digital literacy.

Students said:

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, C3)

You don't have to think alone and if you don't know something, the others can help you and we complete one another. (Hungary, student, C2)

We've learned to work together. (Hungary, student,

Teachers felt:

The devices are being used a lot. What we see now is that students use them more to create things rather than use them to look up or produce texts. (Belgium, head teacher, C3)

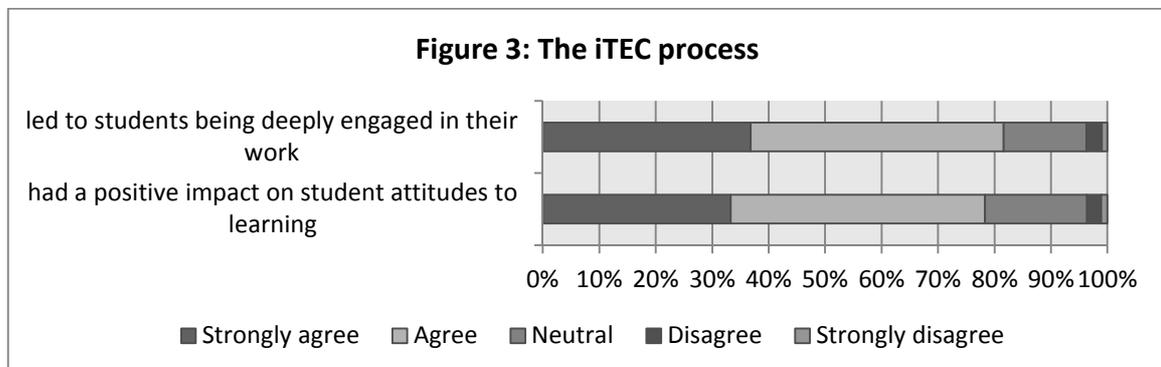
I am totally convinced that the digital learning outcomes have been very substantial, and I think that doing the learning story has prepared the class for using some of the tools in a good way later on. I think that may help increase learning also. (Teacher, Norway, C2)

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 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. (Spain, ICT co-ordinator, C3)

C. Motivation, engagement and attitudes

82% of teachers (n=826) agreed that students became more deeply engaged in their work (Figure 3).

78% of teachers (n=826) agreed that the process positively impacted on student attitudes to learning (Figure 3).



One in five teachers identified increased student motivation as one of the top three most important benefits of the process (particularly teachers from

BE(FL), EE, ES, FR, IS, LT, NO). In cycles 2 and 3 it was the second most frequently cited benefit and in cycle 1 it was the third most frequently cited benefit in an open question on the most important benefit of iTEC (Figure 1).

The case study reports noted:

Students enjoyed the activity. They enjoyed working outside and working in teams. The increased interest for studying in this active way was evident. The approach is definitely innovative; the head of school said that this way of teaching is very innovative, students enjoy it and they remember much more when they have their own experience. (Slovakia, case study report, C1)

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, C3)

The teachers felt:

Children enjoy this kind of work more than a regular lesson. I think that when a teacher has tried this method, he or she would like to continue with it. (Estonia, head teacher, C1)

They even get notices on their telephone every single time one of their friends posts something, so in my view, trying to use a few more methods and resources that pupils are interested in and enthusiastic about, leads to increasing their motivation. (Norway, teacher, C2)

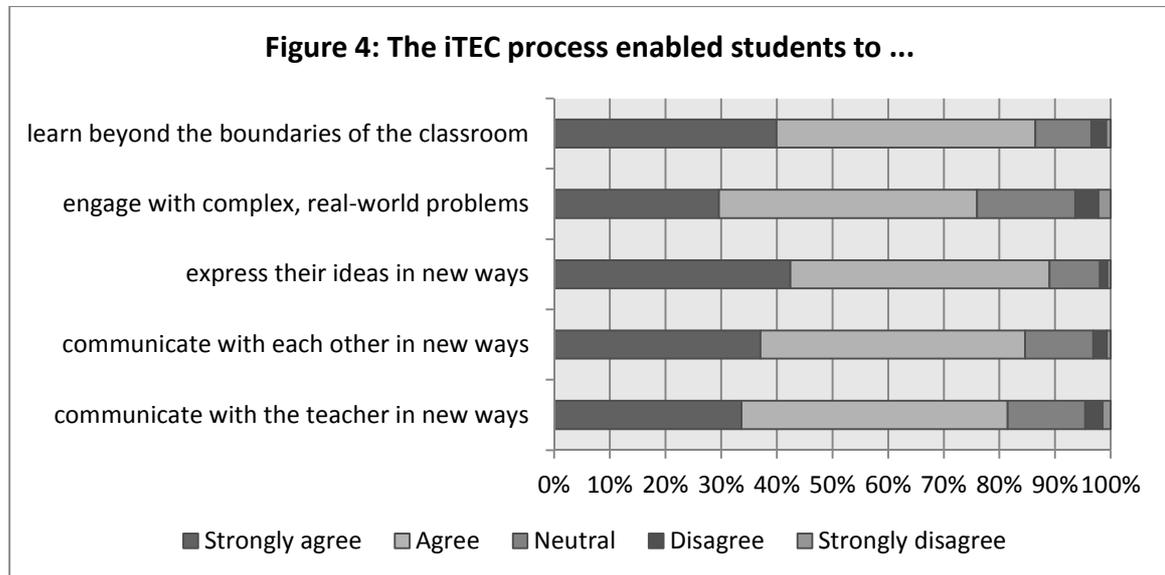
D. Learning practices

90% of teachers (n=826) agreed that the process enabled students to have more opportunities to undertake collaborative work. 91% of teachers (n=826) agreed that the process enabled students to use digital tools to support collaborative work. An increase in collaboration was identified as one of the most important benefits by 24% of teachers in Cycle 1 (the most frequently cited), by teachers from ES, HU and SK in Cycle 2 (the fourth most frequently cited benefit), and 19% of teachers in Cycle 3 (the third most frequently cited, particularly teachers from CZ, EE, ES, HU, IT, PT, SK) (Figure 1).

84% of teachers (n=595)⁵ agreed that the process enabled students to engage in active and independent learning, taking responsibility for their own learning activities and progress. An increase in student autonomy and independent learning was identified as one of the most important benefits in Cycle 2 by teachers from FR, IS, PT, SK and UK (the third most frequently cited) and by

⁵ These data were only collected in Cycle 2 and Cycle 3.

12% of teachers in Cycle 3 (the fourth most frequently cited, particularly ES, HU, IT, PT, TR) (Figure 1).



89% of teachers (n=826) agreed that the process enabled students to express their ideas in new ways (Figure 4).

86% of teachers (n=826) agreed that the process created opportunities to learn beyond the boundaries of the classroom (Figure 4).

Four out of five teachers (n=826) agreed that the process enabled students to communicate with each other (85%) and with the teacher (81%) in new ways (Figure 4).

76% of teachers (n=595⁶) agreed that the process enabled students to engage with complex, real-world problems (Figure 4).

Students said:

As there is task-sharing in the groups we learn to take responsibility and it becomes easier to exchange information from each other. (Turkey, student, C1)

We did some things [we] believed to be wrong (asking other students for the answers), so we were doing it in a corner. But the teachers uncovered us, and told us it was not wrong! [They] encouraged us to do it again. It's way different from the traditional school. (Italy, student, C2)

⁶ These data were only collected in Cycle 2 and Cycle 3.

Teachers and National Pedagogical Coordinators said:

A discussion forum was started on [the VLE] for the students to give positive feedback on the materials. Students were given ground rules that they should give constructive feedback and positive comments. They really enjoyed using the forum to give comments about the resources and each other's resources. (United Kingdom, teacher, C1)

You can see already there has been a change in the culture of learning. The children have changed their interaction with each other. There have been children together who do not work together otherwise. (Germany, head teacher, C2)

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, C3)

The case study reports noted:

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 answer their questions by asking them to try to solve their problems". (Spain, case study report, C3)

The students corrected and helped one another continuously. (Belgium, case study report, C3)

2. The iTEC process has positively impacted on teachers

There is a positive impact, ascribable to iTEC, on *teachers'*:

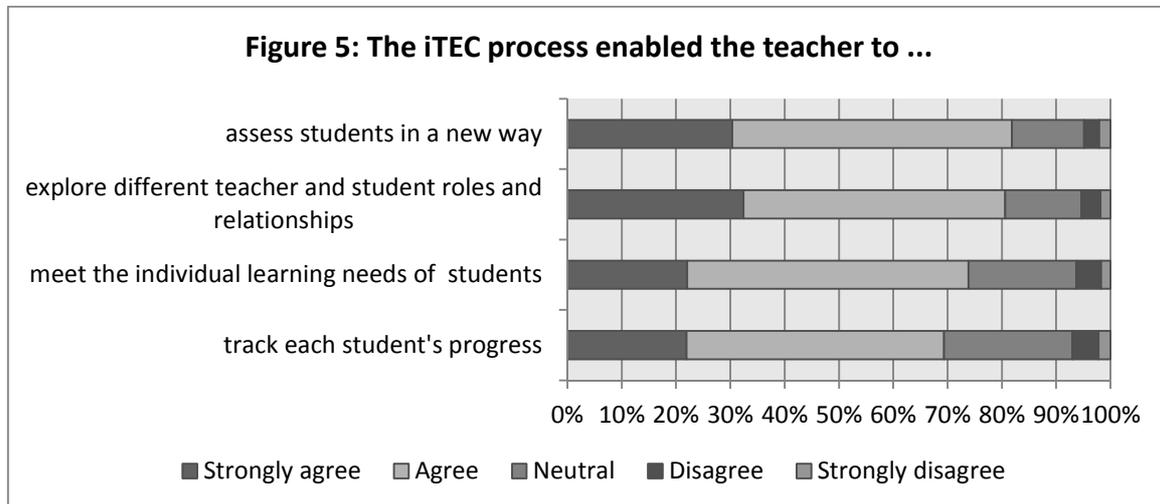
- A. **Technology-supported pedagogy**
- B. **Digital competence**
- C. **Motivation, engagement and attitudes**

A. Technology-supported teaching practices

87% of teachers (n=826) agreed that the process enabled them to incorporate new pedagogical practices. In Cycle 2 and Cycle 3 the most frequently cited benefit of the iTEC process was the introduction of new approaches, identified by 18% and 21% of teachers respectively. In Cycle 1 it was the second most frequently cited benefit (21% of teachers) (Figure 1). Particularly noted by teachers in AT, EE, ES, FI, IS, IT, LT, NO, PT, SK.

86% of teachers (n=826) agreed that the process presented exciting opportunities to do things differently in the classroom.

96% of teachers (n=826) agreed that they would adopt the process again in the future. National Pedagogical Coordinators in Cycle 3 felt confident that innovation in case study schools would be sustained beyond the project in 19 of 36 case studies.



82% of teachers (n=826) agreed that the process enabled them to assess students in a new way (Figure 5).

81% of teachers (n=826) agreed that the process enabled them explore different teacher and student roles and relationships (Figure 5).

75% of teachers (n=826) agreed that the process enabled them to meet the individual learning needs of their students (Figure 5).

70% of teachers (n=826) agreed that the process enabled them track students' progress (Figure 5).

It was noted in case study reports that:

The approach is definitely innovative; the ICT coordinator said that this way of teaching is very innovative, because the majority of teaching at school is front of class teaching (lecture) [and this is not]. (Slovakia, case study report, C1)

According to the teacher, the impact on pedagogy was largely due to the introduction of the new technologies. Thanks to these, kids were more autonomous in their work, allowing teacher to assume a less central role, thus becoming a mere "facilitator". In this way students become more responsible for the construction of their own knowledge and skills. (Italy, case study report, C1)

The ICT coordinator said that the learning story was innovative compared to 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, C3)

Teachers said:

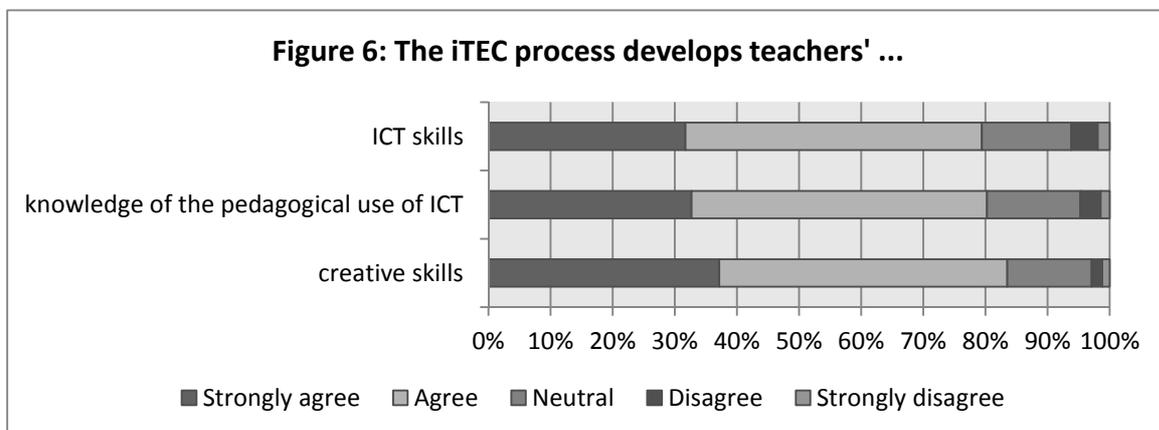
It was more as if I was overseeing [their work]. I checked or guided, I adjusted, but they were the ones who went looking for the information, so I think that in their own school work, it changed a lot of things. It will be helpful for them at secondary school. (France, teacher, C2)

Now I'm way more convinced of the need to push the school practice in this direction, because this enriches the students, offers new learning possibilities, and makes my teaching more interesting. (Italy, teacher, C2)

... it allowed me to assess some things which are not always easy to measure in a normal class. For example, autonomy, creativity, critical thinking, perhaps during a lecture, or even if there is some dialogue or when there is some dynamics, it is always more difficult to assess. With this project, specifically, I got more feedback in these situations and sometimes even surprises with some students... (Portugal, teacher, C3)

So it makes me want to continue. I think that in the future, I will try to make use of projects like that, ones which put them to work researching, with the updates, critiques, peer review, to help guide them afterwards. I think it's more interesting. (France, teacher, C3)

B. Digital competencies



84% of teachers (n=826) agreed that their creative skills had developed (Figure 6).

80% of teachers (n=826) agreed that their knowledge of the pedagogical use of ICT improved (Figure 6).

79% of teachers (n=826) agreed that their knowledge of ICT improved (Figure 6). This was also noted in 9 of 47 case studies in Cycle 3.

Teachers felt:

I wasn't the teacher who was the most... How can I put it? I wasn't the one who used the most computer tools in my classroom. I used them from time to time, but not daily. So there, now, it's really become a class tool... And I am much more comfortable with it. They have made progress, but I think I have too (*Laughter*). I progressed, yes. (France, teacher, C2)

Just the confidence of using technology and gadgets on a daily basis is a huge impact. (Austria, teacher, C3)

A case study report included:

The teacher: "*although there was at school all the necessary technology, I had never thought to use it this way*", for example, to connect via videoconference with an expert. (Italy, case study report, C1)

C. Motivation, engagement and attitude

84% of teachers (n=826) indicated that they would use ICT more often in the future.

73% of teachers (n=826) agreed that they became more enthusiastic about their pedagogical practice. This was noted in 10 of 47 case studies in Cycle 3.

The case study reports noted:

Reflecting on the teacher involved in this pilot, one can say that she had been offered a new method of teaching which directly affects her motivation. Like [Ms L] before, the word inspiration has come along and [Mrs P] believes that this will affect the teaching practices and the attitude of her colleagues, as well as hers, in the long run. (Austria, case study report, C1)

The teacher feels much more motivated his students are learning with enjoyment 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, C3)

Teachers said:

It has [increased my motivation], because for me, I needed to do something different and so in professional terms it has been good because now I don't see myself getting stale. (Portugal, teacher, C1)

From what I can see, a higher student attainment and a higher teacher motivation are the key benefits. (Austria, head teacher, C2)

3. iTEC has the potential to be taken to scale in order to achieve policy objectives

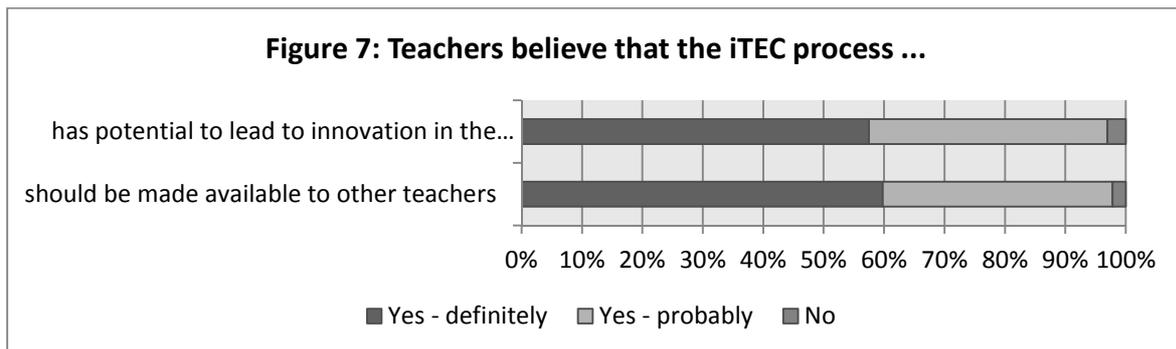
iTEC is seen as scalable, having the potential to:

- A. Support innovation**
- B. Increase the effective use of ICT**
- C. Introduce innovative technologies and tools**

A. Innovation in the classroom

97% of teachers (n=826) were very confident or quite confident that the process has the potential to lead to innovation in the classroom, for a wide variety of reasons (Figure 7).

97% of teachers (n=826) were very confident or quite confident that they would recommend the process to other teachers (Figure 7).



National Pedagogical Co-ordinators (NPCs) in Cycle 3 felt confident that innovation was likely to be transferred within and beyond the participating case study school (27 out of 36 case study reports). There are very early indications that the iTEC process has already begun to transfer without direct intervention. Data from two case studies suggests transfer beyond the participating school. 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.

Teachers commented:

Being part of the first cycle pilot as well, I can tell you that there has been an active exchange between my teachers about pedagogical approaches. So I guess, the impact on the pedagogical side is noticeable. (Austria, teacher, C2)

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, C3)

I am convinced that iTEC is an innovation not only here, in our school but also throughout Hungary. Finally we have something useful in hand as we don’t have learning stories like that, which give us guidelines, step by step description and ideas. I feel strongly that this is something that fills a gap. So I’m pretty sure this will lead to more and more joining us who will incorporate modern technologies and use them in a deliberate way. (Hungary, ICT co-ordinator, C2)

Case study reports noted:

According to the teacher, using videos for learning is not new in itself, the novelty in this experiment is being able to make use of the pupils’ familiar and personal tools. [...] [T]echnological simplicity has made it no longer necessary to be an expert in order to use these tools. (France, case study report, C2)

Teachers talk more to each other about using technology. They work together in an interdisciplinary way using projects. (Belgium, case study report, C3)

B. Increasing the use of ICT

Teachers, and therefore students, increased their use of ICT in the classroom, reporting the use of an average of 8.2 (SD=2.7) different types of ICT (most commonly, data capture devices, digital resources, communication tools, collaboration tools, media authoring tools) to support the implementation. Increased use was identified as one of the most important benefits in Cycle 2 (particularly in ES, NO).

Students said:

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, C3)

The difference between the maths lessons and the other lessons is that in these lessons we work a lot with Geogebra, with Facebook, and with Glogster and we record things and in other lessons we don’t. In the other lessons the most we can do is some work on the computer once in a while. (Portugal, student, C2)

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, C3)

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, C3)

A teacher said:

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, C3)

C. Experimentation with innovative digital tools

60% of teachers (n=826) agreed that they used digital tools that they had not used before. The introduction of new digital tools was identified in the top 5 most important benefits by 17% of teachers in Cycle 1 (5th) and 14% of teachers in Cycle 3 (4th, particularly in FR, NO, PT) (Figure 1).

60% of teachers (n=826) used TeamUp for allocating teams and/or recording reflections.

In Cycle 2 52% of teachers used a social networking site such as Facebook or Edmodo.

In Cycle 3 56% of teachers used blogs to facilitate reflection and communication, these were also referred to in 25 of 47 case studies. They also used SketchUp (6 of 47 case studies), Scratch (10 of 47 case studies)

Students said:

The iTEC lessons weren't completely new because it's the second time for us, but we did new things, like Glogster for example, which I didn't know how to work with and now I do. [...] In the normal lessons, we don't usually work much with computers, or with Facebook. It's a bit of a new thing to work in class with Facebook. It was a very good experience and I hope there will be more. (Portugal, student, C2)

We have made a PowerPoint presentation once or twice, but we don't use computers in our lessons very often. (Estonia, student, C3)

I never worked with Google SketchUp before and because of this project I know how to use it and I also learned how to develop my own blog. (Slovakia, student, C3)

Perceptions of National Pedagogical Coordinators include:

...they also used technology they were not used to: TeamUp, Google docs, Google sites, Picasa. (Portugal, case study report, C1)

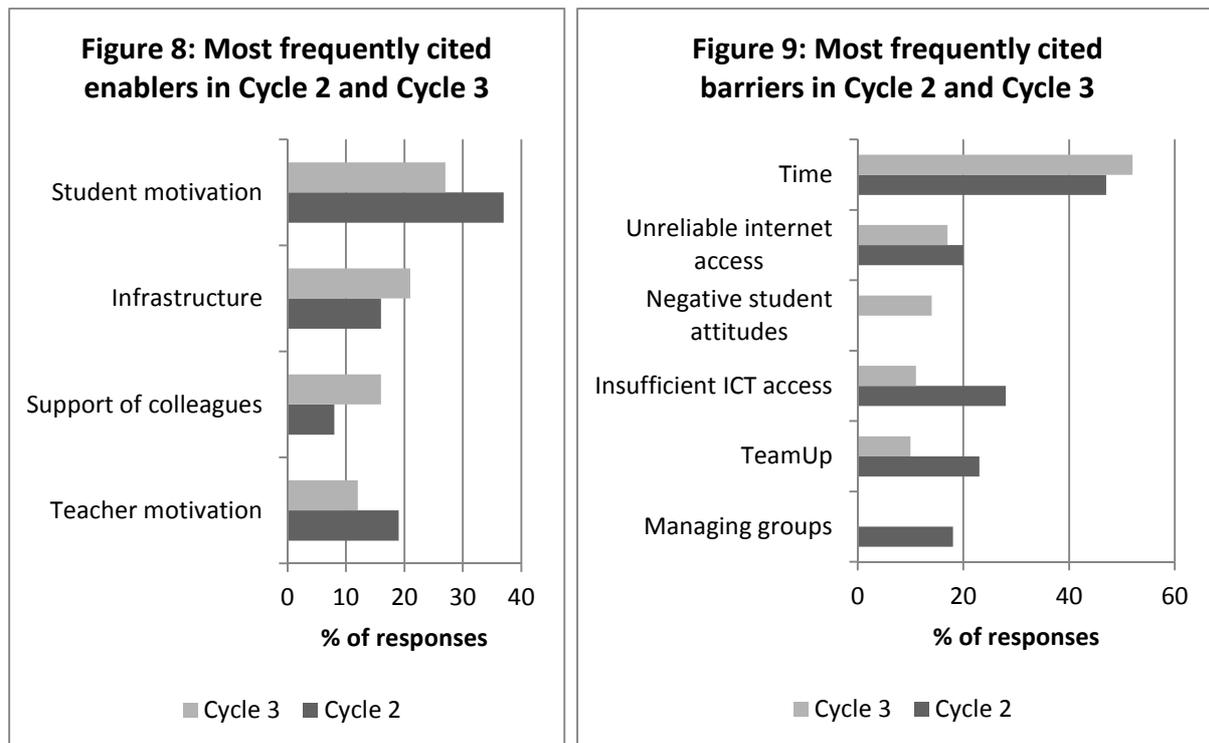
A few [teachers] worked with game design and tried game-based learning in their classrooms. School A worked with different technologies in mathematics (GPS, measuring width, length, diagonals). School A and School B had good results from their project, making guided tours with QR-codes and digital storytelling. (Norway, National Pedagogical Coordinator, C3)

Conditions for success

The iTEC benefits do not accrue automatically, by virtue of their simple introduction. A number of enabling factors affect the impact of the processes and tools developed in iTEC, notably the following six (the importance of each varies according to national and local conditions):

1. **Access to reliable and sufficient infrastructure**
2. **Appropriate school ICT policies**
3. **Pedagogical and technical support for teachers**
4. **Teacher pedagogical and digital competence**
5. **Positive attitudes at all levels towards change**
6. **Suitable digital learning resources**

Conversely, any inadequacy in these conditions is seen as an obstacle.



1. Access to reliable and sufficient ICT infrastructure

ICT infrastructure, including the provision of reliable and sufficient access to the internet, requires further development in many countries.

The second most frequently cited enabler was **reliable infrastructure** identified by 21% of teachers in Cycle 3 (particularly in BE, CZ, ES, HU, NO, SK, UK); also

identified as the third most frequently cited enabler identified by 16% of teachers in Cycle 2 (particularly in FR, DE, HU, IS, SK, TR, UK) (Figure 8).

However, insufficient access to ICT was the second most frequently cited barrier in Cycle 2 (28% of teachers, particularly in AT, ES, FR, HU, IT, LT, NO, PT, SK, TR, UK) and the fourth in Cycle 3 (11% of teachers, particularly in BE, FR, IT, NO, UK) (Figure 9). Furthermore, unreliable access to the internet was the third most frequently cited barrier in Cycle 2 (20% of teachers, particularly in ES, FR, HU, IT, NO, PT, TR) and the second in Cycle 3 (17% of teachers, particularly in BE, ES, HU, IT, TR) (Figure 9). A lack of equipment and resources was also mentioned in 29 (of 47) case studies.

2. Appropriate school ICT policies

There needs to be a flexible approach to the development of local and school ICT policies. In particular, it would be beneficial to explore the adoption of 'Bring Your Own Devices' (BYOD) which can help address ICT access issues.

Smartphones were noted to be an enabler in Austria and France in Cycle 1. Students used the devices to conduct research and capture video and digital images. Although not identified as a main enabler in Cycle 3, a flexible approach to school organization including support for BYOD was perceived to be important in 10 (of 47) case studies.

Outdated school ICT policies did not emerge as one of the most important barriers but was noted in all three cycles. BYOD is one potential solution to insufficient access to infrastructure. It was noted in France in Cycle 1 that national, local and school policies may need to be reviewed in order to realise the full potential of BYOD for teaching and learning. Outdated school ICT policies were identified as a barrier in seven (of 47) case studies in Cycle 3, preventing access to student-owned technologies, and to social media tools like Facebook and Twitter.

Teachers said:

... and there is a way to go for using pupils' telephones because we are not allowed to use them according to the municipal regulations that say that mobile phones shall not be used in teaching, but we know that this tool is worth its weight in gold, for example, using it to film... (Norway, head teacher, C1)

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, C3)

3. Pedagogical and technical support for teachers

ICT technical support and ICT pedagogical support are important enablers.

In Cycle 1 access to technical and pedagogical support were noted to be essential for mainstreaming. Support was identified as one of the most important enablers in NO and ES in Cycle 2. More importantly, support at national level was an integral element of piloting in iTEC. 82% of teachers said that they received training and support from their National Pedagogical Coordinator with 89% of these 671 teachers agreeing that the training was useful for implementing the iTEC process.

Despite this national support, insufficient local support was identified as one of the most important barriers by teachers in Norway in Cycle 2. In Cycle 3, basic technical problems which could have been resolved with adequate technical support were noted in 31 of the 47 case studies.

Such findings are reinforced in a number of studies, most recently the Survey of Schools: ICT in Education (European Commission, 2013) which showed that students in schools where teachers are well supported in pedagogical and technical terms are more likely to use ICT in lessons, regardless of other factors, including student:computer ratios.

4. Teacher pedagogical and digital competence

Teacher confidence and competence in pedagogical uses of ICT are important enablers; it is important to facilitate opportunities for professional development (including formal training, and online and local communities of practice).

In Cycle 1 teacher confidence and competence in pedagogical uses of ICT was seen to be essential for mainstreaming. Inadequate teacher ICT skills were mentioned in 13 (of 47) case studies in Cycle 3 and noted to be one of the most important barriers by teachers in the UK in Cycle 2.

Informal professional development opportunities such as the support of other teachers (either face-to-face or through online communities) was identified as the third most frequently cited enabler in Cycle 3 by 16% of teachers (particularly AT, BE, CZ, PT) and the fourth in Cycle 2 by 8% of teachers (particularly IS and IT) (Figure 8). In Cycle 3 face-to-face meetings were noted to be essential by 10 of 13 National Pedagogical Coordinators, a view shared by teachers and National Pedagogical Coordinators in Cycle 1. Teachers from 16 of the 47 case study schools also noted that iTEC support was beneficial.

As above, such findings are reinforced in a number of studies, most recently the Survey of Schools: ICT in Education (European Commission, 2013) which showed that students in schools where teachers are confident in their operational and

pedagogical use of ICT are more likely to use ICT in lessons, regardless of other factors, including student:computer ratios.

Teacher perceptions included:

What was really good to see was of course the concrete example the teacher from Town A showed us, and how he planned iTEC at another school [...] It was useful, but that is how we teachers are; we like to be inspired from other teachers, and see concrete examples. (Norway, teacher, C1)

The opening 2 days' seminar was very useful. It gave us a clear framework on what we had to do. Sometimes, during the pilot, I'd have needed some technical support. I mean inside the school. We don't have an ICT coordinator, we have just a colleague that is committed to supporting the other teachers in technical issues. It was very helpful in some aspects (internet connection issues, PCs not working, etc), but not in others, eg suggesting hardware or software solutions for the pilot. (Italy, teacher, C2)

My knowledge grew thanks to this project, mostly because of the exchange of ideas with other teachers involved in the project, and different technologies. (Italy, teacher, C2)

The teacher appreciated the preparation workshop. The exchanges with teacher colleagues were a source of ideas for the project. (France, case study report, C3)

5. Positive attitudes at all levels towards change

It is important to foster positive student, teacher and head teacher attitudes to change and innovation.

In Cycle 1 it was noted that students need to be prepared to adapt to unfamiliar pedagogical approaches. A positive student attitude was the most frequently cited enabler in both Cycle 2 (37% of teachers, particularly AT, EE, ES, FR, IS, IT, LT, NO, PT, SK, TR) and Cycle 3 (27% of teachers, particularly EE, ES, FR, HU, IS, IT, LT, PT, SK, TR, UK) (Figure 8).

However, the third most frequently cited challenge in Cycle 3 was negative student attitudes (14% of teachers, particularly FI, IT) (Figure 9).

A positive teacher attitude to change was identified the second most frequently cited enabler in Cycle 2 (19% of teachers) and the fourth in Cycle 3 (12% of teachers, particularly AT, DE, ES, IT, LT, PT, NO). The importance of teachers being prepared to experiment with their approaches and adopt new pedagogies was mentioned in 12 (of 47) case studies in Cycle 3.

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. Furthermore, the most frequently cited barrier identified by teachers in Cycle 2 and Cycle 3 was the lack of time required to prepare and implement the Learning Stories (Cycle 2: 47% of teachers, particularly in DE, EE, ES, FR, HU, IS, IT, LT, PT, SK, TR, UK; Cycle 3: 52% of teachers, particularly in CZ, DE, EE, ES, FI, FR, HU, IS, IT, LT, NO, PT, SK, UK). Whilst lack of time is a frequently cited barrier (eg Becta, 2004) in relation to the integration of ICT, it could in some cases reflect an underlying resistance to change. On the other hand, given the demands made of teachers across Europe, it could be that teachers feel obliged and/or choose to prioritise other activities over the investment required to integrate ICT into their practices.

Although not in the top five, timetabling/curriculum constraints were identified in Cycle 2 by 13% of teachers (particularly in AT, ES, HU, IT, NO, SK, TR) and in Cycle 3 by 8% of teachers. This is also reported in the Survey of Schools: ICT in Education (EC, 2013) for some but not all countries. Rigid national curricula can constrain opportunities for innovation and the development of creative approaches to teaching and learning (Banaji, Cranmer & Perrotta, 2010).

The development of structures and processes to allocate teachers time to develop innovation and engage in professional development should be prioritized. At the same time at local and national policy levels, it would be beneficial to review national curricula with the aim of increasing flexibility for teachers.

6. iTEC resources act as enablers of change in the classroom.

Although not emerging as one of the most frequently cited enablers, some teachers from all three cycles have noted that the iTEC resources were beneficial and flexible. As described above, the iTEC resources have had a positive impact on change in the classroom. Whilst the iTEC support processes such as national coordinators and training have been important, the iTEC resources are one of the main outputs of the project and as such have been the primary lever of change in classrooms.

In the Survey of Schools: ICT in Education (EC, 2013), lack of digital content and of educational resources in the local language were considered an obstacle by both head teachers and teachers, and to a differing extent depending on the country.

Stakeholders have said:

Finally we have something useful in hand as we don't have learning stories like that, which give us guidelines, step by step descriptions and ideas. I feel strongly that this is something that fills a gap. (Hungary ICT coordinator interview, C2)

As in the previous [cycles], 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, National Pedagogical Coordinator, C3)

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 [being centred] in the real world around us. (Turkey, teacher, C3)

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