ITEC - WP 2

D2.2 - SUMMARY REPORT OF SCENARIO DEVELOPMENT PROCESS

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<td>ABSTRACT</td>
<td>This report is the resubmission of Deliverable D2.2 of the ITEC project as described in the Annex 1 – Description of Work (DoW). It is resubmitted on the basis of the review on the 26/27 November. This stated: &quot;Deliverable D2.2 is rejected, and resubmission requested by end M30. The analysis of the different layers of innovation requires further development, especially in relation to the different kinds of innovation taking place in iTEC.&quot; The first draft reported on tasks D2.1 – T2.4 (cycles 3 – 4) as required in the DoW together with a summary of the scenarios and scenario development process in the second year of the project at month 20. The current submission builds on the original report, but with a further discussion on innovation, including the introduction of an innovation matrix that is used to evaluate past and future scenarios showing relative and absolute innovation.</td>
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1 PU = Public
PP = Restricted to other programme participants (including the EC services);
RE = Restricted to a group specified by the Consortium (including the EC services);
CO = Confidential, only for members of the Consortium (including the EC services);
INN - Internal only, only the members of the consortium (excluding the EC services)
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Executive summary

Background

This report is deliverable D2.2 of the iTEC project as described in the Annex 1 – Description of Work (DoW). It reports on tasks T2.1 – T2.4 (cycles 3 – 4) as required in the DoW together with a summary of the scenarios and scenario development process in the second year of the project at month 20. At the point of the D2.2 initial delivery, cycles 1, 2 and 3 have been completed: these ran from September 2010 to December 2011. In this resubmission the completed Cycle 4, which began in January 2012, and the current plan and status of Cycle 5 are also discussed. This is to address the review points, including that around introducing a wider range of scenarios, from highly radical transformations to simpler incremental innovations, even if the former are of more limited reach, and focused on “proof of concept”. However, these two will be described in depth in Deliverable 2.3

A significant focus of cycles 2 and 3 has been the processing of feedback to make improvements in and streamline the scenario development process. In line with the project method of cyclical, iterative development, both the process of scenario development and the content of scenarios themselves have been fine-tuned to incorporate feedback and reflection from completed cycles. In addition to improving how scenarios are developed, this reflection has also helped strengthen the rationale for and use of scenarios, improved the understanding of ‘innovation’ within iTEC and in existing educational practice, and involved important stakeholders like teachers and learners more deeply in the process.

While the overall process of scenario development remained intact across cycles 2 and 3, it was refined to take account of feedback from various stakeholders. This included the Pedagogical Board, the recommendations of the experts from the first European Commission project review and iTEC partners. By using this multi-faceted feedback, it has been possible to interrogate, challenge and refine scenarios in ways that were not possible in the first cycle.

Similar to iTEC’s first cycle, both cycles 2 and 3 began with development and analysis of a list of trends relevant to education in Europe. While the cycles’ processes were similar, their focuses and detailed organisation were unique (i.e. each had a specific theme of trends or set of workshop attendees). In each cycle, a set of 16-20 scenarios were developed using a range of ‘building blocks’, including the trends, teacher and learner input and possible uses of technologies. These were then further developed in collaborative workshops involving teachers, pedagogical and technological experts and iTEC partners. One significant difference in the two cycles was that, in cycle 2, scenarios were developed collaboratively in a workshop in response to individual trends, whereas cycle 3 scenarios were derived from examples of innovative practice collated from iTEC partners and desk research, then drafted by Futurelab and refined in collaborative workshops. As a final step in both cycles 2 and 3, the wider sets of scenarios were evaluated via surveys to identify which 8-10 should go forward in the iTEC cycle and be further tested for possible piloting.
Both cycles have been enhanced by ongoing research into relevant topics that extend project knowledge in areas of teaching and learning (e.g., research into pedagogical approaches, changing nature of knowledge) and internal iTEC understanding (e.g., the meaning of ‘innovation’ in the iTEC context).

**Main activities and achievements**

The main activities and related achievements undertaken by WP2 as reported in this deliverable are as follows:

**Trend descriptors identification:** Trend descriptors were produced at the outset of both cycle 2 and 3 through a collaborative process involving WP2 partners. Each cycle’s set of trends had a specific focus: current political and economic issues of pressing relevance to education and teachers’ realities (cycle 2) and learners’ realities (cycle 3). By creating scenarios that respond to identified trends, the resulting scenarios are meaningful to the stakeholders and their institutions.

**Scenario development and selection:** The scenario development and selection processes for cycles 2 and 3 were highly collaborative and adapted according to feedback from previous cycles. Scenarios responded to a range of ‘building blocks’, including trends, existing examples of innovative practice, input from stakeholders and workshops with professionals. Within these two cycles, there was an increased emphasis and intention to develop variety within scenarios and to ensure diversity in terms of pedagogy, assessment and technologies. As a result of this process, 10 detailed scenarios were developed in cycle 2 and 7 were developed in cycle 3.

**Stakeholder involvement:** Throughout the scenario development and selection process, various stakeholders were engaged in creating and evaluating the scenarios in the following ways:

- Partners’ identification of 23 examples of innovative practice to help develop scenarios
- 5 learner workshops in 4 countries that gathered views on what they would like the future classroom to include
- Significant response to teachers’ survey and learners’ online activity on perceptions of the use of technology in classrooms
- 3 scenario development and evaluation workshops for professionals (teachers, pedagogical and technological experts, iTEC partners) in 2 countries.

**Development of an iTEC Innovation Sub-group:** WP2 organised and facilitated the sub-group, which is comprised of members of 6 work packages across both pedagogical and technical work packages. Its remit was to develop a consensus and understanding of the meaning and application of ‘innovation’ in the context of iTEC. It has produced a working
definition of ‘innovation’ within iTEC and contributed towards a mapping tool and the innovation matrix, the latter recommended by the expert panel at the first Annual Review.

**Development of a definition of innovation in the iTEC context:** This was developed through a combination of discussion with expert partners in the Innovation sub-group combined with established definitions for innovation from within the fields of education research and industry. Innovation was defined to be **potentially scalable learning activities that provide beneficial pedagogical and technological responses to educational challenges and opportunities.** A scenario could be innovative through **process,** so how technology is used to change the actual teaching, or **product/output,** so what has been produced as a result of the scenario.

Finally, it was noted that innovation can be described using a maturity model as it is dependent on context; for example, in a school with limited technology the introduction of interactive white boards and teachers using them to present information might be highly innovative. Yet in another school this may be common practice and therefore far from innovative.

**Additional research:** To support the scenario development process and better understand their relationship with other work across the project, WP2 undertook additional research across the two cycles. As well as the development of a definition of ‘innovation’ within iTEC and the mapping tool and matrix as discussed below, there was a collation of existing examples of innovative practice, and consideration of the European Framework for Key Competences.

**Development of a mapping tool:** This was created at the same time as the definition of innovation with the same participants from across the iTEC project. It has three purposes:

- to demonstrate the diversity of scenarios by mapping and comparing their constitutive elements and subsequent levels of innovation
- to identify any gaps that have not been covered by scenarios in cycles 1, 2, and 3 and that could be addressed in cycles 4 and 5
- to support the scenarios to remain consistent and composed of the same elements throughout the iTEC process

**Development of an innovation matrix:** In developing the matrix we have looked to established methodologies for evaluating innovation from outside the world of education, including the OECD Oslo Guidelines for Collecting and Interpreting Technological and Innovation Data. It also incorporates an extensive literature on ‘maturity models’ setting out the discrete stages in developing new approaches. Taken together the matrix provides:

- a tool to measure absolute level of innovation
- a tool to measure relative levels of innovation
• an ‘innovation ladder’, which can help schools and localities identify their current stages of innovation, as mentioned identifying local context is necessary to determine if a scenario is innovative in that situation
• an organising framework for the scenarios, clearly identifying the stages of innovation where each scenario sits
• a stimulus to the production of more innovative scenarios.

**Involvement of the Pedagogical Board:** The Pedagogical Board was comprised of 4 pedagogical experts from across Europe who completed a number of activities in cycles 1 and 2 to provide feedback on the scenarios and the development process. This feedback fed into some of the adjustments affecting cycles 2 and 3.

The remit of the Pedagogical Board has been subsumed into the Integration Committee. This new Committee also builds on the work carried out by the Innovation subgroup to draw on internal expertise within iTEC and to encourage collaboration between pedagogical and technological partners.

**Next steps**

At this stage of the project it is necessary to identify what can be feasibly achieved within the scope of the project. In collaboration with European Schoolnet and upon reflection of challenges identified in cycles 2 and 3, a number of modifications to the scenario development process were proposed and introduced in later cycles.

In Cycle 4 scenarios were developed through a workshop with a small group of teachers that were circulated online for comment. In addition, the review process was amended as follows:

- The mapping tool was used to show the diversity of scenarios – which allowed them to be amended if too similar in pedagogic or technology areas
- A dimension review performed by experts based on the innovation research by WP2. The groups looked at all scenarios and identify what activities were innovative and what could be barriers that need to be included or addressed in the development of learning activities by WP3

In Cycle 5 two ways of creating scenarios to address innovation and ownership are in progress.

- To create a toolkit so that all teachers and other stakeholders within all the countries taking part can create scenarios that are meaningful to them
- To design and hold a workshop with European technological and pedagogical experts, including TEL researchers, to create more radically innovative scenarios that
respond to key research – these will take account of new technologies but are not driven by the agenda of technology providers

The result will be scenarios embedded in context with ownership by stakeholders and scenarios that could become small-scale pilots contemplating transformative innovations in European schools - which are distinct from an unrealistic focus on blue-sky scenarios. These changes will help improve the integration of the technological and pedagogical partners across different work packages, more seamlessly incorporate iTEC technologies into the scenarios, and more deeply involve stakeholders – particularly teachers – in the scenario development process. Teachers will be integrated into the scenario development process through online engagement, ideally leading to: more long-term, meaningful engagement and creation of scenarios that are relevant and engaging to teachers across the wider iTEC community and a teachers’ network and model of scenario development which can be sustained throughout the project and beyond.

**Structure of the report**

The structure of the report is as follows:

- Introduction
- Background to the iTEC scenarios
- Innovation within iTEC
- Production of the cycle 2 scenarios
- Production of the cycle 3 scenarios
- Beyond cycle 3
- Pedagogical Board perspectives
- Dissemination and impact
- References
- Appendices
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1. INTRODUCTION

This report is Deliverable D2.2 of the iTEC project as described in the Annex I - Description of Work (DoW).

“D2.2) Summary Report of scenario development process: A report that includes the agreed list of trends and drivers affecting education taken from T2.1-T2.4 (cycles 3-4) together with a summary of the scenarios and scenario development process in the second year of the project. [Month 20]"

The initial D2.2 summary report was completed at month 20. At this point, the scenario development process in cycles 1, 2 and 3 had been completed. These ran from September 2010 to December 2011. Cycle 4 began in January 2012 and was completed at the end of May 2012. This resubmitted Deliverable focuses in detail on the completion of cycles 2 and 3 building on Deliverable D2.1 as a baseline description of the scenario development process\(^2\). The later cycles are mentioned to illustrate how concerns raised round innovation in scenarios are being addressed; they will be discussed in depth in Deliverable 2.3.

The resubmitted Deliverable (D2.2) reports on tasks T2.1-T2.4 as required in the DoW together with a summary of the scenarios and scenario development process in the first year of the project. It is divided into the following sections:

1. Introduction
2. Background to the iTEC scenarios
3. Innovation within iTEC
4. Production of the cycle 2 scenarios
5. Production of the cycle 3 scenarios
6. Beyond cycle 3
7. Pedagogical Board perspectives
8. Dissemination and impact
9. References
10. Appendices

D2.3 will similarly report on T2.1-T2.4 together with a summary of the scenarios and an in depth description of the scenario development process for cycles 4 and 5 (month 34). D2.4 will draw final conclusions on WP2 scenarios in the context of D5.5, the iTEC final evaluation report from WPS (month 48).

\(^2\) D2.2 is intended to be read alongside D2.1 given the overlap in the activities covered and to avoid duplication between the reports.
1.1 Introduction to the iTEC scenarios

As noted above, the scenario development process was outlined in Deliverable D2.1 and builds upon a range of scenario development techniques and consensus building tools such as Delphi. (See D2.1, Section 1.2 Cycle 1. Production of the scenarios.) The scenario development process has been fine tuned over the course of the cycles to take account of: the monitoring of the process; a deepening understanding of the work and its context; and the recommendations of the experts from the first European Commission project review held in Brussels in September 2011. These changes will be outlined in this Deliverable and the rationale for the improvements will also be given.

1.2 Overview of the cycle 2 and 3 scenarios

As noted above and outlined in Deliverable D2.1 (in Section 1.1.3 of that report), the iTEC scenarios are short narrative descriptions of preferable learning contexts which facilitate more engaging classroom intended to inspire teachers. The scenarios take account of different elements within the learning environment. Over the course of three cycles, these were fine-tuned. The changes are presented in Table 1.

Table 1: Elements in the scenario – modifications across cycles 1 - 3

<table>
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<tr>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
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<tr>
<td>Activities and tasks (what happens in the scenario)</td>
<td>The following were added:</td>
<td>The following were amended to clarify content:</td>
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<td>Environment (where the scenario is happening)</td>
<td>Vision (aspirations and aims)</td>
<td>Roles became ‘people and roles’</td>
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<tr>
<td>Roles (who is involved in the scenario)</td>
<td>Background motivation (rationale)</td>
<td>Interactions between the other elements became ‘interactions (including pedagogies)’</td>
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<tr>
<td>Interactions between the other elements (how the scenario happens)</td>
<td>Trends (which trend is the scenario responding to)</td>
<td>Resources became ‘resources’</td>
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<tr>
<td>Resources (what is required to support the scenario).</td>
<td>Key concepts (main ideas)</td>
<td>Vision became ‘core purpose’</td>
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The refining of the elements in cycles 2-3 built on: experiences from cycle 1 (and subsequently cycle 2); feedback from members of WP3 based on their experiences of working with teachers to develop the scenarios; and the reflective commentaries on the cycle 1 scenarios provided by the Pedagogical Board. The format of the scenarios was also modified slightly to take account of feedback from WP3 that setting out the different elements of the scenario separately rather than embedding them mainly in the narrative overview (as in cycle 1) made the scenario clearer and the main points quicker to grasp.

The evolution from 'interactions' in cycle 1 through to 'possible approaches to teaching and assessment' in cycle 3 was influenced by several factors including the views of the Pedagogical Board. In the reflective commentaries on cycle 1 (taken fully into account in cycle 3), the Board was constructive in their criticism. They noted a lack of variety in the scenarios and that most were based on either project-based learning or problem-based learning approaches. In addition, they commented that the scenarios did not adequately overcome the 'documented pitfalls' of using such approaches. In response to this, WP2 prepared a document for distribution to participants at the cycle 3 scenario development workshop. This document summarised pedagogical approaches (see Section 5.1.2 for a full account). It was done in order to encourage participants to widen approaches beyond project-based or problem-based learning and to deepen thinking within the approaches. Given that the scenario headings were part of the template which participants completed at the workshop, the re-labelling was important for guiding participants to consider wider approaches. In addition, awareness was growing – particularly through the mapping of the constitutive elements of the scenarios which was done as part of the mapping process (see Section 3.5) that many of the scenarios did not have adequate assessment measures embedded within them. Therefore the template was updated with the label 'assessment' to remind participants that assessment or some element of assessment should be included in each scenario. While the 'trends' heading was added to show scenarios respond to particular trends.

The scenario development process led to the production of 10 detailed scenarios in cycle 2 and 7 detailed scenarios in cycle 3 (see summaries in Appendices 1 and 2).
Cycle 2: summaries of the detailed scenarios

1. **Combining formative and summative assessment**: Teachers use a classroom response system to assess students’ understanding and knowledge of a topic. This information is represented within a class wiki. Students are organised into teams to carry out research to address gaps in knowledge. Support for students comes from teachers, other students and experts via the “people bank”.

2. **Developing collaborative approaches to learning about business**: Students design a business idea mapped to the school curriculum. They support development of their entrepreneurial skills and knowledge through real-life, authentic tasks. The student and teacher set up a virtual “hatchery” to hatch or develop ideas supported by parents, local businesses and schools as well as the “people bank”.

3. **Embedding exam preparation in learning activities**: The scenario provides both teachers and students with useful and innovative ways of using technology to build a bank of resources that can be used for ongoing learning and revision. This enables the teacher to introduce transferable skills and cross-curricular activities whilst still addressing the certification needs of the students.

4. **Mathematics in a multicultural setting**: This scenario uses the language of mathematics to improve participation and communication in a multicultural setting. Using simple and authentic questions and challenges, activities will be informed by research carried out by additional language students and worked through in multiple languages.

5. **Mentoring teachers to improve digital literacy**: This scenario supports action-based teacher collaboration and professional development through the fostering of students' and teachers’ digital literacy. Through peer and network learning, as well as drawing on the expertise of students, teachers’ digital literacy skills are developed.

6. **Our school, our environment**: Using technology to raise environmental awareness. This scenario raises students' awareness of climate change and how to manage energy use. It involves working with the wider community and active monitoring devices and other measures to estimate the school's carbon footprint.

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3 The “people bank” is a database of experts being set up by European Schoolnet. It will be populated with people who are easily contactable by schools and willing and able to support learners. It will be a resource through which teachers are able to straightforwardly ‘bring in an outside expert’.
7. **Professional development in the global classroom:** This scenario encourages teachers to become networked in order to support trying out and co-development of new innovative practices. Teachers give each other support across different countries and students have the opportunity to share their work in these alternative settings.

8. **Researching online social behaviour:** Students research online behaviour to share experiences with peers and develop an understanding and guidance for managing their online identity and activities. Students present their findings in the format of their choice, for instance video, podcast, poster, presentation.

9. **Students creating science learning resources:** Students support one another to learn difficult concepts in science. They create their own "virtual science museum exhibit" alongside sample problems to teach a concept from the curriculum.

10. **Using multiple resources and technology to research a common topic:** This scenario develops students' skills to recognise what resources are appropriate and valid and when they should be used. It aims to challenge some students' overdependence on the internet.

Within the 10 detailed scenarios, the main focal point for seven of them is on supporting learners directly to take up new practices. Two of the scenarios are aimed at enhancing teaching and learning and have an element of the development of teacher competencies which is more explicitly stated. These are: **Combining formative and summative assessment; and Mentoring teachers to improve digital literacy.** The scenario, **Professional development in the global classroom**, is mainly focused on teacher development. The focus on developing teacher competencies within cycle 2 is unsurprising given that the trends – the short descriptors of challenges/possible changes to education – were focused in this cycle on two areas, one of which specifically included responding to teachers’ concerns:

- current economic and political issues of pressing relevance to education;
- realities of teachers (see below).

The scenarios cover a range of subjects with the majority being cross curricular (6), science (3) and mathematics (1)\(^4\). There are a variety of pedagogical approaches – instructional design, project-based learning, enquiry-based learning, game-based learning and thematic learning. Whilst not one of these dominates overall, there are elements of enquiry-based learning within 6 of the scenarios. Most of the scenarios deploy a range of approaches. For instance, **Embedding exam preparation in learning activities** combines instructional

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\(^4\) This comparison of the constitutive elements of the scenarios was done using the mapping tool described in Section 3.5.
design with project-based learning. In terms of the potential benefits of the scenarios, an increase in digital competencies, potentially for both teachers and learners, is expected for nearly all of the scenarios. Most of the scenarios include a range of assessment methods including peer, formative and summative and elements of review and reflection intended to encourage learning. A range of technologies are advocated for use in the scenarios, particularly video cameras and video sharing sites such as YouTube; collaboration tools such as blogs and wikis; and Learning Management Systems and Virtual Learning Environments. This reflects the potential embedded within most of the scenarios to enhance learners’ collaboration, communication and self-management skills.

Cycle 3: summaries of the detailed scenarios

1. **Designing maths games**: This scenario introduces students to the skills of computer programming and develops their mathematical skills through the creation of interactive games using simple, intuitive online programming software such as Scratch.

2. **Designing with multi-touch technologies**: The scenario supports student collaboration and comprehension of difficult concepts in design and technology through the use of multi-touch technology. The multi-touch applications students work on are networked to the main classroom interactive whiteboard so that each group’s progress can be demonstrated throughout the lessons.

3. **Digitally mapping local biodiversity**: This scenario develops students’ knowledge of local ecosystems and digital mapping skills through outdoor learning. It engages them in scientific understanding of the local area and in species identification via online repositories and interaction with experts. It supports them to use digital media effectively to communicate their knowledge and opinions to others.

4. **Home-school communications**: This scenario uses social media to encourage three-way communication about learning between teachers, students and parents/carers in order to begin to bridge the gap between home and school.

5. **Homework and school work “flip”**: This scenario enables a radical transformation of activities, relationships and expectations by “flipping” the core element of the educational experience: school time and homework time.

6. **Schoolville**: This scenario uses the tools and principles from video game design and social networking to foster cross-curricular learning with an emphasis on citizenship.

7. **Virtual engines**: The scenario deploys simulation software to create virtual prototypes that behave realistically according to the laws of physics. This enables the possibility of recreating authentic conditions in which learners can experiment with decision making, problem solving and where learners can experiment with far reaching ideas in a safe environment.
Cycle 3 responded to trends identified in relation to the realities of learners. Following on from that, all 7 detailed scenarios focus directly on enhancing teaching and learning directly for students. Again, the scenarios cover a range of subjects with more concentration on mathematics (5) and technology (5), science (2) and cross-curricular (2). Additionally, most of the scenarios again combined different pedagogical approaches with a balance of the following embedded within them: instructional design, project-based learning, enquiry-based learning and game-based learning5.

More of the scenarios in cycle 3 deployed game-based learning approaches than in previous cycles as the mapping tool had highlighted that these were barely represented in previous cycles. In relation to student competencies, cycle 3 scenarios have the potential to enhance a broader set of competencies such as digital competence; interpersonal, intercultural and social competences; Learning to Learn compared with the scenarios in cycle 2. Again, this is unsurprising given the emphasis placed on these at the scenario development workshop (see Section 5.1.5).

As in cycle 2, there were a range of assessment methods or elements of assessment within the scenarios. These include self, peer, formative and summative assessment and review and reflection. The technologies emphasised in the scenarios were similar to those in cycle 2 with the exception that virtual experiments and simulations were further emphasised during the scenario writing and at the workshop to address the lack of scenarios containing these elements in previous cycles as identified through development of the matrix. Again, the use of tools for collaboration and communication, which were embedded within the scenarios, was underlined by activities designed to develop these skills in learners.

1.3 How the trends and drivers underpin the iTEC scenarios in cycles 2 and 3

As outlined in Deliverable D2.1, trends and drivers were identified from which to develop 'short descriptors' of the challenges and possible changes to education (formal and informal) in cycles 1-3. Appendix 3 lists the top trends and drivers identified for cycle 2; Appendix 4 lists the top trends and drivers which were identified for cycle 3. These in turn became the drivers for the scenarios. In cycle 1, pedagogical and technological trends were identified. As noted in Deliverable D2.1, this generated trends which were quite general and it was decided to be more specific about the trends and drivers to be identified in future cycles to ensure coverage across a wider set of themes. In cycle 2, trends focused on two different areas:

- Current economic and political issues of pressing relevance to education;

5 Again this was determined using the mapping tool described in Section 3.5.
• Realities of teachers in Europe.

This produced 29 leading trends. As these did not fall easily into themes a decision was made to retain the two headings above and cluster the scenarios under these.

In cycle 3, it was decided to focus on learners' realities to balance the focus on the project up to this point on teachers. It was also considered essential to take account of challenges and changes to education affecting learners. From this process, five main themes emerged:

• information literacy is not keeping abreast with the amount of information available;
• growing awareness that disaffection and low attainment in relation to the MST subjects (Mathematics, Science and Technology) and in general are related to inequalities and social background;
• what motivates students? There is an increasing understanding across education systems in Europe – and globally – of how technology and a focus on emotional well-being can be effective to motivate young people, and help them engage with important subjects like MST;
• young people are always connected and make heavy use of digital media and this is posing challenges to teachers and education systems who are yet to identify consistent and effective responses;
• increasing frustration of young people with typical classroom activities.

1.4 Examples of scenarios

Four detailed scenarios are provided here as examples of scenarios selected by stakeholders and those that were not. In Cycle 2 Combining formative and summative assessment was chosen for development while Music for inclusion and integration was not. In Cycle 3 one of the seven detailed scenarios developed was Designing maths games, while The Helpful Hologram was not. The format of the scenarios reflects the change in focus described in Table 1. As noted above, the template for scenarios specifically contains a trend section to make it clearer that scenarios are responding to particular trends and what the trends are.

<table>
<thead>
<tr>
<th>Combining formative and summative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vision (aspiration and aims)</strong></td>
</tr>
<tr>
<td>• to combine elements of formative and summative assessment</td>
</tr>
<tr>
<td>• to use feedback and technology to enhance teaching and learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Background motivation statement</th>
</tr>
</thead>
</table>
| In response to evidence that formative assessment can greatly enhance learning alongside the demands of a national summative assessment system, teachers can use feedback from technology to combine formative and summative assessment. Additionally, teachers enhance their own professional development by developing formative assessment techniques and using the supporting
I am a science teacher who wants to combine elements of formative and summative assessment to enhance my teaching and my students’ learning. First of all I choose a topic from the curriculum and I prepare a test to assess my students' understanding and knowledge of this topic using a classroom response system. With this information I begin to develop a class wiki with headings based on the outcomes of my students' knowledge and the areas that they are struggling with.

Students are organised into teams (mixed or similar ability or a combination of both) and must complete assigned sections of the wiki based on the data from the classroom response assessment and other observations and evaluations I have made during the teaching of this topic and class. In the next lesson the class build the wiki using the headings as a framework, carrying out research, and using the web and other traditional resources like textbooks.

I directly moderate the teams working on the ‘misconceptions’ area of the wiki, providing them with personalised support. I encourage the students to support each other in identifying and addressing common misconceptions. Students will demonstrate their understanding of the topic by composing tests using the classroom response systems. Regular opportunities to reassess learning are available. For some of the more challenging topics support also comes from a “people bank”. Some of those in this network of teachers, experts and other classrooms have agreed to act as moderators of the “advanced” section of the wiki, as well as evaluators of the quality of the knowledge produced by the students. Depending on the feedback gathered, students progress to more advanced sections of the wiki, and more sections are added to accommodate the progression of the class.

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Environment</th>
</tr>
</thead>
</table>
| Formative, personalisation, wiki, adaptive teaching, experts | • classroom  
• wiki space  
• learning management system (LMS) |

<table>
<thead>
<tr>
<th>People &amp; roles</th>
<th>Interactions (incl. Pedagogies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• teacher as the main planner, facilitator and</td>
<td>• formative assessment</td>
</tr>
</tbody>
</table>

**Trend/s**

**Formative assessment has come of age**

Most educators nowadays agree about the effectiveness of formative assessment, that is, assessment used on a daily basis for diagnostic purposes and to dynamically adapt teaching, rather than for grading. At the same time, it is now become clear that this type of assessment requires a deep re-think of the traditional roles of teachers and students, which takes time and support.

**A new professionalism**

There has been lately a great emphasis on teacher professionalism. It appears that many education systems have come to the conclusion that the quality of teachers is the most important factor to improve learning. This is leading to incentives for those teachers deemed to be good, to tighter recruitment of graduates, and stricter controls on the quality of teaching.

**Personalisation in times of crisis**

Teachers are expected to personalise teaching and learning, and due to the economic crisis the cost-saving opportunities offered by technology have become even more relevant. In these times of crisis, using technology to personalise teaching is less about being “innovative” and more about “getting the job done”, saving time and money.
organiser of content
- students as researchers
- key role of “experts” (and the “people bank”) in supporting the teacher allowing a higher level of personalisation
- collaborative learning
- personalised support supported by technology
- experts as moderators (these could even be teachers from other schools)

<table>
<thead>
<tr>
<th>Activities</th>
<th>Resources (incl. Technologies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>adaptive teaching</td>
<td>classroom response system</td>
</tr>
<tr>
<td>classroom dialogue based on feedback</td>
<td>wiki-based platform</td>
</tr>
<tr>
<td>collaborative writing on the wiki</td>
<td>“people bank”: a network of teachers, experts and classrooms, always on and easily customisable and expandable</td>
</tr>
<tr>
<td>formative/summative use of tests</td>
<td></td>
</tr>
<tr>
<td>peer mentoring</td>
<td></td>
</tr>
</tbody>
</table>

Box 1: Example of selected Cycle 2 Scenario

Music for inclusion and integration

Vision (aspiration and aims)
- to support integration and inclusion through music
- to raise students’ self-esteem, language and music skills
- to create relationships within the school and with the local community
- to support life transitions of learners who are often excluded

Background motivation statement

Music is a common language. As immigration and other demographic changes increase the diversity in classrooms, there is a requirement to find new ways in which learners can participate in activities that bring them together and break down barriers. Technology can assist in this process creating large-scale collaborations which provide rich shared experiences.

Narrative

Pablo is a language teacher who has a group of new second-language students that he would like to progress to the core curriculum. He knows that difficulties with language and making social connections can be barriers to integration within the school and wider community.

To address this, Pablo and the music teacher plan a collaborative music project. They use the expertise of the local music community (including undergraduates studying music and community groups) to develop a project that will help integrate the learners with the school and wider community through an artistic performance. Core subject teachers are involved in the project to help strengthen their relationships with the new students.

Pablo works with teachers and musicians to guide integrated groups of students to create musical and/or video performances. Individually or in small groups, students produce loops, clips, samples, or rhythms. The sound clips and samples are edited and mixed together by the students to create ‘mash-up’ compositions. The mash-ups are broadcast throughout the school and local community and potentially lead to live performances.
Importantly, students’ skills and connections developed within the project continue beyond the initial composition. Links made with community groups are further developed to support students’ integration and transition into the wider community.

**Trend/s**

**Demographics shifts owing to immigration**

While the European Union’s overall population is projected to increase slightly between 2005 and 2030, the bulk of that increase will come from net immigration. As a consequence, inclusion (of minorities, immigrants, but also with those with special needs and disabilities) is being recognised as a political priority in many countries.

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration, music and art, transition, collaboration, self-expression, shared understanding, ‘mash-up’</td>
<td>most work organised within schools</td>
</tr>
<tr>
<td><strong>Trend/s</strong></td>
<td>'cool' space or gallery space – could be a classroom or a ‘hub’ within the school where musical activity happens</td>
</tr>
<tr>
<td><strong>Demographics shifts owing to immigration</strong></td>
<td>flexible spaces – could be at home, at university, community group</td>
</tr>
<tr>
<td><strong>Key concepts</strong></td>
<td>performance venues or spaces</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>People &amp; roles</th>
<th>Interactions (incl. Pedagogies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>learners work collaboratively with fellow students and musicians</td>
<td>music students to motivate and teach music</td>
</tr>
<tr>
<td>teachers and other staff support and guide students through the process of creating a mash up, as well as furthering connections within the community</td>
<td>teacher coordinating different musical elements</td>
</tr>
<tr>
<td>teachers gain deeper insight into students’ lives and skills.</td>
<td>'music factory' to facilitate inclusion and integration within school community</td>
</tr>
<tr>
<td>music students, community groups, local choirs, local and international musicians in university – as experts</td>
<td>facilitate integration and support transition</td>
</tr>
<tr>
<td><strong>People &amp; roles</strong></td>
<td>individual voices brought together (as in ‘Virtual Choir’ - <a href="http://www.youtube.com/watch?v=D7o7BrlbaDs">http://www.youtube.com/watch?v=D7o7BrlbaDs</a>)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>Resources (incl. Technologies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>create and edit musical 'mash-up' performances and videos – individual or small group pieces into a larger composition</td>
<td>high-quality recording equipment (could also use low-quality recording like cell phones)</td>
</tr>
<tr>
<td>connect students to musical groups and resources within the wider community through and beyond the composition and performance</td>
<td>music and video editing</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>musical instruments</td>
</tr>
<tr>
<td><strong>Resources (incl. Technologies)</strong></td>
<td>musicians and musical ‘experts’</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>digital resources for inspiration</td>
</tr>
</tbody>
</table>
Box 2: Example of Cycle 2 Scenario not selected

Designing maths games

Core purpose
In this scenario, students are introduced to the skills of computer programming and develop their maths skills through the creation of interactive games using simple, intuitive online programming software such as Scratch.

Narrative overview
My maths teacher colleague Rene and I are struggling with some students in our classes who find maths particularly difficult, are not engaged with the subject and who do not have a secure understanding of some basic maths concepts. We have tried a number of methods to try to re-engage them without much success. We have realised that if students’ understanding is to improve, we need to revisit these concepts in a different way from how they were first experienced.

We decide to use game and app creation to enthuse students and develop a programme of work based around simple, intuitive, ‘drag and drop’, online programming software, such as Scratch or Alice or app building software. These software programmes support the development of computational ideas and creativity alongside maths skills such as understanding degrees of turn, systematic reasoning and creating logical sequences. We involve the school’s IT department to ensure we have the technology and training to use and teach the programming package.

First, students revisit the concepts of maths they need via some online maths games and Smartphone apps. We then support them to create criteria for a good maths game and evaluate the games they use. We explain to the students that they will learn computer programming in order to be able to build their own interactive online maths games/apps aimed at helping younger children learn some of the concepts they are revising. The students are supported to develop the skills needed to effectively use the software via sessions which include direct instruction, open-ended experimental time and sharing learning amongst peers. We also invite people working in the field of game or app development to provide guidance for students, answer questions and introduce students to the possibilities of computer programming as a career.

Once the students are confident at using the software, we support them to design simple maths games, making explicit the maths skills they are using. By considering how they could teach younger children, students deepen their understanding of the maths concepts they need to revisit. The completed games are saved in a repository they can be accessed and used in the future. Students peer assess them against the co-developed criteria and younger students are invited to play and give feedback on them. We also include a competitive element, so organise a school-wide gaming day where students play the games and vote for their favourite.

Trends
What motivates students? There is an increasing understanding across education systems in Europe
- and globally - of how technology and a focus on emotional well-being can be effective to motivate young people, and help them engage with important subjects like MST

Increasing frustration of young people with typical classroom activities

**Possible approaches to teaching and assessment**
- Instructional design
- Direct instruction
- Game-based learning
- Peer assessment – criteria for a ‘good’ game decided near start

**People & roles**

*Teachers* - provide some direct instruction on the programming software but also allow the students to experiment with it, paying close attention to the operations students learn and encouraging them to share tips with each other. Teachers also make explicit the skills the students are using as they learn programming. The teachers continue to support the students on the underlying maths concepts they struggle with throughout the process, again giving them direct instruction where necessary. The outcome (game) is assessed for understanding of both programming and the maths concept the game is based on.

*Experts* – people working in the fields of game creation or app development – to provide guidance on developing criteria or games and introduce students to the idea of working in the field

*Students* - actively share skills learnt and keep a log of new programming instructions they have developed by take screen shots. Peer assess others’ work and give feedback

**Activities**
- Developing maths skills through playing and designing games
- Learning basic computer programming
- Recording and sharing skills learnt
- Teacher training and support for use of game/app programmes

**Box 3: Example of selected Cycle 3 Scenario**

**The helpful hologram**

**Core purpose**
This scenario builds on the opportunities provided by 3D holograms (augmented reality) to take forward and update students’ curiosity in robots, robotics and the design of robots to 3D holograms. This will encourage the discovery of basic concepts within Science, Mathematics and Engineering. Through the planning and presentation of experimental activities, by and for students, teachers can promote the interest in Science, self-regulated learning and peer-assessment.
Narrative overview

By using augmented reality to produce 3D holograms, a teacher intends to draw young people’s attention to topics and challenges in science, engineering and information technologies. He carefully plans a project in which students in groups (using Team Up) design and build prototypes to solve specific practical problems. The plan is based on a full project cycle, which includes brief, research, design, prototyping, testing and evaluation. The expected outcomes are a number of 3D figures meant to help with everyday problems and tasks, each produced by a sub team of students. Movement will be controlled by an app. From the start, the students have access to the resources and the equipment to build and test the figures.

The design cycle starts with a less structured and hands-on research activity, mainly to help students familiarise themselves with the technology and to brainstorm ideas about practical problems that could be addressed by the 3D figures. This is followed by a series of focused lessons and video tutorials (to be viewed as homework) about specific aspects of design, engineering and programming. The learning materials demand a degree of individual study and reading. The teacher prepares an online test to assess understanding of basic notions among the students and suggests further activities for those who seem to lag behind.

Once the cycle enters the phase of actual design and development of prototypes, students assume a more direct role and are expected to both assess their own work and compare progress with their peers. The objectives are set both by the teacher and the students, but once they are established students themselves are responsible for assessing progress of their prototypes. The project lasts for several weeks (project development and testing). During the development of the prototypes, the teacher suggests students break the project down into prototype subsystems. It is thus easier to gauge partial progress.

Students self-select the technologies they wish to use to capture the process of carrying out and communicating the project to their peers, whether through blogging, twitter, screen chomp to make a short film, audioboo, Edmodo.

Trends
- use of technology and authentic challenges to motivate students to engage with MST
- increasing frustration of young people with typical classroom activities

Possible approaches to teaching and assessment
- Instructional design
- Project-based learning
- Formative, self and peer-assessment
- Use of rubrics (e.g. rubrics developed collaboratively to evaluate the prototypes)

People & roles

The teacher acts as a guide, providing expertise and content knowledge when needed, but taking on a more facilitative role once students have become familiar and comfortable with the process. Students are expected to develop such familiarity and confidence throughout the duration of the project, and they are supported in doing so. Eventually, the aim is for them to take responsibility for their own learning, and play a central role in the assessment process.
Activities
The activities are encapsulated by the design process, and they are based on the progression from unstructured and hands-on exploration to more structured planning, development and testing. Familiarity with R&D processes and activities in actual engineering can give useful insights (e.g. breaking down the prototype into subsystems).

Resources (Including technologies)
- Team Up
- Audiobo http://audioboo.fm/
- Screen chomp http://www.techsmith.com/labs.html
- Edmodo http://www.edmodo.com
- Apps for Good http://appsforgood.org/

Environment
The project could be carried out in a normal classroom environment, but ideally a lab or a workshop would be more suited to the phase of hands-on exploration and to the later phases of prototype development and testing.

Box 4: Example of Cycle 3 Scenario not selected

In Deliverable 2.1: Table 1 there is an example of how the content of the trends are traced through to the scenario.
2. BACKGROUND TO THE ITEC SCENARIOS

In relation to context – and particularly to warrant credibility with teachers and other pedagogical experts involved in Futurelab led scenario workshops - the rationale for the development of the ITEC scenarios has been improved. The main arguments are set out here.

2.1 Why do schools need to change?

ITEC is an ambitious project underpinned by a number of key principles and assumptions about the importance of ‘change’ and ‘innovation’ in the diverse European education landscape. These principles and assumptions can be summarised as follows:

- There is a need to recognise that new forms of engagement involving the use of ICT are necessary for both teachers and students. The explosion of Web 2.0 tools over the last decade is still rippling through society, but effects on education systems around Europe are lacking the required transformational ‘thrust’. In fact, there remain widespread concerns that education systems are not reaping the potential educational benefits of such technologies by failing to acknowledge their role in young people’s lives, most notably by requiring pupils to ‘power down’ (Puttnam, 2007) or switch off their personal ICT devices when they come into school. In a recent (2009) NESTA survey, for example, 83% of secondary students in England and Wales wanted to see their teachers embrace new technologies in the classroom.

- ITEC’s assumption is that schools have an important role to play in helping young learners to maximise the potential offered by Web 2.0 technologies. However, there are several challenges as to how to initiate and sustain change in this direction. The work which has been carried out within WP2 on the identification of economic, social and technological trends, as well as a range of consultation activities with teachers and young people (including surveys and workshops), was key to developing a robust baseline in order to begin to address such challenges. Trends include the ongoing crisis and possibly worsening state of the economy, the resulting shifts in labour markets, innovative and disruptive technologies and, at the school and classroom levels, competing pedagogies and new paradigms as to what constitutes ‘value’ in terms of education.

The current European crisis raises an urgent need to develop approaches and strategies that can help education systems find practical and applicable ways to cope with high levels of uncertainty. ITEC’s response to this need is to develop ‘inspiring’ scenarios of innovative practice that target individual teachers or networks of teachers in and across the participating countries. This approach is based on two clear assumptions as to the direction and the forms of change in European education:
a) It is consistent with the European vision about the importance of democratic legitimacy and consensus building (e.g. as outlined in the Treaty of Lisbon), and mindful of the complexity and diversity of decision making processes in the different EU countries with respect to education. ITEC is not aiming to provide a prescriptive model of change. Rather than imposing demands and expectations as a list of ‘must do’ and ‘must not do’, ITEC has created a framework in which consensual and local responses can be developed to address a number of socio-economic, technological and educational trends. The nature of those responses is bound to reflect national, regional and even local priorities, as well as the fact that innovation is most successful when it is appropriated and contextualized. The latter point draws on the second assumption guiding our approach, summarised below.

b) Drawing on ‘classic’ work on end-user innovation (von Hippel, 1988; Rogers, 1995), ITEC and WP2 in particular have assumed that the commitment and the energy of individual users (teachers) is crucial to developing new practices and approaches, and that the most effective way to foster innovation and change is to create the conditions for these individuals to develop their own solutions to problems. This is confirmed by more recent evidence which highlights the importance of good teachers in world-class education systems (Barber and Mourshed, 2007). With this in mind, ITEC has been keen to avoid the simplistic and top-down ‘rolling out’ of innovations, which assumes that dropping a technologically advanced and attractive piece of kit in as many classrooms as possible will automatically lead to scalable ‘transformation’. The project has remained sceptical about approaches of: ‘if you build it they will come’ – the idea that if you give something inherently useful to people, they will use it - that has led many genuinely innovative solutions to be neglected and then unceremoniously shelved, not only in education. This point is aptly made in the seminal account of the “failure” of e-learning to change education from Zemsky and Massy (2004). The recent failure of the UK NHS “Connecting for Health” ICT system (Wikipedia, 2012), as well as Bruno Latour’s account of the failure of a truly revolutionary Parisian public transportation system during the 1970s and 1980s (Latour, 1996), are particularly effective examples that show how many factors (political, social, economic, and so forth) can determine the fate of an innovation, notwithstanding its intrinsic value or potential.

Moreover, the ITEC process takes into account the current economic difficulties with which most educational systems are confronted. Through the introduction of scenarios and associated learning activities that support and inspire educational institutes to use technology more efficiently and innovatively they will make better use of existing technology and teachers. Secondly, the scenarios can take into account and incorporate tacit or implicit knowledge found in the current context and they are designed to include experiential, non-formal and informal learning – all of which are important to developing knowledge and 21st century skills such as collaboration and problem solving.
2.2 Potential of the scenarios to drive innovation

The scenarios can be defined as narrative descriptions of preferable learning contexts that take into account user stories, including the description of resources and the functionalities needed, the interactions they have, the tasks they perform and the aims of their activities. Their main purpose is to provide a context-specific and relevant setting to enable a change in teaching and learning practices, without being too prescriptive to the point of impeding the ‘innovation work’ carried out by individuals.

The expected outcome of this approach is the initiation of a process of ‘diffusion’ in which innovation spreads across a system organically and through minor changes in behaviours encouraged through careful and normative social influencing (Rogers, 1995; Thaler and Sunstein, 2008). Although focused on end-user innovators, the scenarios reflect a steadfast concern for the multifaceted nature of educational change. In this respect, we have drawn inspiration from studies which have adopted an ‘ecologic’ approach to change. Viewing schools as parts of complex ecosystems, these studies have suggested that shifts in certain areas or subsections have repercussions on other areas and on the system as a whole (Law et al., 2008, Zhao and Frank, 2003). For instance, crucial influences to educational change – which can hinder or enable innovation - can be located at different levels of a system:

- At the macro-level, government led initiatives, national policy, national curricula, assessment regimes define the broad conditions in which innovations are developed and negotiated, politically and culturally.
- At the meso-level, local influences such as school cultures, management structures, technological infrastructures and the pressures and expectations originating in the local communities have a direct, observable impact on the uptake of innovative solutions in schools.
- At the micro-level, the influences are directly relevant to the innovators themselves and they originate from individual characteristics such as the capacity and the disposition to use technology, the familiarity with alternative pedagogic approaches, not least the time and the personal effort required for such approaches to succeed.

iTEC acknowledges these influences at all times, and the project as a whole is attempting to adopt a systemic approach to educational innovation, most notably through the direct involvement of European education ministries and technology suppliers. Within this framework, iTEC scenario development and piloting is focused mainly on the elements that are within the control of individual teachers, notwithstanding the need to consider how even very specific actions are influenced by policy decisions, by local and national cultures, by varying predispositions towards technology and innovation, and more broadly by the socio-economic contexts in which innovations are introduced (these are all issues that will be explored by the iTEC High-Level Group in WP11).

Consequently, it could be argued that the potential of scenarios to drive innovation cannot be quantified in a linear and unambiguous manner, but only be expressed as an emergent quality influenced by a range of enablers and barriers, which often overlap with each other.
Once more, we propose to draw on the studies that have explored the conditions that can foster or impede innovation, to suggest that the potential of the iTEC scenarios to drive innovation is influenced by the degree of ‘maturity’ of an education system. This notion will be discussed in the next section.

### 2.3 The maturity model

Maturity models are increasingly being used in education across the world to help planning and strategic development. However, the body of literature that looks specifically at the dynamics of innovation, analysing the emergence of breakthroughs, ‘disruptive’ discontinuities or incremental evolution, and highlighting the factors that can act as enablers or barriers (Rogers, 1995; Tushman and Anderson, 1986; Utterback, 1994; Gladwell, 2000) is far from consensual and many diverging views can be identified. In fact, it could be argued that here are still many unanswered questions about the processes that regulate the adoption of technologies and the success of innovations - and many different theoretical and ideological stances can lead to radically different explanations. Given such a diverse and often contradictory body of knowledge, spanning from management theory and practice\(^6\)\(^7\) to more critical sociological inquiries into the inner workings of capitalism (Harvey, 2010). It was decided within iTEC and WP2 to adopt a more pragmatic approach, focusing selectively on what could help move the project’s vision forward. Hence the choice to use the notion of “maturity” as a broad framework to discuss the potential impact that a project like iTEC might – or might not – have.

In this sense, maturity refers to the co-occurrence of systemic, economic and individual factors that enable a certain innovation or a cluster of innovations to become established and, in the words of James Utterback (1994), based on a “dominant design”. A classic, oft-cited example is the automobile which went through a number of iterations and competing designs, before settling on a “dominant design” which helped crystallise features that still constitute the backbone of modern car manufacturing. At the same time, a favourable economic climate and significant investments in infrastructure (mainly roads), alongside easy access to processed fuels, enabled the growth of mechanised transportation during the 20\(^{th}\) century on a massive scale. This process was further strengthened by rises in personal incomes and by changing lifestyles in the West which helped increase demand exponentially. Following this line of thought, it could be argued that maturity - or “e-maturity” - in the context of ICTs for education depends on a similar combination of factors: the presence of “dominant designs”, which is yet to emerge in educational technology. As noted by Zemsky and Massy (2004), these include the presence of an adequate infrastructure (e.g.


bandwidth, connectivity, support and even technical training), positive attitudes and adequate levels of technical knowledge within the teacher community.

Moreover, “E-maturity” has been used in the past to describe the conditions that might support the uptake of ICTs in education - most notably by the former agency for ICT in the UK Becta (Bradbrook et al., 2008) - and this made it particularly suited to iTEC. According to Becta, e-maturity refers to the capacity to make strategic and effective use of technology to improve educational outcomes, and it is understood as an additional stage of development beyond e-confidence. The latter embodies high levels of ICT knowledge and skills, and a readiness to apply these to existing situations and new challenges. E-maturity can be observed when professionals apply ICT in strategic and discriminating ways.

Consequently, it would appear that the potential of iTEC scenarios to drive technology-based innovation in European education systems is influenced by the degree to which such conditions of maturity are present in different countries. At the same time, there is widespread agreement that access to technology cannot increase the degree of maturity by itself. Even the best equipped schools will fail to become ‘e-Mature’ unless teachers have the competences, vision, training, support and time required in order to harness ICT to support innovative teaching and learning. Pupils are also unlikely to be motivated to learn if they are not engaged by the technology they are using. Moreover, there are important cultural and legal contexts influencing the adoption of a scenario - e.g. attitudes to risk, curriculum rigidity, and various national and even local policies and regulations that dictate how digital technological can be accessed and used in schools – not least health and safety regulations determining the circumstances in which technology use is acceptable, the restrictions placed on certain types of content, and the modalities in which teachers can interact with students through digital and networking technologies. For example, it is not uncommon for schools to explicitly advise teachers against using digital media to communicate with students outside of school hours (Vasager and Williams, 2012).

The level of e-maturity across EU countries has been a concern from the very beginning of the project. For instance, it has been indirectly highlighted in the Knowledge Map produced by WP5 (D5.2), in which data from different sources is used to show differences in ICT-related developments across European education systems. Among other things, the Knowledge Map highlights how, in some countries, ICT is identified as a separate curriculum subject and taught in a discrete way. In others, ICT is included within another technology subject (e.g. Design & Technology). And in other countries, ICT is considered as a general tool and adopted, almost in a cross-curricular way, within other subjects in the curriculum. Similarly, the Knowledge Map suggests that processes of training teachers in the use of technology vary from country to country. Different levels of maturity across the iTEC countries have also been identified through the survey of teachers’ attitudes carried out by WP2, which provided useful contextual background to the development of the scenarios at the beginning of the project (see D2.1). The survey will also be complemented by the forthcoming (2013) survey of schools ICT in Education (European Schoolnet, 2013) which builds on previous studies (Balanskat et al., 2006).
As such, there was awareness within iTEC and WP2 of the challenges posed by different levels of maturity across European schools, where great variation can be found between and within countries, regions, districts, but even between and within individual schools. In response to this challenge, it was decided to develop scenarios which are open to interpretation and that could easily be adapted to different conditions, including variations in technological access, differences in skills and knowledge, different attitudes and perceptions and so forth.

Thus in the cycles being discussed the scenarios were designed to be non-prescriptive so that they could be implemented according to the individual teachers’ ability, creativity and willingness to make the most of the opportunities they are afforded. The aim was to allow teachers to adapt the scenarios so they could be used by the mainstream while still innovating. For example, several of the scenarios developed revolved around the collection and the analysis of real-world data. The scenarios make suggestions as to how such analyses could be carried out, but they never “lock” teachers within one solution or another. So, for instance, it is entirely possible that the same scenario might be based, in one classroom, on basic uses of the spreadsheet application Excel to analyse certain forms of environmental data; in another classroom, a teacher might decide to use more advanced educational modelling software to develop sophisticated visualisations. This idea of flexibility according to context fits in with the underlying principles of maturity models.

2.4 How do the scenarios engage with the idea that knowledge itself is changing and implications for the curriculum?

As noted by Professor Stephen Heppell during a keynote address at the European Schoolnet launch conference in 1998:

“We should not assume that everything changes. By and large, children and learners do not change - there has been no ripple in the European gene pool as a result of new ICT…..Children learn through doing. A sense of audience helps, as does high quality mediation to support, guide and debrief their learning.”

This observation is still relevant nowadays, especially with respect to the issue of knowledge, its changing nature and the possible implications for the curriculum. Although it has become now commonplace to claim that we live in a ‘knowledge economy’, there is still a degree of confusion and disagreement as to how to define such knowledge, in order to derive implications for education systems and support the development of appropriate curricula. The position of iTEC in relation to this issue reflects the belief that economic and

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8 In cycle 5 it is proposed to assist stakeholders implement scenarios which challenge them in terms of either process or output by having them decide their own level of maturity in order to adapt the scenario so that it moves them forward in terms of innovation (see Section 3.4).
cultural changes in the globalised world have dramatically reduced the relevance of many existing school curricula. Conversely, it could be argued that a more contemporary and relevant take on knowledge is concerned with replacing, where appropriate, traditional topics and disciplines with pragmatic and experiential approaches.

In a seminal paper that helped lay the foundations of the modern learning sciences, Scribner and Cole (1973) already noted that experiential learning (i.e. goal-oriented, enquiry- and project-based) enables more engaged forms of participation and more relevant and grounded forms of knowledge. This type of learning works by placing individuals (and the groups they belong to) at the very heart of the educational process, basing expectations of performance on how emotional and existential engagement regulates the construction and the acquisition of knowledge. Knowledge, in other words, tends to emerge from personalised trajectories of development and growth, and by being attuned with individual ambitions and predispositions, as well as social and economic expectations.

Consequently, there is now a growing consensus that knowledge in the 21st century is located at the intersections between three forms of relevance: individual, social and economic. This means that, for example, while individual relevance is still necessary to activate motivation to learn, learning itself cannot be a purely individual and relativistic exercise, but needs to take into account the demands and constraints of social and economic realities. This necessity should not be misrepresented as an attempt to reduce education to a mere utilitarian endeavour, as in fact it draws on ideas about the importance of “powerful” knowledge to emancipate individuals and social groups (see Young, 2008). The relationship between different forms of “relevance” could be represented graphically:

![Figure 1: Graphical representation of relevance](image)

At the same time, the iTEC project's vision suggests an awareness that there are ‘hard-wired’ and biological aspects that underpin the acquisition and the construction of knowledge. Recent findings in neuroscience are in fact providing new and stronger empirical evidence about the established mechanisms of human cognition and their implications for the design of educational resources and technologies (Clark, 2011). As such, we are aware
that in the 21st century the acquisition of new knowledge in young people is still dependent on the functioning of the cognitive architecture and, in particular, on the inner workings of memory. Research compellingly shows that learning relies largely on developing a repository of descriptive and procedural knowledge, which can be quickly selected and applied to identify the best procedures for solving a new problem. Therefore, individuals become cognitively proficient and hence more ‘knowledgeable’ in a field when the information in their long term memory, stored through practice and training, permits them to quickly recognise the characteristics of a situation, giving them indications as to what to do and when to do it. This process leads to the development of talents, predispositions, skills and all the other ‘must have’ features needed to be functioning and productive participants in our increasingly complex and demanding societies.

Related studies (Ericsson and Charness, 1994; Walker, 1987) have also demonstrated that expertise is domain-dependent, as large amounts of information stored in long term memory mean that experts have more domain knowledge at their disposal when performing a task. Drawing on their domain-specific capital of knowledge, experts can circumvent the general limits of their cognitive architecture by being able to select and process more relevant information, while simultaneously reducing the amount of effort (or ‘cognitive load’) spent on processing less relevant information.

Alongside the cognitive dimension, obviously important but not the only valuable perspective, knowledge in the 21st century can also be conceptualised as the result of enculturation and increased participation in a community of practice. Classic studies have shown that increased participation in communities of professionals allows newcomers to get involved in a number of situated socio-cultural practices, gradually developing expertise and identities as legitimate members (Lave and Wenger, 1991; Holland and Lave, 2001).

The scenarios developed in iTEC in cycles 1 to 3 fully engage with the above mentioned ideas and, in particular, three key implications can be gleaned from the process of scenario development and from the discussions that took place during such process. On the one hand, these implications have been turned into design principles which have informed the scenarios and their iterative revision. On the other hand, they carry relevant recommendations for informing reform of curricula on a broader level:

1. The scenarios aim to develop more dialogic and participatory forms of teaching and learning capable of accounting for different forms of relevance: personal, social and economic. In particular, the scenarios build on the assumption that not enough is being made of learners’ experiences and opportunities outside of the classroom in supporting the learning inside the classroom.

2. The scenarios acknowledge the importance of traditional instruction and the role of memorization, constant practice and structured approaches to foster the acquisition of ‘powerful’ knowledge, i.e. knowledge leading to the development of relevant expertise and to a positive participation in society.

3. The scenarios support pedagogical advances that can enable meaningful engagement with the sort of experiential and participatory learning found in real communities of
practice, i.e. existing professional contexts. This would explain the emphasis, shared by many scenarios developed in these cycles, on collaboration and project-based learning.
3. INNOVATION WITHIN ITEC

3.1 Vision of innovation

Developing a vision and working definition of innovation for iTEC emerged as a priority for the iTEC project as a whole. This was recognised as important within WP2 and by iTEC project management. As an understanding of what the project means by the word ‘innovation’ in the context of iTEC scenarios and pilots would lead to a better understanding of what makes an ‘innovative’ scenario. Additionally, the experts at the first project review recommended the creation of an ‘innovation matrix’ to better analyse and ensure a range of innovation across the scenarios. Creation of such a matrix similarly required a clearer understanding of the concept of ‘innovation’ within iTEC.

While WP2 has led the development of this area, it is recognised that an operational understanding of what the project means by ‘innovation’ is relevant to all work packages. WP2’s approach to this area was two-fold: i) to undertake further research into current understandings of innovation in similar contexts and ii) to work with other iTEC partners to develop a definition of innovation that is useful and relevant across the project.

3.2 Defining innovation

A literature review was undertaken to support partners’ understanding of how innovation is seen in the context of technology-enhanced education. The review investigated what is meant by innovation in education and the nature of innovation in the iTEC project. The review was read by those in the innovation sub-group and used within their discussions. These discussions led to the following definition of innovation in iTEC:

Innovation in iTEC consists of potentially scalable learning activities that provide beneficial pedagogical and technological responses to educational challenges and opportunities.

On this basis, an iTEC scenario can be innovative because of processes within the scenario or products and outputs (what has been produced as a result of the scenario). Innovation in iTEC can be relative and context-dependent; for example, in a school with limited technology the introduction of interactive white boards and teachers using them to present information might be highly innovative. Yet in another school this may be common practice and therefore far from innovative. This is in addition to a more traditional view of absolute innovation where the scenario describes a radical transformation in either process or product.

The report can be found in Appendix 5.
The definition was circulated to all project partners via the iTEC progress report for M15/16 (Nov/Dec 2011) and further discussed at the iTEC General Assembly in March 2012.

### 3.3 Setting up the innovation sub-group

An ‘innovation sub-group’ was set up in October 2011 including representatives from across the project, particularly in order to ensure the involvement of both technological and pedagogical partners. Members of the Steering Committee were invited to participate in the sub-group, which is currently comprised of partners from WP2, 3, 4, 5, 8, and 9.

The remit for the sub-group was to develop a definition of innovation within iTEC and to discuss and create the ‘matrix of innovation’ as recommended by the review panel. Innovation sub-group meetings have taken place monthly on the following dates: 28 October, 16 November, 16 December, 20 January, 17 February and 16 March.

These meetings have led to a working draft of a definition of innovation (as mentioned above and found in Appendix 5). Additionally in response to reviewers’ suggestions from the first project review and in recognition of the importance of a thorough analysis of the scenarios that iTEC is developing this collaborative process within the innovation sub-group also led to the development by Futurelab of: i) an innovation matrix (discussed in Section 3.4) and ii) a mapping tool (discussed in Section 3.5). Discussions within these meetings have also been useful ways of connecting and communicating work across the project, especially between the pedagogical and technological areas.

### 3.4 Matrix of innovation

Without a view as to what constitutes innovation within the context of the iTEC project, and a related mechanism for provoking the development of innovative scenarios, there is a perceived risk that those scenarios taken forward for trialling reflect incremental improvements in practice that sit comfortably within existing pedagogical approaches. The perceived risk has been managed by the iTec scenario selection process. The selection criteria have been weighted towards ensuring that innovation is a primary requirement for a scenario to be taken forward to learning activity design.

To further support this emphasis on innovation WP2 has produced an innovation matrix which will underpin the development of future scenarios and provide a tool for auditing and classifying the collection of scenarios.

The innovation matrix emerged from discussions between partners on innovation and can be viewed as:
• a tool to measure absolute level of innovation
• a tool to measure relative levels of innovation
• an 'innovation ladder', which can help schools and localities identify their current stages of innovation, as mentioned identifying local context is necessary to determine if a scenario is innovative in that situation
• an organising framework for the scenarios, clearly identifying the stages of innovation where each scenario sits
• a stimulus to the production of more innovative scenarios.

The matrix was under development in cycles 2 and 3 and was therefore not used in scenario development.

3.4.1 Background to the innovation matrix

In Section 2.3, it was argued that innovation in iTEC can be viewed as relative and context-dependent as well as absolute. A maturity model takes account of this and shows innovation as change / movement between levels as well as describing the “highest” level. Such models have a long pedigree and have been used extensively to support organisational change in different sectors of the economy.

The initial development of the concept of ‘maturity’ models was in the 1970s at Carnegie Mellon University and elsewhere. Since then, significant theoretical and practical effort has been put into developing ‘maturity models’ that set out the stages in an organisation’s development of its capacity and capability to exploit new opportunities afforded by technology in pursuit of its objectives. They have provided organisations with a tried and tested ‘route-map’ for developing their use of technology. For example, the Carnegie Mellon University Software Engineering Institute (SEI) has developed a Capability Maturity Model for the software industry which has been used by over 1000 businesses in 19 countries.

3.4.2 The innovation matrix structure

Building on this research and development work and in particular that carried out by Becta, the former agency for ICT in the UK (Professor Bridget Somekh), and the National College for School Leadership, a maturity model for iTEC has been developed as part of the continuing work within WP2. This maturity model forms the basis of the iTEC innovation matrix. It identifies five stages or layers of innovation: Exchange, Enrich, Enhance, Extend, and Empower. These layers provide a ‘direction of travel’ for innovation as a whole – Exchange being the least innovative while Empower indicates the greatest.

Table 2: The five stages or layers within the iTEC innovation matrix
<table>
<thead>
<tr>
<th>Stage</th>
<th>Exchange</th>
<th>Localised use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where technology is used within current teaching approaches, learning is teacher-directed and classroom-located and the learner is a ‘consumer’ of learning content and resources.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Enrich</th>
<th>Internal Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where technology used interactively to make differentiated provision within the classroom, it supports a variety of routes to learning and the learner is a ‘user’ of technology tools and resources.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Enhance</th>
<th>Process redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where teaching and learning are redesigned to incorporate technology, building on research in learning and cognition. Institutionally -embedded technology supports the flow of content and data, providing an integrated approach to teaching, learning and assessment and the learner is a ‘producer’ using networked technologies to model and make.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Extend</th>
<th>Network redesign &amp; embedding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where ubiquitous, integrated, seamlessly connected technologies support learner choice and personalisation beyond the classroom. Teaching and learning are distributed, connected and organised around the learner, with learners taking control of learning using technology to manage their own learning.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Empower</th>
<th>Redefinition &amp; innovative use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where technology supports new learning services that go beyond institutional boundaries, mobile and locative technologies support ‘agile’ teaching and learning and the learner is a ‘co-designer’ of the learning journey, supported by intelligent content and analytics.</td>
<td></td>
</tr>
</tbody>
</table>

Given the layers of definition the next stage was to define the dimensions of the matrix. The OECD’s ‘Oslo Manual’, *The measurement of scientific and technological activities: proposed guidelines for collecting and interpreting technological innovation data*, makes a helpful distinction between technological **product** and technological **process** innovations. Within the context of education the product is the learning outcome as expressed as a teaching objective. This suggests that to capture educational innovation fully, one dimension of the innovation matrix should explicitly address innovation in outcomes such as the teaching of new subject content and new skills, or content and skills that have to date been beyond those expected of a particular group of students for example. Other dimensions should capture innovation in educational processes, such as changes in pedagogy, the learners’ role and how learning is managed and assessed. Finally the model needs to address the role and nature of the technology being used. This led to the selection of the five dimensions that form the horizontal axes of the matrix.

It is important to note that, while there are loose dependencies between the different dimensions within the matrix, teachers, schools and localities may find that, for example, while the technology they are using is innovative, the pedagogical approach is not and the learning outcomes being addressed can be well taught with less innovative technology.
Conversely, a teacher or school may find that they using well established technologies in ways that are innovative to address new objectives.

The full iTEC innovation matrix showing all the dimensions and their definitions is found in Table 3.

The innovation matrix can be used to provide a picture of absolute and relative innovation as described below. This is important as it is a tool that allows iTEC partners to ensure that any incremental transformations are being used in appropriate contexts rather than describing existing practice, and showing where radical innovation appears in a scenario and where it can be integrated into practice.

**Relative innovation**
The matrix recognises that innovation has to be understood within a local context, as discussed by the innovation sub-group when discussing a definition. Stakeholders and participants can use the descriptors within the innovation matrix to assess their current position. Then as within the context of the model innovation is defined as movement between the levels – they can work out what activities will innovate their practice. For example, a maths teacher may use online material to teach concepts, in order to innovate the learner role he may decide to let his students create their own material to demonstrate their understanding. Rather than focussing on potentially unattainable future goals, this method allows a disciplined approach to innovation where starting points are identified and the next incremental stages identified.

At the same time the model has been designed to recognise that some schools and localities have made significant steps along the innovation journey. That is, some schools may still be at the Enrich stage while others at the Extend or Empower. The framework recognises these different starting points, and allows stakeholders to tailor new and existing scenarios to their context. An example would be a school that took on the Combining formative and summative assessment scenario described in Section 1.4, Box 1. Currently, this has an underpinning technology level assessed at Enhance (level 2) as it would be: “Interacting with technology, for example, adding to blogs or wikis, using apps within a learning platform”. The teacher may feel that this is not an innovation in their school, as students already add to wikis in other subjects, and decides it will be more effective if they design and populate their own website.

By understanding and sharing their status stakeholders can clearly see and communicate the value of local and incremental innovations as part of that process. It also avoids over-ambition – which often leads to failure as it is harder to take greater innovative steps and can address any barriers by recognizing the current status.

**Absolute innovation**
The matrix can be used as a tool to define and assess highly radical scenarios. In this case all the dimensions would be at layer 5, Empower. The stakeholders could then choose whether or not to pilot these scenarios as they stand or how they can adjust the scenario so
that it maintains many of the layer 5 attributes but can be implemented within the current classroom.

The matrix could also be used to examine whether existing scenarios could be enhanced to become more innovative. For example, in the **Designing maths games** scenario described in Section 1.4, Box 3, the learner is described as a producer of materials, meaning they are working at the Enhance level. However, given the structure of the scenario, the teacher asking them to create games to demonstrate an understanding of mathematical concepts (as well as game design indirectly), there is no scope to make this layer more innovative, i.e. allowing them to take control over their own learning journey or co-design it, without a radical rethink of the task. In contrast, in the scenario **Music for inclusion and integration** (Section 1.4, Box 2) the teacher is guiding “integrated groups of students to create musical and/or video performance”. This is not an innovative pedagogy, considered as enriching according to the matrix. However, if it was revised so that the students were responsible for themselves, that is selecting who to work with, both inside and outside the school, what type of performance to do, what to use, how to present and when to create then this would be empowering.
### Table 3: The innovation matrix categories

<table>
<thead>
<tr>
<th>Stage</th>
<th>Product/Outcomes Learning Objectives</th>
<th>Educational processes</th>
<th>Management of teaching, learning &amp; assessment</th>
<th>Underpinning Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Isolated teaching objectives addressing specific pieces of subject content within the curriculum.</td>
<td>Pedagogy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technology is used within current teaching approaches as a direct replacement for well established practices</td>
<td>Learner role</td>
<td>Learning is teacher-directed and classroom-located.</td>
<td>Standard technology, such as interactive whiteboards, websites etc</td>
</tr>
<tr>
<td>2</td>
<td>Sequences of teaching objectives addressing related areas of content within a subject domain.</td>
<td>Technology used interactively to make differentiated provision within the classroom, Learner as ‘user’ of technology tools and resources.</td>
<td>Technology and systems supports a variety of routes to learning.</td>
<td>Interacting with technology, for example, adding to blogs or wikis, using apps within a learning platform</td>
</tr>
<tr>
<td>3</td>
<td>Outcome is innovative within the subject. Objectives include higher order thinking and key subject specific process skills.</td>
<td>Teacher uses innovative pedagogies and develops competences. Teaching and learning ‘redesigned’ to incorporate technology, building on research in learning and cognition.</td>
<td>Learner as ‘producer’ and collaborator using networked technologies to model and make.</td>
<td>Institutionally-embedded technology supports the flow of activities, content and data, providing an integrated approach to teaching, learning and assessment.</td>
</tr>
<tr>
<td>4</td>
<td>Objectives that go beyond traditional subject competencies to include cross-cutting 21st Century Skills such as collaborative problem solving.</td>
<td>Informal learning harnessed. Teaching and learning distributed, connected and organised around the learner.</td>
<td>Learners take control of learning using technology to manage own learning.</td>
<td>Ubiquitous, integrated, seamlessly connected technologies support learner choice and personalisation beyond the classroom.</td>
</tr>
<tr>
<td>5</td>
<td>Product is highly innovative. Objectives that are created by the students to achieve their chosen outcome in addition to 21st century skills</td>
<td>Technology supports new learning services that go beyond institutional boundaries</td>
<td>Learner as co-designer of the learning journey, supported by intelligent content and analytics.</td>
<td>Technology supports new learning services that go beyond institutional boundaries.</td>
</tr>
</tbody>
</table>

- **Stage 1 Exchange Localised use**: Isolated teaching objectives addressing specific pieces of subject content within the curriculum. Technology is used within current teaching approaches as a direct replacement for well-established practices. Learner roles focus on being the consumer of learning content and resources. The classroom setting is static, with a focus on technology as a direct replacement for well-established practices. Underpinning technology includes standard technology, such as interactive whiteboards, websites, etc.

- **Stage 2 Enrich Internal Coordination**: Sequences of teaching objectives addressing related areas of content within a subject domain. Technology is used interactively to make differentiated provision within the classroom. Learner roles focus on being a user of technology tools and resources. Technology and systems support a variety of routes to learning. Underpinning technology includes interacting with technology, for example, adding to blogs or wikis, using apps within a learning platform.

- **Stage 3 Enhance Process redesign**: Outcome is innovative within the subject. Objectives include higher order thinking and key subject-specific process skills. Teachers use innovative pedagogies and develop competences. Teaching and learning are ‘redesigned’ to incorporate technology, building on research in learning and cognition. Learner roles focus on being producers and collaborators using networked technologies to model and make. Underpinning technology includes using software to programme, create websites, games, video clips, animations, 3D models etc., 1:1 computing.

- **Stage 4 Extend Network redesign & embedding**: Objectives that go beyond traditional subject competencies to include cross-cutting 21st Century Skills such as collaborative problem solving. Informal learning is harnessed. Teaching and learning are distributed, connected, and organised around the learner. Learners take control of learning using technology to manage their own learning. Underpinning technology includes the use of innovative technology, e.g., 3D printing, Alternate Realities. Using technology across boundaries, for example, integrating products made at home with those in school.

- **Stage 5 Empower Redefinition & innovative use**: Products are highly innovative. Objectives that are created by the students to achieve their chosen outcome in addition to 21st century skills. Technology supports new learning services that go beyond institutional boundaries. Learners are co-designers of the learning journey, supported by intelligent content and analytics. Underpinning technology includes mobile and locative technologies supporting ‘agile’ teaching and learning, that is, responding to situation.
3.4.3 Applying the innovation matrix

In order to aid visualisation, matrix profiles may be represented as radar diagrams. Take, for example, the scenario **Combining formative and summative assessment** described in Section 1.3. Considering each dimension in turn, the scenario is assessed and assigned to a layer, as shown in Table 4. This can be one person’s informed judgment, or – as here – by several, or a joint exercise between a range stakeholders (which can also serve as a useful stimulus for discussion).

**Table 4: Analysis of the scenario Combining formative and summative assessment**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Scenario</th>
<th>Criteria</th>
<th>Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product/Outcomes Learning Objectives</td>
<td>students to support each other in identifying and addressing common misconceptions... students progress to more advanced sections of the wiki ... more sections are added to accommodate the progression of the class</td>
<td>Outcome is innovative within the subject. Objectives include higher order thinking and key subject specific process skills.</td>
<td>3 - Enhance</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>...choose a topic from the curriculum ... prepare a test to assess my students' understanding and knowledge of this topic using a classroom response system. With this ... develop a class wiki with headings based on the outcomes of my students’ knowledge and the areas ... struggling with.</td>
<td>Teacher uses innovative pedagogies and develops competences. Teaching and learning 'redesigned' to incorporate technology, building on research in learning and cognition.</td>
<td>4 - Extend</td>
</tr>
<tr>
<td>Learner role</td>
<td>the class build the wiki using the headings as a framework, carrying out research, and using the web and other traditional resources like textbooks</td>
<td>Learner as 'producer' and collaborator using networked technologies to model and make.</td>
<td>3 - Enhance</td>
</tr>
<tr>
<td>Management of teaching, learning &amp;</td>
<td>people bank... network of teachers, experts and other classrooms have</td>
<td>Ubiquitous, integrated, seamlessly connected</td>
<td>4 - Extend</td>
</tr>
</tbody>
</table>
agreed to act as moderators of the "advanced" section of the wiki, as well as evaluators of the quality of the knowledge technologies support learner choice and personalisation beyond the classroom.

**Underpinning Technology**

<table>
<thead>
<tr>
<th>assessment</th>
<th>agreed to act as moderators of the &quot;advanced&quot; section of the wiki, as well as evaluators of the quality of the knowledge technologies support learner choice and personalisation beyond the classroom.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underpinning Technology</td>
<td>class wiki with headings based on the outcomes of my students' knowledge and the areas that they are struggling with...</td>
</tr>
<tr>
<td></td>
<td>Interacting with technology, for example, adding to blogs or wikis, using apps within a learning platform</td>
</tr>
<tr>
<td></td>
<td><strong>2 - Enrich</strong></td>
</tr>
</tbody>
</table>

Plotting the five layer numbers gives a radar diagram, which quickly gives an overview of the type of innovation within the scenario. Thus it can be seen that the pedagogy – asking students to create their own revision material in a format appropriate to them is more innovative than the technology proposed (wikis).

![Radar diagram](image)

**Figure 2: Radar diagram for the scenario “Combining formative and summative assessment”**

In contrast, after considering each dimension in turn the resulting radar diagram for the scenario that was not selected around music inclusion and integration shows greater innovation in terms of learning objectives and that it uses technology considered more innovative.
The radar diagram for the second scenario, Developing maths games, shows that the underpinning technology is more cutting edge – the software to create games is more innovative (i.e. cutting edge, underused in schools) than filling in a wiki. However, the management of teaching, learning and assessment – using technology as one method of improving maths skills, is not as innovative hence being ranked at the Enrich layer.
In contrast the last scenario (not selected in Cycle 3), the learners would be creating holograms to address problems they have identified that could benefit from 3D figures. The underpinning technology is highly innovative, however, the pedagogy behind, for example, the performing of an online test to assess understanding of basic notions, are less innovative. Hence the different focus visually represented in the radar diagram.

**Figure 5: Radar diagram for the scenario “The helpful hologram”**

Radar diagrams have the advantage over producing an average score of innovation across all dimensions in that they show the areas of innovation, for example, whether there is a focus on innovative pedagogy in a cycle. They also allow a quick comparison of scenarios, although when selecting a scenario to implement the underlying trend must also be considered. Figures 6 and 7 illustrate a breakdown of the selected scenarios in cycles 2 and 3. They show that in cycle 2 there was a greater emphasis on innovating the management of teaching, learning and assessment. While in cycle 3 there is clearly more of an emphasis on learner role and more scenarios use more innovative underpinning technology when compared to the previous cycle.
Figure 6: Radar diagram all scenarios in cycle 2

Figure 7: Radar diagram all scenarios in cycle 3
3.5 The mapping tool

The mapping tool was generated at the same time as the definition of innovation with the same participants from across the iTEC project. It has three purposes:

- to demonstrate the diversity of scenarios by mapping and comparing their constitutive elements and subsequent levels of innovation
- to identify any gaps that have not been covered by scenarios in cycles 1, 2, and 3 and that could be addressed in cycles 4 and 5
- to support the scenarios to remain consistent and composed of the same elements throughout the iTEC process

3.5.1 Background to the mapping tool

The mapping tool has been developed within iTEC’s Innovation sub-group and through the participation of partners in WP2, 3, 4, 5, 8, and 9. In addition to discussions held within each of the innovation sub-group meetings (see section 3.3 for dates), a working group was also set up to begin drafting this tool. Its first meeting was held on 2 March 2012. A draft proposal for the mapping tool was submitted to the sub-group for discussion and agreement given on 16 March 2012. The approved intention was to use it to map previously created scenarios in preparation for the development of those in cycle 4.

The draft mapping tool was well received at the General Assembly held in Brussels, March 2012 and it was agreed to continue its development within the Innovation subgroup. It was also incorporated into the work of the newly constituted Integration Committee which is being taken forwards building on the membership and remit of the Innovation subgroup (see section 7 Pedagogical Board update).

3.5.2 The mapping tool structure

The mapping tool was aligned within frameworks and structures that already exist within the project, such as the taxonomy of teaching and learning (which includes activities, environment, technology, people, pedagogy and assessment and is used to help create scenarios) and the evaluation materials developed by WP5. In this way, the matrix feeds into ongoing processes in a coherent way and includes content that will be useful and relevant across the iTEC cycle.

The tool comes in the form of a table with a number of dimensions or categories (e.g. ICT, pedagogy) across the top – see Table 5 below for an illustration. Each scenario is mapped according to the types of elements they contain (see Appendix 7). If a scenario contains that
dimension an x is marked in the column, if it is pivotal to the scenario then two crosses are added.

Once all the scenarios have been reviewed it is easy to see the similarities and differences within the scenarios. In this case all three are set in a classroom with a teacher leading, they use a virtual learning environment, collaboration tools, and the focus is on developing competencies and skills that allow students to search for, organise and analyse information. However, the third scenario uses a wider variety of technology and can be done from home.

**Table 5: Sample of mapping tool for cycle 2**

<table>
<thead>
<tr>
<th>Scenarios - Name</th>
<th>Combining formative and summative assessment</th>
<th>Developing collaborative approaches to learning about business</th>
<th>Embedding exam preparation in learning activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Technology (derived from iTEC vocabulary)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Virtual learning environment</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2. Student information system (online portfolio, automated assessment tool, student reporting tool, task management tool)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Collaboration tools (e.g. calendar, social networking tool, social bookmarking tool, data sharing tool, wiki, feedback tool)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4. Communication tool (e.g. IM, video and audio conferencing, blog, forum, bulletin board)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. Content management (e.g. file transfer client, online storage)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Digital resources and content (including databases, reference tools, animations, video clips, educational software, podcasts)</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>7. Data analysis tool*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Game</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Geotagging tool**</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>10. Media authoring tool (e.g. concept-mapping tool, image or video editor, word processor, web authoring tool, podcast client)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Multi-media repository client (e.g., music/photo/video/slide sharing sites)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12. Simulation software</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>13. Syndication feed</td>
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<td></td>
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<tr>
<td>14. Data capture device (e.g. microphone, video camera, camera, scanner, datalogger)</td>
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<tr>
<td>15. Document reader (e.g. document camera/digital visualiser)</td>
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<tr>
<td>16. Interactive teaching and learning device (e.g. IWB, multi-touch table, learner response device, interactive tablet, wireless slate)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Manufacturing device (e.g. 2D or 3D printer)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Mobile device (e.g. phone, netbook, PDA, tablet)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>19. Programmable robotic device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. iTEC tools (e.g. TeamUp)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Webinars or online events</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total types of technology | 3 | 5 | 9 |

2. Pedagogy (from Futurelab work on pedagogies)

| Instructional design | X | X |   |
| Project-based learning | X | X |   |
| Enquiry-based |   |   | X |
| Game-based |   |   |   |

| Other types of pedagogy - please specify | Feedback from experts |   |

| Total types of pedagogy | 2 | 1 | 2 |

3. Assessment

| Self-assessment |   |   |   |
| Peer-assessment |   |   | X |
| Formative assessment | X | X |   |
| Summative assessment | X | X |   |

| Other assessment - please specify | Feedback from experts |   |

| Total types of assessment | 2 | 2 | 2 |

4. Potential benefits (content from WPS teacher questionnaire and external research)

| Use digital tools to support collaborative work (a) | X | X | X |
| Develop competencies and skills that allow students to search for, organise and analyse information (a) | X | X | X |
| Provide opportunities for students to communicate and express their ideas in a variety of media forms (a) |   |   | X |
| Use new pedagogical practices (b) |   |   |   |
| Assess students in a new way (b) |   |   | X |
| Create opportunities to learn beyond the boundaries of the classroom (b) |   |   | X |
| Explore different teacher and student roles and relationships (b) |   |   | X |
| Introduce new concepts which would be difficult to teach otherwise (b) |   |   |   |
| Support teachers to meet the learning needs of each student through individualised instruction (b) | x |   |   |
| Promote active and independent learning in which students take responsibility for their own learning activities or progress. (b) |   | x |   |
| Support collaborative, project-based learning in which students work with others on complex, real-world-like problems (b) |   | x |   |
| Communicate in new ways with the wider community (e.g. other teachers, parents, experts) (c) | x | x |   |
| Increase access to services that enhance learning for all students (c) |   |   | x |
| Increase access to educational content for all students (c) |   |   | x |
| Improve social cohesiveness and understanding by having students interact with groups and cultures they would not otherwise |   |   |   |
| Improve management of educational resources (become easier, more efficient or more effective) |   |   | x |

**Total types of activities**

| 5 | 3 | 4 |

5. Environment

| Classroom | x | x | x |
| School campus (beyond classroom) |   |   |   |
| Local community |   |   |   |
| Home |   |   | x |
| Virtual | x | x | x |
| Work environments |   |   | x |
| Other schools (local, national, international) |   |   |   |
| Other environments |   |   |   |

**Total types of environments**

| 2 | 2 | 3 |

6. People

| Classroom teacher | x | x | x |
| Other teachers | x | x |   |
| Other people in the school |   |   |   |
| Learners in classroom | x | x |   |
| Learners beyond the classroom (in school, other schools, international) | x |   |   |
| Parents/families |   | x | x |
| Outside experts | x | x |   |
| Others in the community | x | x |   |
Other people

<table>
<thead>
<tr>
<th>“people bank”: a network of teachers, experts and classrooms</th>
<th>‘people bank’ and online community space – a network of teachers, experts and classrooms</th>
</tr>
</thead>
</table>

Total types of people involved | 7 | 4 | 3 |

7. Transversal Competences (from EU Key Competences)

| Communication in the mother tongue | x | x | x |
| Communication in foreign languages | |
| Mathematical literacy and competence in science and technology | |
| Digital competence | x | x | |
| Interpersonal, intercultural and social competences | |
| Learning to learn | x | x | |
| Entrepreneurship | x | |
| Civic competences | |
| Cultural expression | |

Total number of competences addressed | 3 | 2 | 3 |

Notes

* Software used to sort through data in order to identify patterns and establish relationships.
** Software that allows users to add latitude and longitude coordinates to various media like photographs and videos.
(a) Relates to benefit: 'Increasing appropriate and effective use of digital technologies to support teaching and learning'
(b) Relates to benefit: 'Increasing the range of pedagogical strategies used'
(c) Relates to benefit: 'Increasing access to educational resources (people, tools, services, content)'
(d) Relates to benefit: 'Improving management of educational resources'

A full map of the selected scenarios using the mapping tool can be found in Appendix 6.

This mapping, allied with the innovation matrix radar charts described above, allows users to grasp how complex a scenario is or where its emphasis lies, while a more in-depth analysis of a scenario is possible through looking at the different elements of the map. By analysing a diverse set of characteristics, the matrix can depict how the different facets of individual scenarios inform their relative levels of innovation (i.e. Does a scenario respond to educational challenges through supporting innovation in one specific area or via more complex changes in a number of areas?).
3.5.3 Applying the mapping tool

The mapping tool will be used to review scenarios created in all cycles. This mapping will allow us to see the diversity of scenarios by mapping and comparing their constitutive elements and subsequent levels of innovation. For example, whether there is a focus on games based scenarios, problem-based learning, out of school activities etc., and which have not been considered. The mapping tool was used to analyse the focus of scenarios described in Section 1.2.

As mentioned above it will allow the scenarios to be analysed according to the number of dimensions addressed. This will show whether or not it focuses on incremental change in one area or whether it is a more complex scenario changing multiple areas. It will also allow the identification of any gaps that have not been covered by scenarios in cycles 1, 2, and 3 and that could be addressed in cycles 4 and 5.

Finally, the various dimensions will be used as a starting point in future scenario development. They can support stakeholders to create scenarios that are consistent and composed of the same elements throughout the iTEC process. Revised as a list of prompts they will allow stakeholders to consider features, such as where it is based, and what pedagogies could be used, while developing future scenarios.

3.6 The relationship between the mapping tool and the innovation matrix

The innovation matrix and mapping tool were designed for different purposes. The mapping tool gives an overview of the elements within a scenario, but it is the innovation matrix that locates the scenario in terms of its innovative characteristics, either relative to the current situation or absolutely. A higher number of elements identified in the mapping tool does not indicate a higher degree of innovation, as there is no judgement as to how these elements are used. For example, a scenario that can be classroom and work based may not be more innovative than one that is only classroom based – it may merely be a student reading about supermarket roles than shadowing a supermarket employee for a day. Without a structure to the task the scenario level of innovation cannot be judged.

Similarly, although useful for assessing where innovation occurs in a scenario the matrix does not list what the elements are within the scenario. Returning to the examples of Designing math games and Music for inclusion and integration, both are ranked as Enhance when considering pedagogical innovation, but it is the mapping tool that shows that the maths games scenario uses game based and instructional pedagogies while the latter uses a project based pedagogy.

3.7 Next steps
Both the innovation matrix and the mapping tool have provided an opportunity to work in depth with partners in both pedagogical and technological work packages and this is leading to rich conversations about how the project links up as a whole and how the scenarios may be differentiated from each other. This is continuing into the final stages of the project. Consequently both may be modified in the light of experience and when used by larger numbers and types of people. For example the descriptors in the innovation matrix may need expansion and further exemplification, and it could be accompanied (e.g. in the toolkit) by a short paper on the background to the matrix, discussing the concepts of innovation and maturity. It may also be possible to use the mapping tool data to produce graphical outputs or interactive versions to improve usability.

Furthermore they have both been adapted into tools used in the Cycle 5 Future Scenario Development Toolkit as both can be used to inform scenario development. For example, if the goal is for a stakeholder to create a simple incremental scenario analysing current status will enable them to determine what layer, Exchange, Enrich, etc is needed in each of the dimensions and what activity would allow that to be reached. Alternatively the same innovation matrix could be used to create a radical scenario by providing a checklist for the stakeholders as to what needs to be happening in each dimension in order to be highly innovative – even though it may have less reach and be focused on “proof of concept”.

Alternatively the categories in the mapping tool could be used as a starting point for discussion around the types of activities could be incorporated into the scenario to complement existing practice. Then the same tool could be used to review one or more scenarios to ensure a range of subjects and skills are covered appropriate to the stakeholders.
4. PRODUCTION OF THE CYCLE 2 SCENARIOS

4.1 Completion of cycle 2

As described in Deliverable D2.1, the overall approach to the production of the scenarios in iTEC is an adaptation of the Delphi method as an iterative process which is repeated over five cycles. For ease of reference and description, the stages for cycle 2 are duplicated here from Deliverable 2.1. This will allow for the completion of sections about tasks which were unfinished at the point of writing the previous Deliverable due to the timing of the report.

The steps for developing scenarios and consensus building in cycle 2 are as follows:

1. Identification of experts and stakeholders (to include iTEC partners and the Pedagogical Board) (T2.1)
2. Complete the survey design (Futurelab) (T2.1)
3. Desk research to develop short descriptors of challenges/possible changes to education (carried out by Futurelab, WP2 partners)* (T2.2)
4. Survey of trends descriptors (completed by all partners, Pedagogical Board, stakeholders)* (T2.3)
5. Distribution of survey link to target teachers in 1000 classrooms* (T2.3)
6. Distribution of Power League (and ordering tools through which young people can prioritise key trends) link to target learners in 1000 classrooms* (T2.3)
7. Analysis and reflection on stakeholder responses (T2.4)
8. Workshop 1 to create and co-author 20 mini scenarios (carried out by Futurelab, WP2 partners, visual artist) (T2.5)
9. 20 mini-scenarios shared online for survey ranking (all partners, Pedagogical Board, stakeholders) (T2.6)
10. Analysis of survey ranking, selection of 8-10 scenarios for further development (carried out by Futurelab) (T2.6)
11. Activities to add detail to the 8-10 full scenarios including workshop 2 (carried out by Futurelab, WP2 partners). (T2.7)

*These elements are the ‘building blocks’ which will feed into the development of the mini-scenarios and in turn, the detailed scenarios.

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9 The tasks as set out in the DoW represent the five varying cycles with not all tasks being required in each cycle. Therefore, given the complexity of this, the stages are set out here in a linear manner with the task number that they relate to provided in brackets.
The following stages (and corresponding accounts) were complete by the point of writing of Deliverable D2.1: 1: Identification of experts and stakeholders; 2: Complete the survey design; 3: Desk research to develop short descriptors of challenges/possible changes to education; 4: Survey of trends descriptors and described in D2.1.

The following sections which were not complete by that point are expanded upon below. Also more detail is provided about item 8: Workshop to create and co-author 20 mini scenarios given that an overview was provided in D2.1.

### 4.1.1 5 and 6: Distribution of survey link and Power League (T2.3)

As noted in 2.1, a survey of teachers’ attitudes to the uses of ICT for teaching and learning was distributed across Europe through iTEC partners and other networks to reach teachers in 1000 classrooms. It focused on current uses, attitudes, enablers and barriers related to the use of technology in classrooms. Simultaneously, teachers were asked to use a Power League in their lessons. This is an online tool designed to stimulate discussion by asking students to order particular items by preference. The Power League categories were based on the trends identified in cycle 1 and gathered data on students’ preference for learning and the use of technology in classrooms. A summary report of the results is attached as Appendix 7. The full report is online at: [http://itec.eun.org/web/guest/scenarios](http://itec.eun.org/web/guest/scenarios).

### 4.1.2 7: Analysis and reflection on stakeholders responses (T2.4)

As described above, cycle 2 brought together a number of elements which were analysed and reflected upon in order to create a set of shared priorities, concerns and aspirations. These included the trends descriptors, the teachers’ survey and results of the learners’ Power League activity and – at this stage of workshop 2 – feedback from the Pedagogical Board on the cycle 1 scenarios. Activities were developed through which these responses could be fed into the next workshops to underpin scenario development. During the same period, evaluation criteria for the scenarios were drafted (see Appendix 8). These were initially for consideration by the Pedagogical Board, who would use them to evaluate the scenarios. They focused on the innovative qualities of the scenarios, and the feasibility of implementation of their pedagogical and technological approaches. They also underpinned activities at workshop 2 described below to further develop and refine the mini-scenarios to become detailed scenarios.

### 4.1.3 8: Workshop 1 to create and co-author 20 mini scenarios (carried out by Futurelab, WP2 partners, visual artist) (T2.5)
Futurelab, WP2 partners and representatives from other iTEC packages attended a two-day workshop at the Promethean offices in Paris (19-20 April 2011). Again, participants were briefed on the trends and provided with summary presentations of the results of the teachers’ survey and the Power League activity. A template was provided (electronically to use on the interactive whiteboards) for participants to generate 20 mini-scenarios. The templates included space for activities and tasks, environments, roles, interactions and resources. Workshop activities were set up in groups (again mixing pedagogical and technical partners in each). Each group was provided with a variety of trends in an envelope from which they could choose one and then add further trends as their ideas developed. Each member of the group was given a top ranked learner view drawn from the Power League results and a list of headlines from the teachers’ survey to ensure that these perspectives influenced the development of the scenarios.

Over the two days 16 scenarios were co-authored. Activities were designed to ensure that the mini-scenarios were distinct from each other and incorporated all the cycle 2 trends. Creating the mini-scenarios was both intensive and challenging. It was decided therefore to improve each of the mini-scenarios by allotting more time to its development – therefore producing 16 rather than 20 – to ensure the quality.

4.1.4 9: 20 mini-scenarios shared online for survey ranking (T2.6)

The survey tool, Survey Monkey, was used to help all iTEC partners, the Pedagogical Board and other stakeholders assess and rank the mini-scenarios. As in cycle 1, respondents were asked to assess desirability (how much they liked the scenario) and probability/timescale (how long it would take for the content of the mini scenario to become common practice in schools without the influence of the iTEC intervention). A total of 153 stakeholders responded and the results were analysed, as below.

4.1.5 10: Analysis of survey ranking, selection of 8-10 scenarios for further development

As in cycle 1, the results of the survey were analysed by ascribing a numerical value to each of the two choices which were the most preferable as seen by stakeholders (4-5 which were judged as highly likely to happen, 4-5 of which were less likely to happen) according to probability/timescale. This produced 10 mini-scenarios to be taken forward for further development.

10 All scenarios and mini-scenarios available at http://itec.eun.org/web/guest/scenario-library;jsessionid=A826A2972694DCE653F1570EF427C3C7
This selection process could lead to a limitation in innovation, although it does produce scalable incremental scenarios. For example, scenarios not chosen include a music factory, mash-ups, counteracting online bullying, and creating a database of challenges provided by industry. These are feasible, but were not taken forward nor the innovative features in all scenarios specifically identified for incorporation in the revised scenarios (see the next section for what was included). It could be argued that this process results in unsurprising scenarios – the selection process precluding more radical innovation although developing “mainstream” innovation. This process was revised in later scenarios.

4.1.6 11: Activities to add detail to the 8-10 full scenarios including workshop 2 (T2.7)

The workshop was held in Bristol, UK (25-26 May 2011) and attended by Futurelab, WP2 partners and representatives of other iTEC work packages. It also included a small number of academic staff from the University of Bristol and two teachers from the north of England. The aim was to refine and develop the selected mini-scenarios and to add detail. Similar activities were carried out to those in workshop 1 – summary presentations of the trends, findings from the teachers’ survey and Power League. Again, a template was provided to generate the content of the scenario. Additionally, feedback about the cycle 1 scenarios had been received by this point from the Pedagogical Board. This was presented at the beginning of the workshop and added a further dimension of criticality into the development alongside evaluation criteria and prompts developed by Futurelab to interrogate and challenge each scenario. For instance, partners with a stronger pedagogical background were given prompts to challenge and criticise each scenario and partners with a stronger technological background were given prompts to challenge and criticise the technological content of the scenario. These were mainly drawn from the evaluation criteria under development. This was the starting point for the workshop and then participants moved into mixed groups to further refine and develop scenarios addressing the points that had been raised. On this basis, 10 detailed scenarios were developed (see summaries of the scenarios in Appendix 1).

4.2 Reflections on the scenario development process in cycle 2

Cycles 1 and 2 ran back-to-back from September 2010 until end of May 2011 with cycle 3 beginning in September 2011. At this point, WP2 had successfully delivered their part of the original description of work and this allowed for consideration of how the scenario development process was developing and to take account of any concerns. To this end, the scenario development process was refined in line with issues identified as part of the internal
review of iTEC carried out as part of the self-review process in preparation for the review by experts from the European Commission. They took account of the views of European Schoolnet, other iTEC partners and key stakeholders.

It was decided that the scenario development process could be improved through taking the opportunity to do the following:

- increase teacher and learner involvement
- consult more with key stakeholders
- draw on existing examples of good practice
- collaborate more with technical partners in iTEC
- streamline the process.

Most of these points were reiterated in the recommendations from the first European Commission project review held in Brussels in September 2011.

There was also concern that the scenario ranking process – seeking consent from all iTEC partners and associated teachers in cycles 1 and 2 – had led to limiting the mini-scenarios which went forward to become detailed scenarios and in turn were developed by WP3 to mainly those which were already pedagogically and technologically feasible. It was agreed to rethink the process in cycle 3.

Specifically in relation to the scenarios, it was agreed to give more emphasis to the following:

- focus on MST (Mathematics, Science and Technology)
- assessment or elements of assessment
- variety and deeper understanding of different pedagogical approaches
- European framework for key competencies 11

The need for more variety and depth in pedagogical approaches within the scenarios had been identified by the Pedagogical Board (see above). The alignment with the European framework for key competencies was intended to ensure affiliation with European policy objectives and to ensure a clear set of criteria which the scenarios could meet.

These principles and ideas were taken forward in planning for cycle 3 to be set out in the next section.

11 The European Framework for Key Competences: This framework defines eight key competences and describes the essential knowledge, skills and attitudes related to each of these
5. PRODUCTION OF THE CYCLE 3 SCENARIOS

5.1 Stages of cycle 3

In the light of the reflections for improving the process for the development of scenarios outlined above, the plan for cycle 3 was then fine tuned. Compared with cycle 2, a number of elements were not included because by this stage, they had either been completed, for example: Identification of experts and stakeholders (T2.1) or they were not part of the description of work for this cycle, for instance: Complete and distribute the teacher survey and learner Power League activity (T2.1; T2.3). In the interests of streamlining the process, it was decided to adapt other parts of the process to be more efficient in order to leave more time to improve the development of the scenarios process. The different stages are described here with rationale for change as appropriate set out below.

1. Desk research to develop short descriptors of challenges/possible changes to education (Futurelab, WP2 partners) (T2.2)
2. Research to inform the creation of the scenarios (Futurelab)
3. Scenario gathering work (Futurelab, iTEC partners)
4. Scenario development with learners (Futurelab, WP2 partners)
5. Workshop to review and enhance the 18 mini-scenarios (Futurelab, iTEC partners, teachers/subject/pedagogical experts)
6. 20 mini scenarios shared on-line for survey ranking (iTEC partners) (T2.6)
7. Analysis of survey ranking, selection of 8-10 scenarios for further development (Futurelab) (T2.6)
8. Activities to add detail to the 8-10 detailed scenarios (Futurelab, WP6, 7, 8) (T2.7)

5.1.1 1: Desk research to develop short descriptors of challenges/possible changes to education (T2.2)

After the broad socio-technical trends of cycle 1, and the economic shifts and the realities of teachers of cycle 2, the underlying theme in cycle 3 was ‘learners’ realities’. This was also in response to the already discussed need to increase the level of learner involvement in iTEC. The theoretical principle that informed the development of descriptors of changes in relation to the realities of students was consistent with previous cycles. The aim of the desk research was therefore to focus on events and developments that can be observed empirically as they unfold in the present, in order to derive suggestions and implications as to the direction and the shape of change over the medium term. This approach has been explored by a number of authors and thinkers (Bussey and Inayatullah 2008; Bell 2003; Slaughter 2002). The identification of trends and drivers – which became the short
descriptors that fed into the scenarios – was developed through a collaborative process with iTEC partners. This process was based on the experience matured over the previous cycle, which enabled a more streamlined and focused approach that increased the efficiency of the overall process.

As in previous cycles, to ensure that a wider set of perspectives about trends and drivers were included, partners assigned to WP2 (European Schoolnet, Promethean, Smart, DGIDC, AALTO, ANSAS) were asked to highlight topics and themes they were particularly familiar with or interested in. To help with this process, a template was issued to these partners, along with examples of how these could enable education and learning and suggestions for further reading and evidence to understand the trend further.

The range of resources considered included:

- High-profile publications like ‘The Shallows’ by Nicholas Carr (2010) which suggests the internet encourages the rapid, distracted sampling of small bits of information from many sources, thus leading to a condition of information overload that affects young people in particular;
- OECD PISA studies consistently showing that there is a relationship between student performance and socio-economic status in several countries;
- Scholarly papers suggesting that young people are particularly at ease with curricular approaches that are narratively driven, experientially immersive, and multimedia rich (Barab and Dede, 2007).

Having received responses from WP2 partners, the next stage was for Futurelab to draw up a list of descriptors. Researchers analysed the descriptors and clustered them into five trends (as listed in section 1.3).

The ranking of descriptors which took place in previous cycles was replaced in cycle 3 by a more streamlined and efficient process. This was the result of feedback and suggestions from the iTEC project management. Consequently, discussions with WP2 partners (carried out remotely) were favoured over a formal and time-consuming ranking process. The discussions succeeded in focusing efforts on a smaller number of relevant trends without sacrificing depth or analytical coverage. The outcome of this process was the identification of five specific trends (see above), rather than broad “themes” underpinned by a large number of trends as in previous cycles.

5.1.2 2: Research to inform the creation of the scenarios

Desk research was carried out during cycle 3 in order to develop a deeper understanding of the different pedagogical approaches that underpin the scenarios. This activity was
undertaken in response to constructive feedback from the iTEC Pedagogical Board, which highlighted the need to make more explicit and formal references to a variety of instructional methods and approaches to teaching and learning. As a result, a synopsis was developed, which summarised four innovative pedagogies which may be used in the classroom and beyond (e.g. by creating links with out-of-school contexts and experiences). The aim was not to carry out a comprehensive review, but only to highlight the approaches which are more suited to the iTEC project given its assumptions about educational change, innovation and so forth (see sections 2 and 3).

In order to focus efforts as efficiently as possible, the following definition of pedagogy was adopted: the range of goal-oriented, didactic and pastoral activities which teachers, educators, or even more experienced learners, may undertake to provide guidance, support, instruction, orientation and feedback to other learners. Independent learning was therefore not considered as a type of pedagogy, although it is an essential element present in all the approaches described in the synopsis.

Another assumption guiding the research on the pedagogic approaches is that the synopsis should not be seen as a “how to” guide but as the starting point of a process of investigation and research to be carried out locally by individual teachers or by groups of teachers, accounting for specific enablers and constraints. The summary also states in clear terms that actual teaching and learning is most effective when based on a combination of two or more approaches. An element of instructional design and a strong emphasis on formative assessment should be key features in all forms of pedagogies. Other elements from project-based learning, enquiry-based learning and so forth could then be integrated, depending on the nature of the tasks, the curriculum and other local factors. The four pedagogic approaches are reported below, some relevant references and weblinks are also provided.

**Instructional design**

Putting too much emphasis on “constructing knowledge” through active exploration and discovery can even have negative consequences for learners, because it may overload them with information their young brains cannot cope with, and which could be much more effectively internalised through structured and gradual instruction (Clark et al, 2006).

**Project-Based Learning (PBL)**

PBL emphasises authentic tasks and personalised challenges that address real-world issues and problems. The aim of projects is to re-create real-life working conditions in complex, knowledge-intensive fields in which multiple skills need to be used in one way or another.

**Enquiry-based pedagogy**

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12 See [http://projects.hightechhigh.org/](http://projects.hightechhigh.org/) for more information:
Whilst project-based learning aims to replicate as faithfully as possible the practices of a wide range of professions, enquiry is more specifically linked to the practices, the values and the languages of scientific and creative disciplines. "Enquiry-oriented" approaches to the curriculum are those that model the learning experience around the practices and mechanisms of scientific or creative enquiry, implicitly or explicitly encouraging students to take on the roles of knowledge seekers, artists or “knowledge builders” (e.g. Scardamalia and Bereiter, 2003).

Game-based pedagogy
The main assumption of a game-based pedagogy is that the playful and intrinsically motivating elements of video games may offer great potential for learning. These elements can either be generated automatically in a game environment through software coding, in which case the pedagogic element would be absent or secondary, or re-created through specific practices and techniques in the context of formal or informal activities. This second option might help educators orchestrate tasks and interactions in a “game-like” fashion, whilst still providing expert and goal-oriented guidance needed to enhance the learning experience of students in relation to specific topics or subjects (Salen, 2004)\(^\text{13}\).

Thematic Learning
The way learning is structured in most education systems around the globe makes it very hard for many students to maintain the required levels of motivation and attention. Inconsistent timetabling, fragmented tasks and seemingly arbitrary and abstract success criteria keep alienating large sections of the student population in many countries. Thematic learning is a simple way to address these issues, by advocating a more cohesive learning experience that revolves around a central theme or phenomenon.

The work carried out by Susan Kovalik (1994) provides empirical backing and guidance on thematic learning. Drawing on research on the functioning of the brain, Kovalik argues that the search for meaningful and coherent patterns underlies powerful learning in authentic conditions. She describes three steps that could help with the development of thematic curriculum:

- Identification of a year-long theme
- Determining the key concepts and skills to be mastered within year-long themes
- Creating and using enquiries.

5.1.3 3: Scenario gathering work

\(^{13}\) The Quest 2 Learn school website: [http://q2l.org/](http://q2l.org/)
As noted above, two main aims in cycle 3 were to: consult more with key stakeholders and draw on existing examples of good practice. There was also a strong belief amongst iTEC partners that many good examples of innovative practice already exist and should be incorporated into the project through the development of the scenarios. In response to this, a method was devised through which examples of innovative practice could be elicited from iTEC partners and other key stakeholders which could then form the basis of scenarios. A template was carefully designed which could draw on the experience and knowledge of iTEC partners to encourage them to send innovative examples to WP2. This provided criteria for both the selection of innovative examples by partners and other stakeholders and the elicitation of the information needed by WP2 to develop these into scenarios (see Appendix 9). The request was sent to all iTEC partners and distributed through their networks to other stakeholders. In addition, WP2 carried out desk research to identify examples of innovative practice to ensure wider coverage.

Partners responded with 23 examples of innovative practice. Twenty of these formed the bases of 18 mini-scenarios which were drafted by Futurelab, drawing on the ideas contained within the examples plus the desk research. Where there were similarities, overlaps or complementary suggestions or examples, ideas were combined. In three cases, innovative examples were not taken forward to be developed into scenarios as the cases were not clear. Time was too short to follow up on them within cycle 3 to get clarification however this will be followed up in cycle 4.

In addition, early trends and commonalities emerging from learners’ workshops in cycle 3 (see following section for detail) also contributed to the base ideas and content of the mini-scenarios.

5.1.4 4: Scenario development with learners

To ensure young people’s input contributed to the scenario development process in cycle 3, Futurelab, WP2 partners and associate partners organised and created half-day workshops for learners that gathered their ideas and suggestions for preferable learning scenarios. Five workshops were held in four countries (Portugal, Italy, Norway and UK), and all materials were translated and then locally adapted to suit the situation and requirements of the participating students. Across all five workshops, 111 students between the ages of 11-15 participated.

At the beginning of each workshop, participants were briefed on its purpose and provided with an overview of the iTEC project. Workshop activities began with exploratory activities that asked students to imagine and discuss what schools could be like or should be like. In groups, they then outlined what they would like learning and education to be like. They responded to this question in relation to four categories (People, Space, Activities and Technology and Resources) that align with the iTEC taxonomy of learning and teaching that
is used in the scenario development workshops with professionals. Time permitting, groups were then asked to further develop their ideas into a scenario through an annotated drawing. Some groups also recorded a description of their ideas with a voice recorder.

The results of each workshop were translated into English where required and analysed for trends and commonalities within workshops and across different workshops. Trends identified in each of the four categories, as well as common themes overall, were used as one ‘building block’ of the mini-scenarios that were developed in cycle 3. Moreover, the trends and visual depictions of scenarios were presented to the participants at the cycle 3 scenario workshops, who were asked to ensure that young people’s preferences and ideas were considered in all mini-scenarios.

5.1.5  5: Workshop to review and enhance the 18 mini-scenarios

Taking account of the need to include more teachers, subject and pedagogical experts in the scenario development process, invitations were extended beyond iTec for the cycle 3 workshop which was held in Bristol, UK on 22-23 November 2011. Twenty-six participants attended the workshop including teachers and pedagogical experts from Finland, France, Spain and the UK. The emphasis was different at this workshop from previous ones given that the scenarios had already been drafted by Futurelab; the objective for the workshop, therefore, was to evaluate and develop scenarios rather than to co-author them from scratch. Activities were designed to facilitate this process incorporating the ‘building blocks’ developed in preparation: the Learners’ Realities Trends, Synopsis of Pedagogical Approaches, Young People’s Workshop – Commonalities summary and the iTec definition of innovation. A template was designed to enable participants to work in groups of 3-4 to evaluate and improve the 18 mini-scenarios (see Appendix 10). The participants were asked to challenge and suggest improvements to the scenario in relationship to the following:

- How inspiring is this scenario?
- How well are young people’s views represented or included in this scenario?
- How innovative is this scenario?
- How pedagogically feasible is this scenario?

Participants were asked to carefully capture their discussions on the template below so that Futurelab could incorporate the enhancements and recommendations for each mini-scenario before they were put online for feedback from iTec partners. This was carried out after the workshop ready for the ranking process14.

14 All scenarios are online at: http://itec.eun.org/web/guest/scenario-library?sessionid=A826A2972694DCE653F1570EF427C3C7
As noted above, Futurelab were also asked to review the ranking process for the mini-scenarios given some concern that the process could be leading to only pedagogically and technologically feasible scenarios going forwards for further development. With this in mind, it was considered important to engage workshop participants in this process given that they had spent two days working with the mini-scenarios in depth and that they constituted a group of pedagogical experts whose views were significant.

Therefore, they were asked to rank the mini-scenarios during the workshop. This was a two stage process.

1. **Degree of innovation**

   Participants were provided with the working definition of innovation developed for iTEC “the process of responding to educational challenges by designing solutions that benefit stakeholders.” Participants were asked to negotiate within groups and to agree a shared evaluation of the degree of innovation according to the following question and accompanying scale:

   ‘The purpose of this exercise is for each group to give an approximation of how innovative the scenario is for you and for teachers in your country.’

   5 = very innovative; 1 = Not at all innovative.

2. **Preference**

   Participants were also asked to vote as individuals on the two scenarios that they thought should go forward in the iTEC process. They were asked to base this decision on their knowledge and experience of teachers, schools and classrooms and to consider how inspiring the mini-scenario was; how pedagogically and technologically feasible it was; how well young people’s views were represented; as well as how innovative they thought it was (areas they had been working on in depth during the scenario development process).

The workshop participants considered their responses to these questions carefully, after having engaged on a deep basis with the content and the development of the mini-scenarios. The two measures were combined and the mini-scenarios ranked accordingly.

5.1.6 6: 20 mini scenarios shared on-line for survey ranking (T2.6)
The results from the ranking carried out by participants at the Bristol Scenario Development Workshop produced 18 mini-scenarios ranked from 1-18 (1 being the highest; 18 being the lowest). The survey tool, Survey Monkey, was used to elicit feedback on the ranked positions. The request was distributed to all iTEC partners who were asked to indicate whether they agreed or disagreed with the scoring. They were also asked to add comments if they wished.

5.1.7 7: Analysis of survey ranking, selection of 8-10 scenarios for further development (T2.6)

After closure of the survey, the scores and comments were downloaded. These were circulated to the Steering Committee who met for two hours online to decide which scenarios should be taken forward, taking on board the wider scores and comments. A decision was taken that seven of the mini-scenarios would go forward for further development.

5.1.8 8: Activities to add detail to the 8-10 full scenarios (T2.7)

Futurelab further developed each of the seven mini-scenarios taking account of the comments which had been provided as part of the feedback. Where mini-scenarios were excluded content which had been positively commented on was incorporated where possible into the scenarios going forward.

Feedback and ideas from the technical partners were also incorporated. These were elicited by Futurelab during a workshop held in Vienna, Austria on 5 – 6 December 2011, organised by WP7. The leader of WP2 attended the workshop and asked participants to brainstorm technologies which already exist and technologies which are being developed by iTEC to support the cycle 3 scenarios. This activity provided the opportunity for a two-way exchange between the process of scenario development and the technical developments occurring as part of the project. It also generated many ideas for the development of widgets to support the scenarios. For example, one of the scenarios, Digitally mapping local biodiversity, prompted discussion about how existing technologies such as GPS, Google maps, Google Earth and QR codes for guided walks could enhance the scenario in addition to how technologies being developed for iTEC could also provide support. These ideas were fed into the further development of the detailed scenarios before beginning work on the scenarios with WP3.

This process overcame some of the issues arising from the selection process as the ranking was dependent on the reviewer’s opinion of how pedagogically and technologically feasible it was; how well young people’s views were represented; as well as how innovative they thought it was. However, the perception of feasibility meant some of the scenarios, for
example, those that talk about augmented reality – creating holograms to help students understand science concepts, creating challenges for peers using multi-touch technologies, the creation of learning records similar to an analytics approach of recording learning, might not have been selected. This would result in less radically transformative scenarios going forward, although would scale to all classrooms.

5.2 Reflections on the scenario development process in cycle 3

The changes made in cycle 3 were productive, with a streamlined process being more efficient. The improvements outlined were successful in increasing teacher and learner involvement, particularly through the inclusion of more teachers at the scenario development workshop in Bristol and at the young people’s workshops held in Portugal, Italy, Norway and UK. The process of elicitation facilitated more key stakeholder involvement, drawing on existing examples of good practice, and collaboration with technical partners. A two-way exchange with technical partners for the development of the scenarios was also enabled through Futurelab-led activities as part of the Vienna technical partner workshop. The template for the elicitation of good practices facilitated the inclusion of scenarios focused on MST (Mathematics, Science and Technology) and included a greater degree of assessment. The Synopsis of Pedagogical Approaches encouraged workshop participants to take a deeper and more varied approach in the workshop. Finally, alignment with the European framework for key competencies allowed for differences between and gaps within the scenarios to be identified and a variety of criteria to be met.

Taking account of the improvements, an internal review of cycle 3 was also carried out following from the self-review undertaken in preparation for the first review carried out by experts from the European commission and their subsequent recommendations. From this, potential improvements emerged as follows:

- Increase teacher involvement and of key stakeholders
- Improve the timeframe
- Increase the longitudinal dimension, merge cycles 4 and 5
- Increase online activity
- WP2 and WP3 to work more closely together
- Increase focus on personalisation, European key competencies
- Increase integration of iTEC technologies
- Focused engagement with suppliers.

Whilst cycle 3 benefited from additional input by teachers, it was agreed that more of a bottom up approach in cycle 4 will give teachers more of a sense of ownership of the
scenarios. Merging cycles 4 and 5 has the potential to improve the timeframe meaning that cycle 4 will be less rushed allowing more time to engage teachers and other key stakeholders. Also it will allow for the building of an online teacher community and peer network that can be involved across the project through from the scenario development process in WP2 to the participatory design workshops and pre-piloting in WP3 and piloting in WP4. This will also require WP2, WP3 and WP4 to work together more closely which will widen their involvement in and understanding of the process and how to enhance the outputs. Moreover, the joined up process will enable the teachers involved to bring their experiences at the different stages of the project to influence the next stage of scenario development and so on so that they will be instrumental in the iterative process. Increased focus on personalisation and European key competencies will further enhance the scenarios. Increased integration of iTEC technologies is again a means through which the project can become more joined up between technical and pedagogical work packages to ensure that the vision for iTEC is realised. More focused engagement with suppliers has the potential to facilitate iTEC’s sustainability in the longer term given that suppliers will most likely continue to exist and advocate technologies in schools beyond the end of the project. To this end a workshop has been organised with Smart and Promethean in April 2012 to ensure the prominence of Interactive Whiteboards and associated technologies within the cycle 4 and 5 scenarios.
6 BEYOND CYCLE 3

6.1 Next steps

In the light of the review the planning for cycle 4 and 5 was revised. They will be discussed in detail in Deliverable 2.3. The remainder of this section, however, gives a brief overview of the last two cycles.

6.1.1 Cycle 4

The first task was to create a community of teachers for the development of scenarios to take forwards in WP3 and WP4, the second to provide stimulus materials and activities. In January 2012 a meeting was held with iTEC teachers, organised and led by European Schoolnet. In this Futurelab worked with teachers during one of the sessions to produce initial outlines for 10 mini-scenarios based on an analysis of feedback and evaluation results of earlier cycles from WP3 and WP5. These were put online and activities to encourage teachers to further develop them circulated.

The review process was amended. There was still voting by stakeholders for the preferred scenarios. However, all the scenarios were analysed using the mapping tool to show the diversity of scenarios – the aim was to identify those similar in pedagogic or technology areas and revise to make them more distinct. Secondly, six groups were created each asked to review all the scenarios here was a dimension review performed by experts based on the innovation research by WP2. The groups looked at all scenarios and identified what activities are innovative and what could be barriers that need to be included or addressed in the development of learning activities by WP3. The six areas were:

1a. Is the scenario sufficiently innovative for the future classroom?
1b. Does the scenarios add to the range of innovation provided through iTEC?
2. Does the scenario have the potential to support teacher competency acquisition?
3. Is the scenario innovative in its potential use of technology?
4. Does the scenario address recognised focus areas for educational reform?
5. Is the scenario currently feasible and sufficiently scalability for potentially large scale impact?
This process is described in depth in Deliverable 2.4 Second validation report delivered June 2012 from page 30.

6.1.2 Cycle 5

The approach to Cycle 5 is also revised. Acknowledging the need to create more innovative scenarios, which may be more challenging to scale across the entire pilot but could be used in small-scale pilots contemplating transformative innovations in European schools, a separate expert workshop is proposed. Although still in the design stage it is proposed to invite pedagogic and technology experts from across Europe, including from the TEL research community, to consider what innovative technology and pedagogically challenging areas there are and what scenarios could emerge from these. It should be noted that the workshop and associated scenarios will be driven by experts, and not the technology providers.

The second area is to ensure that the stakeholders have ownership of the scenarios. To achieve this a Future Scenario Development Toolkit has been created and is currently being finalised. This will provide a legacy for the iTEC project as will be available to stakeholders after cycle 5. The toolkit is based on processes from earlier cycles; it references iTEC tools, and incorporates innovation matrix and mapping tool. It will allow stakeholders to create scenarios that are relatively innovative when compared to their context or absolutely radical in terms of innovation. Fewer scenarios are created in each workshop and are tailored for the local context rather than having to be used across Europe. This should mean that the selection process beyond Cycle 5 reduces in importance. Instead the selection criteria will be built into the development process.

These changes will help improve the integration of the technological and pedagogical partners across different work packages, more seamlessly incorporate iTEC technologies into the scenarios, and more deeply involve stakeholders – particularly teachers – in the scenario development process. This might be online or through face-to-face engagement, ideally long-term.

There is also recognition that WP2 should be taking more account of other European projects (possibly also international projects) in developing scenarios. For this purpose, work has begun on identifying appropriate relevant projects and this work in progress is provided in Appendix 11. Also, NEXT-TELL (Next Generation Teaching Education and Education for Life) have composed a scenario for Cycle 5.

The aim, within the third year of the project is also to attract more Associate Partners to the iTEC project. Partners will work within iTEC in two ways. Initially partners will be required to
support the dissemination process, communicating iTEC through their own networks, thus raising awareness. EUN is also engaging with a subset of Associate Partners to work alongside iTEC in the development and delivery of classroom pilots based on Future Classroom Scenarios. **In response to the recommendations of the European Commission Review Panel, at the second iTEC review, these pilots are intended to be of smaller scale, but demonstrating far more radical innovation.** While the radical nature of these pilots may limit them in terms of up-scaling they will act as an example of what can be achieved through iTEC with sufficient focus of resources
7 PEDAGOGICAL BOARD UPDATE

WP2 recruited and managed the Pedagogical Board – consisting of international experts in pedagogy and technology – to add an important dimension of scrutiny and validation to the project. The Board consisted of 4 members as described in Deliverable D2.1. Members were given a one-year contract concluding at the end of November 2011.

Activities carried out by the Pedagogical Board were as follows:

WP2
- Online ranking of the cycle 1 and 2 mini-scenarios
- 2-3 page reflective commentary on the cycle 1 mini-scenarios
- Completion of online survey and comments on the cycle 2 mini- and detailed scenarios
- Online ranking of the trends, review of the trends identification process and how they feed into the scenario development process
- Comments on the evaluation criteria for the selection of scenarios.

WP6
- Review report on teacher competences

A recommendation from the first project review was that the Consortium should reconsider the role of the Pedagogical Board. Following internal discussion, a report on the role of the Pedagogical Board was provided to the Commission which included the rationale for deciding to end the Pedagogical Board after one year. It was agreed that whilst the comments and reviews of the Board had been vital in setting up and shaping the project during its first year, more emphasis would be placed on iTEC partners and key stakeholders for the remainder of the project. For this purpose, the remit of the Pedagogical Board will be subsumed into the Integration Committee which is being set up by WP2 following the first review by experts from the European Commission. This new Committee will also build on the work carried out by the Innovation subgroup to draw on internal expertise within iTEC and to encourage collaboration between pedagogical and technological partners.
8 DISSEMINATION AND IMPACT

Futurelab drafted a short- to long-term plan to ensure effective dissemination of the WP2 work for maximum impact in M20 (see Appendix 12). A number of ad hoc activities have also taken place during the last year as follows:

- Short article on the scenario development process for the European Schoolnet newsletter
- Seminar on iTEC presented at the graduate school of education, University of Bristol (May 2011)
- Webinar explaining trends process (see below)

As part of the dissemination process, a webinar took place on 2 November 2011 to explain the trends process to an extended audience including iTEC members as well as associate partners. The aim of the webinar was to:

- Clarify some key concepts in iTEC: trends, educational change, iTEC vision
- Introduce some of trends identified during the first three cycles
- Provide an overview of some basic assumptions about iTEC, from the perspective of WP2

The webinar took place using the Elluminate web conferencing platform and was supported by EUN. Twenty participants attended the webinar. The recording is available here: https://sas.elluminate.com/site/external/jwsdetect/playback.jnlp?psid=2011-11-02.0710.M.C44859422845FA10518F4640FD929B.vcr&sid=2010141
9 REFERENCES


10 APPENDICES

Appendix 1: Scenarios selected for cycle 2

In this section the text of the ten scenarios selected for further development in cycle 2 is that used in the selection process. For each there is a radar diagram generated according to the innovation matrix.

<table>
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<tr>
<th>TITLE</th>
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<tbody>
<tr>
<td>Combining formative and summative assessment</td>
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<table>
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<tr>
<th>VISION (ASPIRATION AND AIMS)</th>
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<tbody>
<tr>
<td>• to combine elements of formative and summative assessment</td>
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<tr>
<td>• to use feedback and technology to enhance teaching and learning</td>
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<table>
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<tr>
<th>BACKGROUND MOTIVATION STATEMENT</th>
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<tbody>
<tr>
<td>In response to evidence that formative assessment can greatly enhance learning alongside the demands of a national summative assessment system, teachers can use feedback from technology to combine formative and summative assessment. Additionally, teachers enhance their own professional development by developing formative assessment techniques and using the supporting role of technology.</td>
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<th>NARRATIVE</th>
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<tr>
<td>I am a science teacher who wants to combine elements of formative and summative assessment to enhance my teaching and my students’ learning. First of all I choose a topic from the curriculum and I prepare a test to assess my students’ understanding and knowledge of this topic using a classroom response system. With this information I begin to develop a class wiki with headings based on the outcomes of my students’ knowledge and the areas that they are struggling with.</td>
</tr>
</tbody>
</table>

Students are organised into teams (mixed or similar ability or a combination of both) and must complete assigned sections of the wiki based on the data from the classroom response assessment and other observations and evaluations I have made during the teaching of this topic and class. In the next lesson the class build the wiki using the headings as a framework, carrying out research, and using the web and other traditional resources like textbooks.

I directly moderate the teams working on the ‘misconceptions’ area of the wiki, providing them with personalised support. I encourage the students to support each other in identifying and addressing common misconceptions. Students will demonstrate their understanding of the topic by composing tests using the classroom response systems. Regular opportunities to reassess learning are available. For some of the more challenging
topics support also comes from a “people bank”. Some of those in this network of teachers, experts and other classrooms have agreed to act as moderators of the “advanced” section of the wiki, as well as evaluators of the quality of the knowledge produced by the students. Depending on the feedback gathered, students progress to more advanced sections of the wiki, and more sections are added to accommodate the progression of the class.

### TITLE
Developing collaborative approaches to learning about business

### VISION (ASPERSION AND AIMS)
- to develop collaborative approaches to learning about business in young people and add to their competitiveness in the job market through engagement in real, relevant and purposeful tasks

### BACKGROUND MOTIVATION STATEMENT
As the fallout of the financial crisis is set to continue, many EU countries are facing massive debts and high spending cuts, which is affecting the job market and decreasing young people’s chances of employment. This activity will support students to develop collaborative approaches to business and to gain practical experience of setting up and developing a business idea.

### NARRATIVE
I design activities through which my students can identify a business idea and together we map it onto the school curriculum. We then develop creative ways to address and work towards this idea. Students choose one or more business ideas in which they are interested and that support development of their entrepreneurial skills and knowledge through real-life, authentic tasks (e.g. designing new products or setting up a service). I also explore the
cross-curricular potential of these activities because the business idea includes tasks from a range of subjects, including data analysis (e.g. supply and demand), marketing, business planning and writing.

Throughout the activity I take the role of facilitator and business consultant. My students and I set up a virtual ‘hatchery’ where the students can develop, share and nurture the ideas they want to ‘hatch’. In the past, I have created a hatchery in a corner of my classroom where ideas are shared with post-it notes and I have also used a virtual space on the school intranet. We have led the development of a local bank of ‘ambassadors’, which consists of parents, local businesses, and schools who will support the students in their projects. Students ideally also access a support network of internationally based peers and experts via an online community and a series of webinars and events. With the guidance of and external experts, peers and me, students build on the initial challenge and bring it to a conclusion as agreed with me as the teacher. Students present their results to a panel of ambassadors and to the online community for feedback and ideas for further development.

**TITLE**

Embedding exam preparation in learning activities

**VISION (ASPIRATION AND AIMS)**

- to support learners to use technology effectively to enhance their exam preparation and to develop their communication skills
BACKGROUND MOTIVATION STATEMENT

Students and teachers are confronted by increasing demands from assessment and examinations, which can lead to restrictions in the range of pedagogic activities carried out. This scenario helps resolve this by providing both students and teachers with useful and innovative ways of using technology to build a bank of resources that can be used for ongoing learning and revision. This enables the teacher to introduce transferable skills and cross-curricular activities whilst still addressing the certification needs of the students.

NARRATIVE

At the beginning of the year students and I brainstorm different ways and methods of revising, and how these might be used for different topics. As the year progresses I choose appropriate revision methods to be used during the teaching process. My colleague decides to plan this in advance, but I prefer to choose a method from the list for each part of the curriculum when we get to it.

To help in my planning, I identify those methods that are primarily intended for an audience and not only for the person who makes the resources (e.g. video or podcasts). These need to be more carefully scheduled into class activities because they take more time and planning. At the end of each topic the students prepare the revision resources which they will also use to prepare for the final exam. These are stored online on a platform that they can access from anywhere (with password protection), and can be shared with more people if we decide to.

The resources which my group prepares include flash cards for widgets or (for example) Android mobile phones; mind maps (including shared online mind maps); printed flash cards; audio podcasts; videos; animations of models and processes; simulations; wiki notes; and quizzes, crossword puzzles, and online games (where there are kits available). To carry out the classroom activities, I use iTEC tools and resources which are designed for production of each type of revision method.

I identify different processes for developing the resources, which I vary throughout the year. For example:

- Divide into groups of five and each team produces a resource. These are then peer reviewed, improved and posted on the revision collections site.
- Each student prepares their resource at home and uploads it to the revision collections site. The students vote for the ones they think will be most useful when they come to the revision period. (e.g. like/dislike on Facebook, print them out and post comments or votes).
- Joint creation of an online mindmap or virtual representation of processes from the full class group (e.g. Mindmeister, Exploratree).
- Collaborative production of a video that documents a week-long look at a curriculum area, as part of the learning activities and not just for revision after the event.

After exams at the end of the year, the class votes for the resource for each topic that they found most useful. With the consent of the authors, this is also made public on the school
website. I am also invited by the head of the school to share my experiences with other teachers in the school.

TITLE
Mathematics in a multicultural setting

VISION (ASPIRATION AND AIMS)
- to develop a common multi-literacy promoting inclusive and multicultural classrooms
- to increase students’ engagement in learning activities

BACKGROUND MOTIVATION STATEMENT
As immigration and other demographic changes increase the diversity in classrooms, there is a requirement to find new ways in which students can participate in activities that bring them together and break down barriers. Technology can assist in this process creating multi-lingual collaborations which provide rich shared experiences and also offer opportunities for students to increase their engagement in schools and gain confidence.

NARRATIVE
“Diversity in this school should be an asset, not a barrier!” These were my words during a heated conversation with one of my colleagues in the Mathematics department. The reason for my outburst had been the topic of discussions for a long time. My school serves a large community with a high level of immigration, which comes with many challenges. A large number of our students speak an additional-language, which means that communication can be problematic and this inevitably compromises their learning. The school has introduced many traditional literacy initiatives with some degree of success. However, I
have been feeling that it is time for something different. What if we try to use the “universal language” of mathematics to improve participation and communication across the school?

Using a scheme within the school that encourages improving communication, I offer the idea to the head teacher. He agrees to allocate some time and budget to our multilingual Mathematics project and a team of like-minded, enthusiastic teachers is put together. The idea of the project is to help students across the school develop a “common language” around mathematics. To keep things relatively simple, we decide to focus on percentages and fractions. Our aim is to get all our students to explore authentic questions and challenges which involve these mathematical concepts. The novel and exciting element is that the activities will be informed by research carried out by additional-language students, and they will be worked through in multiple languages.

We start the project by giving personalised support to additional-language students, so that they learn the basic mathematical concepts well. These students work in their own language and also translate the concepts into the first language. Students then use the internet and social bookmarking tools to collect links and learning resources on the mathematical concepts. Students search for these resources from the different countries represented in the classroom and add these resources to the social bookmarking tool so they can be shared with classmates.

The second phase involves the additional-language students explaining what they had found to their classmates through structured presentations and question and answer sessions. My colleagues and I facilitate these sessions, addressing misunderstandings and communication issues.

To ensure all students understand the mathematical concepts, they use an online template created to help them reflect on what they learned and identify further questions that could be answered using percentages and fractions. I create groups that include students from different countries and these groups work on authentic questions like calculating the number of students leaving school with qualifications in different countries or the relationship between eye colour and gender in the classroom. The groups use the first language and the additional language as necessary. Students record this activity and findings in an online collaborative document (e.g. Google docs), so it can be shared with the rest of the students.

As a final step, the students use a social networking tool to make contact with a group of students and teachers in the home countries of students in class. They share their experience of multicultural mathematics and ask for some feedback.

At the end of the experience, the students’ confidence is visibly higher, as are the levels of interaction and participation amongst the students. Additionally, interest and engagement in mathematics also significantly increase. Because this was a success in the Mathematics department, it is also adopted as a model in other departments.
Product outcomes/learning objectives

Underpinning Technology

Management of teaching, learning and assessment

Pedagogy

Learner role

Mathematics in a multicultural setting
## TITLE
Mentoring Teachers to improve Digital Literacy

### VISION (ASPIRATION AND AIMS)
- to support action-based teacher collaboration and professional development through the fostering of students’ and teachers’ digital literacy

### BACKGROUND MOTIVATION STATEMENT
Knowing how to use the web and digital technologies effectively and appropriately is a critical skill for students to learn and is one that is now being addressed within many schools. Teachers are therefore often expected to have high levels of digital literacy themselves. However, lack of confidence or competence in their own knowledge and skills is often a barrier to using technology in classrooms. Peer learning and support is one way teachers can gain the necessary skills and knowledge to develop their own – and their students’ – digital literacy.

### NARRATIVE
I am developing activities and tools to foster the digital literacy of my students in my own subject, and through involvement in an international project (i.e. iTEC) I am able to showcase this work in a whole school staff meeting. Two of my colleagues (one in my subject and one from another department) express an interest in exploring these issues with me but have less experience and confidence.

Although my expertise is in online video sharing platforms, together we decide to broaden our focus to look at a wider range of issues and new tools, such as open source and cloud video editing. We quickly identify students with existing expertise in this area in our classrooms and so we invite them to demonstrate some of these to us.

My two colleagues and I begin to plan lessons and activities together, observe each other’s work and reflect on our experiences. We are given some opportunities to team teach, because it is recognised that our collaboration is helping both to improve students’ progress and skills and also raise our own skills and confidence.

I am also finding it very helpful to access an international educators’ forum around digital literacy which contains advice and tips. The three of us use this forum to contact relevant experts, search event listings (such as Webinars) and read current research. We also share our new expertise with others on the forum, and this further validates our work. It is also very interesting to hear other professionals’ observations on the work we complete and our students create. This encourages us to set up a face-to-face staff forum in our own school for sharing ideas and fostering new mentoring relationships in other areas.
Mentoring teachers to improve digital literacy
Our school, our environment: using technology to raise environmental awareness

VISION (ASPIRATION AND AIMS)
- to integrate all students into the larger school environment
- to bring together the school community
- to raise awareness about low-carbon schools, carbon output and the environment

BACKGROUND MOTIVATION STATEMENT
There is a generally accepted need to raise environmental awareness among young people. For this to be effective students need to engage in work with authentic problems in a realistic context. Engaging with the community is also important. But for this to be possible the work should link with the curriculum and existing teaching practice in the school and make use of attractive technologies that offer new ways of representing and managing energy use.

NARRATIVE
I am initiating a curriculum mapping process with my fellow teachers in the school to identify a specific project around environmental awareness and plan cross-curricular activities in the school in the coming term. In chemistry we are looking at different types of plastics. In mathematics we are analysing the actual and projected energy use of the school.
I am tasked with recycling. We establish an area on the school learning platform where progress on the project can be tracked. We also use this as a place to plan our contacts with the local community who could be invited to speak or respond to questions via email and to identify video resources which could be used.

I start with a discussion in my classroom around the environment and ask students to research recycling in the community and their own homes, offering support as required.

My class works together on data gathering and presentation, making use of tools that help them to do this in a standard way and that perform immediate calculations on the data. They also interview people from within and outside of the school. My maths teacher colleague is fortunate to have access to real-time active monitoring devices in the school that feed information into the website. We also use iTEC tools to estimate our class’ and school’s carbon footprint.

Using the area on the platform prepared for this project, I help my students create a website about their carbon usage and other environmental impacts of the school. We use animation, audio, video and photography to create digital stories to represent our consumption. They also use the materials to prepare printed materials and posters.

At the entrance to the school there is now a live display with updated information about school recycling.
Finally, I invite a colleague from a neighbouring school to see what we have done. This has become the basis for collaborative activities between the schools. This leads to distribution of posters and presentations during students' assembly, and eventually to a special day for the schools in the area to come together to discuss their work. We are really pleased that all the schools get awarded an Eco-School badge! This gives us enough publicity that we are able to offer a consultancy to clients who want to carry out an environmental audit on their own activities.

**TITLE**
Professional development in the global classroom

**VISION (ASPIRATION AND AIMS)**
- To connect teachers and classrooms through the use of innovative technology practices
- To help teachers grow from passive to active participants in online communities
- To support teachers to share innovative practice and co-develop resources

**BACKGROUND MOTIVATION STATEMENT**
Legislative and economic pressures mean that certain methods used to teach difficult science, mathematics or technology topics are no longer possible or practical. Teachers need inspiring ideas to cover these gaps. There are pockets of innovation in classrooms around the world. Social media and online collaboration tools can help teachers get connected with each other and share innovative teaching practice and resources between schools in the same community or across the globe.
NARRATIVE

I am considered by my peers to be a “connected teacher.” I often know how to find answers to hard teaching problems through being well connected to teaching communities and online resources.

I was not always like this. In the past I was more of an observer on an online community of teachers but I would certainly never post anything online or talk with teachers outside my school about what I do in the classroom. I learned to become a follower on Twitter and had a few colleagues as friends on Facebook but I often struggled on my own to find answers to hard teaching problems.

One day, I was struggling to find a new approach to teaching a difficult topic (gravity) and I wrote about it in my Facebook status. One of my Facebook friends put my status message on Twitter, and one of her followers then let me know about a TeachMeet (self-organized blended professional development workshop) for physics and science teachers held at a school nearby.

I attended and was inspired by the five-minute presentations, in particular a presentation given remotely by Ms Maria Gonzales, who got her students to create simulations of the motion of the Earth and Moon using the Scratch programming environment. I contacted her through her Facebook profile.

I prefer to try things out on my own and so am experimented with Scratch myself, using the online resources available. I also asked Maria on Facebook for help. We also use Skype to give one-to-one support to each other. We recently worked together to perfect a lesson activity where students worked in pairs to create Scratch simulations of the motion of comets around the Sun. We often share resources between each other, adapting them for use with our own curriculum.

Maria and I also arrange for our two classes to meet online with Skype and get our students to present their simulations and share their Scratch programming experiences with each other. Other teachers in the science department sometimes attend and recently the principal of my school asked us to give a short talk about our use of Scratch and how we came to learn to use it at a professional development forum for secondary schools in my local authority.
TITLE
Researching online social behaviour

VISION (ASPIRATION AND AIMS)
- to support students to recognise and manage complex social phenomena, such as making new online friends, online bullying, and creating an online identity
- to create connections between out-of-school and in-school experiences of technologies
- to develop students’ 21st century skills, research skills and emotional intelligence

BACKGROUND MOTIVATION STATEMENT
Teachers are becoming more aware of the opportunity to use social media to support learning because of its impact outside the classroom. There is concern as well as excitement about these online opportunities, creating a need for teachers to reflect on these social media experiences with their students.

NARRATIVE
My students and I are reflecting on our online social media experience. We recently viewed a blog as part of our learning and have been drawn to user comments and their appropriateness. I want to use these sorts of online forums in my teaching so I feel it important to address this. We decide that together we will research online social behaviour.

I undertake an activity that supports my students to identify online behaviours they encounter by using anonymous response devices or other anonymous means so that all students can share their experiences,
including those which may not have been positive. We then explore whether there are categories of online behaviours (e.g. acceptable, helpful, appropriate, un-acceptable, unhelpful etc).

I want students to explore other people’s opinions about and experiences of certain online behaviours that interest them (e.g. making new friends, creating an online identity, online bullying, online pranks) through developing a research project that uses digital media as a tool.

I support students to devise a research question and present students with a range of tools that they can use to gather data for their research. Students suggest ways they can use these tools and identify others they know of. They undertake their research in collaborative groups or individually.

The students are supported to make sense of their data and present their findings in a format of their choice (e.g. video, podcast, poster, presentation) in the context of a class research conference to which an audience of our choice is invited, such as parents, other classes, teachers and members of the local community.

We use their findings to create guidance for our own online interactions. We then share these online and invite constructive comments.

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**TITLE**

Students creating science learning resources

**VISION (ASPIRATION AND AIMS)**

- Students support one another as they learn difficult concepts in science
- Students collaboratively create exhibits that can be used to teach the difficult concepts learned
Exhibits are used to teach younger children or those in future years

BACKGROUND MOTIVATION STATEMENT

Science teachers find that some topics in the curriculum are hard for students to grasp and it can be a struggle to keep students interested in the subject. Each year, a teacher is introduced to a new group of children and must deal with the challenge of understanding if the new students have already grasped the pre-requisites for the most challenging topics or how each student best learns. The challenge therefore is to devise learning experiences that support this understanding and also stimulate students’ curiosity and interest in science.

NARRATIVE

As a science teacher in a transition year, I try to get students interested in topics by asking them to teach each other and the younger year groups.

First, I administer a formative assessment that covers both the pre-requisite curriculum and this year’s curriculum. Then, I form small groups of students mixing those who show they know certain concepts well with others who do not. Each group is tasked with creating a multimedia interactive science museum “exhibit” to teach a concept from the curriculum.

I point the students to textbook and online resources (e.g. resources from the Learning Resource Exchange - lre.eun.org) that are related to the concept. They learn as a group, and those who already showed proficiency can help their peers. I give them sample problems and worksheets that they can use to check that everyone in the group understands the concept sufficiently.

The group picks one or two of the methods they have used to learn and that have worked well for them and creates their own “virtual science museum exhibit”. The students have quite a bit of freedom over how to construct their exhibit: it might be a poster, a physical or virtual simulation, a video recording of a lecture, a rap song, or a puppet play. There are few limits to their creativity! Each group creates a few sample problems to accompany their exhibit.

At a timely and appropriate point in the school year, all the students in my class present their exhibits to children from an earlier grade (possibly at a feeder primary school). Beforehand, I assess their work for accuracy and completeness and offer suggestions for improvements. I also usually encourage groups to involve an external expert (e.g. a curator from the science museum or a professor from the university). Later in the year I use the problem sets each group created in year-end subject reviews before final exams. Finally, the exhibits are uploaded to the iTEC learning resource exchange. Next year I will use them to help enliven and enrich my lessons, making science accessible in ways that were proven effective by students the year before.
TITLE
Using multiple resources and technology to research a common topic

VISION (ASPIRATION AND AIMS)
- to help teachers create collaborative resources
- to provide evidence for teachers on the value of using technology alongside other resources in the classroom
- to develop students’ skills of evaluating material

BACKGROUND MOTIVATION STATEMENT
There is a danger that the internet will be taken as the sole resource by students for gathering information – despite the many other sources available. A key 21st century skill is recognising what resource is appropriate and valid and when it should be used.

NARRATIVE
I have set up a class project around the history of the school. This acts as an introduction to research as well as allowing for the inclusion of required transversal skills such as learning to learn and cultural awareness. We have access to physical documents about the school, the original title deeds, boards of achievements, old photographs of sports days etc. There is also online information around the changes in school size, the boundaries for accepting students, and past exam performance, as well as more generic information such as satellite pictures and census information for the area.

The project begins with a discussion of what information we have and what other information is available. The class is then divided into small groups that are tasked with gathering data from the various resources identified. Thus one group looks at previous pupils and staff. Several parents and grandparents attended the school and they are asked...
for any old school reports. Where possible the students also conduct interviews with these adults and teachers who can be traced through school records. Another group looks at the building and tracks changes in the school layout. They take photos similar in perspective to existing images and consider how and why the school has evolved in that way. They decide to use old newspaper records and the internet to see if the changes correspond to external events. A third looks at the subjects taught and how they have changed; comparing it to other schools in the region and the requirements of local industry.

Once the data is gathered it is reviewed. The students identify discrepancies between the recollections of teachers and pupils and between these stories and the dates found in the school records. This leads to a discussion of validity of information, using memories, records and material on the internet which initially came from similar sources. It also allows me to introduce the ideas of metadata and tagging of data. This leads to the class generating a set of tags describing content and source for their information that would allow it to be easily searched by others.

Using the generic online template for research information, we input our researched information. This site is structured so that material can easily be uploaded and tagged as well as providing functionality such as printing posters from selected material or creating timelines. Next year I hope my new students will add to the site.
Appendix 2: Scenarios selected for cycle 3

In this section the text of the scenarios selected for further development in cycle 3 is that used in the selection process. For each there is a radar diagram generated according to the innovation matrix.
Designing with multi-touch technologies

CORE PURPOSE:

To support student collaboration and comprehension of difficult concepts through the use of multi-touch technologies

NARRATIVE OVERVIEW:

I, Mr Disdier, am a design and technology teacher and I want to engage students in my class in thinking about the theories and concepts behind spatial design. I decide to develop a design project using the available multi-touch interface technology in the school to support collaborative learning related to design.

I begin the topic with some introductory design activities that use the school’s touch tables to foster collaboration amongst my students from the outset. Students look at photographs of different spatial designs and work together to analyse and annotate characteristics of the designs. I then organise students into small groups, each of which create fun design challenges for the other groups to solve. The multi-touch applications students work on are networked to the main classroom IWB, so I can demonstrate each group’s progress on the IWB throughout the lessons.

The students feed back on the spatial design concepts they learn from the initial activities, and I integrate the class ideas to more theoretical design and maths concepts through lecture and supplementary materials. The developing set of shared knowledge within the class is recorded and shared on a class web page.

The groups are then asked to draw on their learning of spatial design and design a space (e.g. urban, small community, school) with certain conditions and criteria. I give each student a particular research or design role in their group, to ensure their contributions. Students’ designs will be judged by an ‘expert panel’ of local architects and planners based on the agreed criteria. Groups create their designs collaboratively using the multi-touch technology interfaces and 3D modelling tools and applications. These tools allow students to visualise their design from different scales and angles, which provides an immersive experience in which students can assess and edit their designs as needed. Students share their designs with other groups who annotate and assess them. I also encourage groups to take their project outdoors to gather and record information and inspiration about spatial design. I am available to help with design ideas or use of the technology as required. As the design process unfolds, the groups contribute to the class’ shared understanding of the topic on their collaborative document. Finally, they present their finished designs – and the concepts behind them - to the expert panel for feedback. This feedback is combined with the other assessments undertaken throughout the project to form the final summative assessment of the project.
Designing with multi-touch technologies
Digitally mapping local biodiversity

CORE PURPOSE:
This scenario develops students’ knowledge of local ecosystems and digital mapping skills through outdoor learning. It engages them in scientific understanding of their local area and in species identification via online repositories and interaction with experts. It supports them to use digital media effectively to communicate their knowledge and opinions to others.

NARRATIVE OVERVIEW
I am a high school geography teacher, keen to develop students’ mapping skills and knowledge related to land-use and also to explore how digital technologies can give young people a voice about local spaces. My science teacher colleague wants his students to develop the scientific skills of identifying species and understanding habitats. We have seen students benefit from outdoor and experiential learning in the past on field trips and are keen to increase the number of opportunities they have for this sort of learning. Together we create a project in which students use mobile digital technology and GPS/GIS technologies to map land-use and document the habitats of their local spaces. The outcome of the project will be a downloadable interactive guided nature walk for the local community.

Mr Thorne and I work with our colleagues in the Maths department to provide direct instruction on how to use the mobile GPS/GIS technologies and how coordinates work. We then devise a short treasure hunt which involves students using the devices to find a certain place in the local town/school grounds, using specific coordinates, which they then plot on an online map.

Once the students have a good understanding of GPS/GIS and mobile devices, groups of students are allocated certain small areas in the locality which have diverse habitats and uses of land. They add their locations to a central online map. After some direct teaching on methods, they begin the process of documenting the land use and undertake research into what species and habitats exist there. They photograph all the wildlife they find in their area. When they return to the classroom they use a combination of traditional and online classification keys/sites to try to identify all the species. For any problematic identification the students have pre-arranged access to remote experts/scientists who they can email their photographs or have video calls with. Students discover more about the species they have identified and are taught about monitoring populations. They are also taught to use sensors to monitor data such as humidity and sunlight.

Students consider links between land-use/environmental factors and habitats. Mr Thorne and I ensure that students use scientific ideas and geographical/environmental knowledge to explain phenomena. I also encourage students to consider their views on the future of that space.

Students monitor their small area over a period of a few months, collecting and analysing data and creating short video documentaries/photostories/podcasts as they go. Throughout this process my colleagues and I support the students with their choices of content and how to effectively communicate their knowledge to the chosen audience. We then work with the students to turn their work into an interactive, guided walk that members of the local community can participate in to learn about the local biodiversity. To do this we use mobile digital technologies and either QR codes or mediascape software that allow others to hear the documentaries/see the pictures/hear podcasts the students have created when they are in the physical spaces. The walks are promoted on local travel sites and through community groups and libraries.
Digitally mapping local biodiversity
Home-school communications

CORE PURPOSE:

Research shows that parent/carers’ engagement in students’ learning at home is a significant factor contributing to students’ achievement in school. In this scenario social media is used to encourage three-way communication about learning between teachers, students and parents/carers in order to begin to bridge the gap between home and school.

NARRATIVE OVERVIEW:

The relationship between home and school was discussed at a recent staff meeting at the secondary school where I teach, and there was an agreed understanding among senior management team and teachers that parent/carers’ engagement in students’ learning at home is a significant factor contributing to students’ achievement in school. We also recognised that there are barriers to parents’/carers’ engagement with school learning and that digital technologies can enhance home-school communication. In response to a pupil and parent/carer survey about digital technology use and preferences, a few teachers and I agree to work with the headteacher to pilot the use of the following home-school communications during one topic of work with a view to developing the following methods across the school:

Closed social networks – using free online platforms teachers set up social networks that are private/by invitation only. Teachers and students invite parents/carers to join the network. The teachers and students upload photographs or videos of work they are doing on to the space and ask parents to comment. Students, teachers and parents start discussion threads about topics that are being learnt, with a focus on making links between the learning in school and world outside school. Teachers post homework; parents and students can ask questions. The teachers also posts information about the methods being used for teaching this particular topic. The teachers work with the community of students and parents/carers to establish shared goals and guidelines that ensure any comments given as feedback are focused and constructive.

Project blogs – these are set up to give a wider audience for the students’ work. Students take turns to write blog entries about what they have learnt and to upload pieces of work/photographs that have been produced for an external audience. Parents/carers can read about and comment on the showcased work and then forward the link to friends and extended family. The teachers also set up a school YouTube channel where students share films about their learning. The video links are included in the blog.

The other teachers and I use the diversity of platforms and audiences as an opportunity to support students’ digital literacy via conversations about the affordances of each platform and what is appropriate for the different audiences including issues around e-safety. We find that these technologies are particularly useful for some students with special educational needs, as they support different methods of communication and recognition, better contact with families and more personalised approaches. However, we are also aware that home access to the internet is limited for some families. Therefore, we set up after-school sessions which provide access to the school’s computer suite in the evenings. In the future we also plan to link in a scheme in which each family is given a netbook.
Product outcomes/learning objectives

Underpinning Technology

Management of teaching, learning and assessment

Pedagogy

Learner role

Home school communications
Homework and schoolwork “flip”

CORE PURPOSE:

To allow a radical transformation of activities, relationships and expectations, by “flipping” two core elements of the educational experience: school-time and home-work time.

NARRATIVE OVERVIEW:

I’ve been teaching for nearly ten years and have decided to try the popular idea of “flipping” in my class. The basic idea behind flipping is that lectures become homework, while class time is used for collaborative student work, experiential exercises, debate and lab work. Videos and other e-learning materials are used extensively during “home time” to deliver learning content, while class-time becomes open to experimentation and collaboration. I’ve read about flipping and realize it’s not a fully-fledged pedagogical approach, but a philosophy meant to be used flexibly and fluidly alongside all the tools I have gathered during my career. I’ve read how “flipping” can positively impact student learning regardless of the subject or the type of classroom.

It is important to me that the additional classroom time gained through flipping is used as effectively as possible, and that the resources students use in their own time are of the highest possible quality and appropriate to their current levels of knowledge. A content library that is integrated with online videos checked for quality and accessibility seems the best way to ensure success. My colleagues and I have developed teaching resources, videos and online activities over the years, and I’ve also kept the best revision materials developed by students at the school. Now it’s time to put this rich repository of content to good use in a structured approach, filling any gaps with high-quality resources available for free over the internet.

I look within the curriculum to identify topics that lend themselves well to ‘flipping’, like those that don’t require significant initial student-teacher interaction and that have high-quality resources for the at-home instructional element. I also ensure that students understand the purpose and format of ‘flipping’. I support students who lack access to resources at home to find other times and locations to view the materials. I also take advantage of a new school scheme that provides students with notebooks, to help ensure access for students and encourage them to complete their home tasks.

After the first weeks of flipping, some initial challenges arise. I realize that class time requires a different, but just as rigorous, form of planning, and that collaborative activities and project work come with their own issues to be addressed separately. However, after some initial adjustments, the benefits become evident, as the classroom becomes a place for more effective learning activities and increased student-teacher and peer interactions. Many students begin to choose how they learn content and demonstrate understanding, all while being allowed to master it at their own pace.
Schoolville

CORE PURPOSE:

To use tools and principles from video-game design and social networking to foster cross-curricular learning with an emphasis on citizenship.

NARRATIVE OVERVIEW:

I am a member of a group of teachers who, with the support of the head teacher and with all students on board, have started an exciting new initiative to increase participation in the school. The aim is to establish a scaled-down but fully-functioning model of a real society at the school, complete with a political system and a micro-economy. I am confident that this approach will motivate students by engaging them in authentic and practical experiences. The town is led by a mayor or mayoress and it has a fully elected council, with regular meetings taking place in the library to deliberate on a range of issues, including serious matters such as disciplinary policies. There is even a newspaper and a video news channel. A number of enterprises have been established by students as cross-curricular projects: shops, services, etc. Students apply for positions within these enterprises and are responsible for their performance against mutually agreed criteria.

The twist in this story is that while some aspects of “Schoolville” are real, like the meetings in the library and the consultations about school matters, other aspects are simulated as elements of a video-game loosely based on the popular Facebook game “Farmville”, as well as other video games like “Sim-City”. The game is a simple flash-based app. Students can open shops, offer services and as they progress they gain XPs (Experience Points) which they can re-use to perform other actions and to “buy” additional resources. Small amounts of XPs are awarded automatically by the software for completing basic actions, while larger amounts and special prizes are given by us teachers for completing more challenging projects, and for demonstrating specific achievements. For example, an advanced feature of the game is the option to open virtual shops to sell trinkets, virtual pets and whatever students are interested in.

Running the shops requires knowledge of mathematics and management skills, as specific objectives can only be achieved if the student or the group of students running the enterprise carry out tasks or solve problems, which are set by me and the other teachers. An important aspect of Schoolville is the clear mapping of in-game objectives and tasks against curricular requirements. Tasks and problems range from online quizzes to more complex activities, like writing a mini financial report or a business plan. For example, one of the tasks requires students to use an online worksheet that asks them to recognise the equivalence of percentages, fractions and decimals, and to calculate and use percentages to compare proportions. Another task asks them to work out sales forecasts based on fictional data and information provided by me.

The “schoolville” initiative is permanent and runs throughout the year, parallel to the formal school calendar.
Virtual Engines

CORE PURPOSE:

To use simulation software to create virtual prototypes that behave realistically according to the laws of physics.

NARRATIVE OVERVIEW:

Simulations can be used for a wide range of topics and goals: science, history, business etc. They can recreate authentic conditions in which learners can experiment with decision making, problem solving or where they can try out daring and unlikely ideas in a safe environment. Engineering simulations are particularly popular as software physics engines have advanced to a level where they can simulate real-life dynamics with unprecedented accuracy. This makes them great learning tools in Maths, Science and Technology (MST).

I am a Design and Technology teacher who is just beginning to find out about the opportunities of simulations, and after a period of research and planning I finally decide to take the plunge and try this approach in my classroom. The main resource is a simulation software that can run on individual laptops, as well as on the interactive whiteboard, which in fact offers a new level of interaction thanks to its touch-based interface. Students can shift parts of a virtual prototype across the screen and see the results in real time.

The goal of the project is to build a rocket-propelled racing car. The project starts with lessons about basic content knowledge. The lessons are not didactic but structured like discussions, in which the presentation of content is always supported by active questioning and by a measured use of digital media (e.g. videos and physics games) to illustrate basic principles of rocket-science, engineering and physics.

The remainder on the project requires a degree of exploration and experimentation; during this phase I draw on the principles of enquiry-based learning to support the process. The main aim is to build a virtual prototype that behaves realistically, and does not take off when picking up speed!

During the interaction with the software, I make sure that the simulation does not end up simplifying complex dynamics; therefore I plan several de-briefing sessions in which we reflect on the process and question the underlying assumptions of the software. My ultimate aim is for students to walk away from this project with an accurate understanding of the physics or the mathematics involved.

An important part of the project is the collaborative development of an evaluation rubric to assess the prototypes. The project ends with a public display of the prototypes on the interactive whiteboard, and all prototypes are assessed collaboratively against the criteria outlined in the rubric. Eventually, a number of videos showing different phases of the project and the rocket-propelled cars in action are created and uploaded to YouTube.
Appendix 3: Cycle 2 summary of trends and drivers

CYCLE 2 SUMMARY OF TRENDS AND DRIVERS
[Trends rated most highly within each category marked in italics]

ECONOMIC AND POLITICAL

The financial crisis continues

The fallout of the financial crisis is set to continue, with many EU countries facing massive debts and making big spending cuts. At present, this is affecting the job market and is decreasing young people's chances to access jobs.

The rise of Asia

China and India are educating more engineers and scientists than the US and Europe combined, and this gap is likely to increase in the future, leading to fiercer competition on the global job market for high-value jobs. This trend, combined with the enduring difference in labour costs between Western and Asian countries, is having a negative impact on young graduates' opportunities in Europe, as many companies can hire from a wider pool at a lower cost.

A growing MST (Mathematics, Science and Technology) skills gap

Although predictions of actual human resource requirements for the next 5-10 years are difficult, many employers in Europe believe that the potential demand for MST (Mathematics, Science and Technology) skills is likely to increase.

Increasing importance of global comparisons

Education in Europe is increasingly influenced by global comparisons. This trend is shaped mainly by International league tables like PISA and TIMSS, which attract headlines on newspapers and are having a great influence on current education policies across the continent.

Demographic shifts owing to immigration
While the European Union's overall population is projected to increase slightly between 2005 and 2030, the bulk of that increase will come from net immigration. As a consequence, inclusion (of minorities, immigrants, but also with those with special needs and disabilities) is being recognised as a political priority in many countries.

A shift to service sector employment

The economic downturn is mostly affecting jobs in manufacturing and agriculture, and this appears to have accelerated the shift to services. In fact, services are still expected to provide most job growth between now and 2020.

International MST competition

Many countries around the world are pursuing MST (Mathematics, Science and Technology) strategies in an attempt to attract more young people into MST subjects and ultimately MST careers. They believe that by doing this they will reap the benefits of sustained economic growth.

Europe’s north-south divide widens

There is a widening gap between northern and southern EU countries in relation to overall earnings for the same types of occupations. For instance countries like Portugal are experiencing wage cuts and the overall earnings in Italy and Spain are low compared to their northern counterparts.

Europe is getting older

According to demographic forecasts, the total population of 18 year olds in 2020 within the EU will be two percent less than in 1993. Furthermore, nearly 25 percent of people in the European Union in 2030 will be above 65, up from about 17 percent in 2005.

Schools coming together

There is a tendency in several countries towards setting up large clusters of schools. This is happening for example in Italy, Portugal and in the UK. These clusters include primary, lower and upper secondary schools and can have up to several thousands of students. Advantages of this trend are: economies of scale and reduced costs, easier transition from primary to secondary, teaching by stage rather than age.
Disadvantages are: closure of local small primary schools, difficulty of managing such large populations of students and teachers, and risks of de-personalised, standardised teaching and learning.

From central to local

Many countries in Europe which had already embarked on policies of school autonomy have, in recent years, started to reinforce the powers granted to schools.

This is taking different shapes in EU countries, but overall there is a clear shift from central to local forms of governance.

Integration of ICT is becoming more systemic

Recent studies and decades of practical experience of ICT in schools are leading to more comprehensive and systemic policies to support ICT. For instance, these policies now try to foster clear and committed leadership at all levels, they also put a strong emphasis on collaboration with other institutions to ensure that teachers benefit from the best possible continuous professional development.

TEACHERS’ REALITIES

Enhanced professional development

There is a trend of increased emphasis on teacher professional development, in which the use of technology plays an important part. For example, technology is used to create collaborative platforms and communities of practice to bring life to the “hard to teach” and “hard to understand” areas of the curriculum, like MST (Mathematics, Science and Technology), thus engaging students with such crucial subjects.

Beyond the tool

The web and current digital tools offer great opportunities for information seeking and knowledge creation, but they also pose challenges, such as coping with too much information and the lack of quality control. Therefore, there is an increasing emphasis on teachers’ digital literacy, less in terms of mastering specific tools, and more in terms of developing a critical attitude, in order to observe and evaluate the information-seeking and knowledge-building activities of students.

Enthusiasm does not come cheap
In many European countries teachers and other public sector workers are experiencing salary cuts, tax increases, higher cost of living. Overall, living standards for many educators are being challenged, and so is their enthusiasm and their willingness to innovate.

The challenges of fostering MST: connecting teachers and learners with industry

Employers are increasingly dissatisfied with how scientific and technological subjects are taught in schools, arguing that teachers and learners are disconnected from the reality of industry and lack real-world experience in those crucial subjects.

21st century skills in practice

Teachers are increasingly expected to incorporate the so called 21st skills in daily teaching. These include media and ICT literacy, communication, problem solving and collaboration.

Keeping up with informal learning

Students live in worlds filled with engaging technology and opportunities to pursue personal interests and motivations. Once they enter schools they have to leave behind such interests and motivations. This creates a divide between the way “schools teach” and the way “students learn” in informal learning environments. Teachers are nowadays facing a challenge trying to bridge this gap.

A new professionalism

There has been lately a great emphasis on teacher professionalism. It appears that many education systems have come to the conclusion that the quality of teachers is the most important factor to improve learning. This is leading to incentives for those teachers deemed to be good, to tighter recruitment of graduates, and stricter controls on the quality of teaching.

Encouraging independence, or not?

Better performing teachers are being promised more independence in Oslo for example, but assessment and accountability systems are still hard to change. This puts many teachers in awkward and frustrating situations, in which their ability and willingness to innovate are compromised by tight controls and external pressures and expectations. For this reason, the
current trend is that most teachers still choose to “play it safe” rather than being independent and taking risks.

**Ticking boxes**

Because of the high levels of bureaucracy and paperwork often associated with accountability, teachers are less inclined to create engaging learning environments, because too much of their time is spent on forms, evaluations, formal assessment procedures and "ticking boxes".

**Personalisation in times of crisis**

Teachers are expected to personalise teaching and learning, and due to the economic crisis the cost-saving opportunities offered by technology have become even more relevant. In these times of crisis, using technology to personalise teaching is less about being “innovative” and more about “getting the job done”, saving time and money.

**Formative assessment has come of age**

Most educators nowadays agree about the effectiveness of formative assessment, that is, assessment used on a daily basis for diagnostic purposes and to dynamically adapt teaching, rather than for grading. At the same time, it is now become clear that this type of assessment requires a deep re-think of the traditional roles of teachers and students, which takes time and support.

**Learning goes outside, does the teacher follow?**

Education has always been associated with schools. However, this relationship is now under stress as new technologies move learning outside of the school walls. This trend poses challenges to the traditional role of the teacher. Some specific opportunities and risks are: educating outside school hours, more emphasis on facilitation, mentoring and guidance, increased workload, linking with families, some risks of establishing informal links with students (e.g. using emails and texts).

**The challenges of fostering MST (Mathematics, Science and Technology): tackling lack of interest**

There is currently a great emphasis on MST skills, but teachers face challenges when supporting such skills in the classroom. There is a lack of interest from students (particularly girls) in MST subjects and jobs compared to other disciplines and professions.
Teachers getting older

Retirement age for public sector workers is being extended in many countries, as the result of pension reforms and budget deficits. The clear trend is that of older teachers at school, which is leading to a greater "age divide" between students and their teachers.

Inclusion in practice

Many classes in European schools are now culturally and ethnically diverse. Teachers are becoming increasingly experienced in dealing with diversity and know how to recognise and address inclusion issues when these arise.

Low carbon teaching

This trend is associated with much wider trends, from climate change to the shift towards more sustainable lifestyles and alternative sources of energy. Schools and teachers are increasingly encouraged to incorporate these themes in curricular activities, discussions and tasks with learners.
## Appendix 4: Cycle 3 summary of trends and drivers

### Learners’ realities

<table>
<thead>
<tr>
<th>Trend 1</th>
<th>Information literacy is not keeping abreast with amount of information available</th>
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<tbody>
<tr>
<td><strong>Description</strong></td>
<td>An increasing number of learning resources are available digitally, and the saturation of information, and ubiquitous access to such information, is posing challenges to critical understanding, intellectual depth and reasoned engagement with topics. The need to increase skills like information literacy and digital literacy across the student population in Europe and globally are becoming priorities.</td>
</tr>
<tr>
<td><strong>Evidence</strong></td>
<td>Newman, T. (2008). <em>A Review of Digital Literacy in 3-16 year olds: Evidence, Developmental Models and Recommendations</em>. Bristol: Timmuss Ltd. - This review is directly relevant to those interested in how to optimize the skills of defining, accessing, understanding, creating and communicating information whilst using digital technologies (ICT). These skills are collectively known here as digital literacy skills. This review has summarised a wealth of evidence to show that today’s young people have inadequate digital literacy skills. There is often a large gap in students’ perception versus the reality of their digital literacy. Many young people think that access to lots of information equals quality, and that ICT exposure equals ICT competence. If they are not taught digital literacy skills at an early age they quickly learn to ‘make do’ with search engines such as Google when looking for information. Evidence shows that much of the impact of ICT on children has been overestimated. ICT is often used in the classroom as enrichment rather than a medium to transform learning and teach employability skills. Today’s children rely heavily on search engines although they do not know how to complete effective searches. Nor do they have the critical and analytical skills to assess the information effectively. They often get disheartened during web searches, feeling that they have viewed hundreds of sources without finding what they were looking for. Young people are asking for help in learning how to carry out research tasks effectively. Eisenberg, M., Lowe, C. and Spitzer, K. (2004). <em>Information Literacy: Essential Skills for the Information Age</em>. 2nd. edition. Libraries Unlimited - This book is from Eisenberg et al. known worldwide as one of the originators of the innovative Big6 Information Problem Solving Process. Tracing the history of information literacy, the authors discuss its economic importance; examine past, present, and current research in the field; and explain how information literacy relates to the national</td>
</tr>
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standards transforming K-12 education and higher education today. The authors also look at examples of information literacy in several different contexts, underscoring both its importance and pervasiveness in our society. Learning to be critical and savvy consumers of information is necessary in today's world.


What is it in the twenty-first century that we want young people, and adults returning to study, to know? What is it about the kind of knowledge that people can acquire at school, college or university that distinguishes it from the knowledge that people acquire in their everyday lives everyday lives, at work, and in their families? *Bringing Knowledge Back In* draws on recent developments in the sociology of knowledge to propose answers to these key, but often overlooked, educational questions. Michael Young argues for the continuing relevance of the writings of Durkheim and Vygotsky and the unique importance of Basil Bernstein's (TM)s often under-appreciated work. He illustrates the importance of questions about knowledge by investigating the dilemmas faced by researchers and policy makers in a range of fields.


“Building on the insights of thinkers from Plato to McLuhan, Carr makes a convincing case that every information technology carries an intellectual ethic — a set of assumptions about the nature of knowledge and intelligence. He explains how the printed book served to focus our attention, promoting deep and creative thought. In stark contrast, the Internet encourages the rapid, distracted sampling of small bits of information from many sources. Its ethic is the ethic of the industrialist, an ethic of speed and efficiency, of optimized production and consumption — and now the Net is remaking us in its own image. We are becoming ever more adept at scanning and skimming, but what we are losing is our capacity for concentration, contemplation, and reflection (...)

| Trend 2 | Growing awareness that disaffection and low attainment in relation to MST subjects (Mathematics, Science and Technology) and in general are related to inequalities and social background |
| Descriptio | Narrowing the gap between low attainment and disadvantage is becoming a policy priority in many countries. Evidence consistently suggests that in countries with more equitable education systems students achieve better, especially in crucial subjects like mathematics and science. Social background and cultural expectations are also the cause of gender disparities in attainment, |
with boys outperforming girls in mathematics, but girls outperforming boys in all other measures of performance.

**Evidence**

- OECD PISA studies consistently showed that there is a relationship between student performance and socio-economic status in several countries, although it also shows that a relatively large percentage of students from disadvantaged backgrounds in places like Honk-Kong, Shangai, Korea and Finland, achieve some of the highest scores in Science and Maths. The Programme for International Student Assessment (PISA) is an internationally standardised assessment of 15-year-old students’ learning developed and managed by the Organisation for Economic Co-operation and Development (OECD). Every three years, it assesses how far students near the end of compulsory education have acquired some of the knowledge and skills essential for full participation in society. The assessment focuses on the domains of reading, mathematical and scientific literacy, which are covered not only in terms of mastery of the school curriculum, but also in terms of cross-curricular knowledge and skills. The test is based on a mixture of multiple-choice questions and items requiring students to construct their own responses.

http://www.pisa.oecd.org/pages/0,3417,en_32252351_32235731_1_1_1_1_1,0,0.html

- According to “the case for change” an official 2010 report from the UK DFE (Department for Education) setting policy priorities, evidence from international studies shows conclusively that it is possible for a school system to be simultaneously higher performing and more equitable. Analysis of the evidence from these international studies, from the design of the highest performing and fastest improving systems globally and from national evidence, shows that there is substantial scope for beneficial reform.


- According to an EU study carried out in 2008/09 and covering 29 European countries, socio-economic status remains the most important factor explaining student achievement; thus it is important to consider family background alongside gender when supporting children who are under-achieving. The study also shows that are not many initiatives in place to address gender patterns in achievement. Where they exist, the most common policies tackling gender gaps in attainment concern boys’ under-achievement. Policies usually involve the promotion of new learning and teaching styles that motivate boys, or improvement of pupil-teacher ratios. Only some countries have developed special programmes for improving boys’ reading skills and girls’ achievement in mathematics and science.

**Trend 3 – What motivates students?** There is an increasing understanding across education systems in Europe - and globally - of how technology and a focus on emotional well-being can be effective to motivate young people, and help them engage with important subjects like MST

| Description | There is a growing consensus in academic research that technology in learning is most effective and motivating when used in context of specific topics and disciplines (e.g. simulations and game-like environments to build models in maths or science). Therefore, ICT in learning needs to focus on specific software and resources, rather than simply on increasing access (e.g. increasing pupil/computer ratios). Where the aim of the research has been to investigate ICT without clearly identifying the specific range of ICT uses, then unclear or contradictory results were obtained. Research also shows that motivation and self-regulation in learners are closely related to feelings of emotional well-being in the classroom. A focus on purposeful technology use, coupled with an appreciation for students’ need to maintain emotional well-being, seem crucial to increase independent learning and performance. |
| Evidence | Cox, M. and Marshall, G. (2007) ‘Effects of ICT: do we know what we should know?’ *Education and Information Technologies*, 12, 1, 59–70 - Many decades after the introduction of ICT into classrooms there are still unanswered questions about the impact of technology in the long and short term on students’ learning, and how it has affected simple and complex learning tasks. This review of several studies identifies strategies to address the gaps in our knowledge about ICT and students’ learning.

Boekaerts, M. and Corno, L. (2005). ‘Self-regulation in the classroom: a perspective on assessment and intervention’, *Applied Psychology: An International Review*, 54, 2, 199–231 - Boekaerts proposed a model of self-regulation in which students face two priorities in classroom learning. One priority is to achieve growth goals that increase resources (e.g. students seek to deepen their knowledge or increase their cognitive and social skills); another priority is to maintain emotional well-being within reasonable bounds (i.e. students try to look smart and protect their ego, or they try to avoid harm and secure resources).

According to the authors, science curricula based simulations and games are not based on the underlying cultural logic of “print-based” literacies and pedagogies, in which the learning process is controlled by the teacher or even the computer. Instead, they are narratively driven, experientially immersive, and multi-media rich. They view information communication technologies as having the potential to greatly aid both in fostering students’ inquiry and in providing richly situated learning experiences despite the relative isolation of many school classrooms. They draw on research findings to advocate the potential of videogames and immersive participatory simulations for engaging children in rich socio-technical contexts, where they address meaningful problems, and through which they can learn and collaboratively experience all stages of scientific inquiry.

**Trend 4:**

Young people are always connected and make heavy use of digital media, this is posing challenges to teachers and education systems who are yet to identify consistent and effective responses.

**Description**

Students increasingly have constant access to mobile devices and digital content on an ‘anytime, anywhere’ basis. Furthermore, ownership of mobile devices amongst young people is on the rise almost everywhere in Europe, and applications like blogs, wikis, photo- and video-sharing sites, and also online social networking sites and virtual worlds, have seen unprecedented take up over the last few years. This trend has crucial implications for education. On the one hand, young people are often viewed (and often view themselves) as more proficient in the use of technology – especially mobile technology – than adults. On the other hand, integration of mobile learning and ubiquitous social networking in the classroom is becoming a priority. However, many questions and confusions still exist: how can we integrate these “progressive” technologies meaningfully, while many educational policies in Europe are encouraging more conservative approaches in education? Will students use their smart phone to cheat on tests? Will they use social networking constructively or disruptively in the classroom? Will teachers lose control of their class if we allow students to bring in and use their own devices? And how can we effectively use these devices for rich academic work if not every student has one? What curriculum supports mobile learning?

**Evidence**

- *Project Tomorrow* is a not-for-profit organisation that actively promote educational innovation in the US and Globally. They strongly support the use of technology in the teaching of science and mathematics, and advocate the development of critical thinking, problem solving and
creativity skills needed to compete and thrive in the 21st century. They produce large scale surveys (Speak-Up) involving students, teachers and parents [http://www.tomorrow.org/speakup/index.html][http://www.tomorrow.org/speakup/pdfs/SU10_3EofEducation_Educators.pdf]

- The emerging Technology Initiative is a flagship initiative of the New Media Consortium (NMC), an international not-for-profit consortium of learning-focused organizations dedicated to the exploration and use of new media and new technologies. The initiative charts the landscape of emerging technologies for teaching, learning and creative inquiry and produces the NMC’s series of Horizon Reports, [http://www.nmc.org/horizon](http://www.nmc.org/horizon)

- The Institute for Prospective Technological Studies (IPTS) is one of the seven scientific institutes of the European Commission's Joint Research Centre (JRC). Its purpose is to develop science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension. For instance, they carried out a study to investigate how social computing applications can be used in organised learning settings to enhance learning activities and promote innovation and inclusion in Education and Training, [http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2899](http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2899)

- Ofcom, the independent communications regulator in the UK, carries out large scale studies into media literacy. The adult media literacy report surveyed 2117 adults aged 16+, and the children’s media literacy report surveyed 2071 children aged 5-15 and their parents. The surveys have been running since 2005 and ask respondents about a range of media attitudes and behaviours. According to the latest survey (2011), half of parents (48 per cent) with children aged 5-15 who use the internet at home think they know less about the internet than their children do. This rises to 70 per cent of parents of 12-15 year olds. At the same time, there has been increased online activity among children in the past year, including higher usage of mobile and games consoles to go online, [http://stakeholders.ofcom.org.uk/market-data-research/market-research/](http://stakeholders.ofcom.org.uk/market-data-research/market-research/)

- Ferri P., Nativi digitali, Bruno Monadori, Milano, 2011. In his last research work, based on his previous activity, Paolo Ferri brings together Gardner hypothesis on new potentials (a “digital intelligence”) that can be activated by the socio-technological opportunities of a specific culture (Gardner, 1999) and the works on new types of intelligences (Battro, Denham, 2007) describing the digital natives as a new generation that has developed a new kind of intelligence (digital intelligence) different
from previous generations (including of course teachers and policy makers).

| Trend 5: | Increasing frustration of young people with typical classroom activities |
| Description | On the hand, there are calls to increase the degree of ‘choice’ that learners have in learning, and learners themselves often express a wish to have more choice as to what and how to learn. Some findings have consistently emerged from surveys and studies on learners’ preferences: more interactive technology in the classroom, more hands-on activities and projects, and less didactic instruction. On the other hand, there are critics arguing that students should not be treated as “customers” and the principle of choice should not apply to education and to public services in general (“should patients be allowed to choose the medical treatment that is best for them?”; “should students be allowed to choose how best to learn?”). The most authoritative of these voices argue that students can only choose between alternatives that they know already, whereas the purpose of education should be to expose students to experiences, opportunities and knowledge which they could not possibly have access to otherwise. Schools are stuck in the middle of this debate, and often it is up to individual teachers to find compromises that reflect mostly their specific values and beliefs. There is an urgent need for resources that can help educators make informed pedagogic decisions with respect to these issues. |
| Evidence | • Five things students say they want from education [http://www.eschoolnews.com/2011/07/28/five-things-students-say-they-want-from-education/3/](http://www.eschoolnews.com/2011/07/28/five-things-students-say-they-want-from-education/3/) This is a survey carried out by the e-magazine E-School news. It is fairly representative of the many, often non-academic, survey studies which have explored young people’s views on digital technology and education. Another of such studies is [http://latd.tv/kids/kidsTech.pdf](http://latd.tv/kids/kidsTech.pdf). A common element running across this type of literature is the “gap” between what is happening in classrooms and how young people would like to learn. • According to Michael Young, professor of education at the Institute of Education in London UK, The purpose of (formal) education is to ensure that as many as possible of each cohort or age group are able to acquire the knowledge that takes them beyond their experience and which they would be unlikely to have access to at home, at work or in the community. What this knowledge is and how it should be made available are, he suggests, the core questions for research and theory |
(...)

He also argues that by reducing education to choices between outcomes, there is a risk of neglecting or disregarding debates about the terms on which such choices are made. Young, M. (2010). ‘Alternative educational futures for a knowledge society’, European Educational Research Journal, 9, 1.

- In their Campaign for Learning initiative the UK research company Ipsos MORI has been involving School Pupils running questions in Surveys to highlight what are the most common teaching methods used in classes, what do children say are their most preferred ways to learn and who do children say they learn the most from, both in and out of school highlighting the different visions.

http://www.campaign-for-learning.org.uk/projects/L2L/Newsletter/Issue11/MORI.asp
Appendix 5: Innovation definition and report

Defining Innovation in iTEC

Summary

The concept of ‘innovation’ is central to the iTEC project, so a shared understanding of what is meant by innovation is essential to its success. This document has been prepared by Futurelab in consultation with the iTEC innovation subgroup15.

Innovation within the iTEC project can be broadly defined as the process of responding to educational challenges by designing solutions that benefit stakeholders.

The innovative solutions designed by iTEC can occur through a number of enablers supported by iTEC: inspiring scenarios and learning stories, newly developed technologies, training support and resources, and a teacher’s community and knowledge base. However, the focus of iTEC’s innovations is on technology-enhanced teaching and learning activities.

Therefore, innovation within iTEC is specifically defined as potentially scalable learning activities that provide beneficial pedagogical and technological responses to educational challenges and opportunities.

Through this definition, innovations in iTEC are intended to help teachers respond to the day-to-day and systemic challenges they face with inspiring pedagogical and technological solutions. In this way, innovation is a response to identified stimuli and trends within education rather than ‘change for change’s sake’.

Pedagogical and technological innovations proposed by iTEC respond to challenges identified in a number of areas: European and global trends in society and education; research on current levels of innovation across Europe, realities of teachers and preferences of students; and ongoing work with iTEC partners, pilot schools, teachers and students.

The perceived benefits to stakeholders include:

- Increasing learner engagement;
- Increasing teacher engagement;
- Increasing appropriate and effective use of digital technologies;
- Increasing the range of pedagogical strategies used (e.g. student-centred learning, individualised learning, collaborative learning, creativity, communication, new assessment approaches, different teacher/learner roles, new learning spaces, engaging with wider community);

15 See Appendix A at the end of this section for a full list of partner participants.
• Increasing access to educational resources (people, tools, services, content);
• Improving management of educational resources.

While iTEC focuses on teachers' practice in the classroom and acknowledges the importance of innovative responses to problems being led locally by teachers, it also understands that educational change in classrooms does not happen in isolation. Therefore, the broad scope of innovation within the project recognises different levels of educational change, from innovation found in classrooms and schools to local, national and global contexts. As such, iTEC involves many participants in implementing an educational innovation, including Ministries of Education, technology industry partners, teachers and students to ensure a multi-layered approach to supporting innovation.

Innovation within iTEC is also understood to have the following characteristics:\textsuperscript{16}:

• **Context-specific:** Innovation is seen to be a concept dependent on subjectivity and a number of contextual factors.
• **Planned:** iTEC innovations are intentional interventions. Materials and learning stories are provided to schools, though implementation involves the discretion of teachers.
• **Mediated:** Participants’ actions are affected and enhanced by phenomena at different levels and throughout time, including individual experiences, school environments, competing priorities, government policies and socio-cultural contexts.
• **Multi-dimensional and multi-layered:** Innovation involves changes in use of materials and resources, teaching approaches and beliefs across different levels of educational systems.
• **Ongoing:** Change is a process, not an event. Planning for innovation should include thinking beyond the introduction of change.
• **Competitive:** Single innovations are competing with many other school improvement priorities, as well as existing assessment frameworks and curriculum requirements.
• **Evolutionary:** Changes may be incremental and small-scale rather than large-scale transformation or revolutions.

**Understanding 'Innovation' in iTEC: Further background research**

**Introduction**

Debates on innovation and change within education seem fraught with a conundrum. On the one hand, change and innovation is a constant imperative across policy and academic discussions. On the other hand, many argue that little seems to change.

The innovative promises offered by technology in education face the same difficulty. Innovation within education is often linked deterministically to the potential offered by ICT, in that these technologies automatically lead to improved teaching and learning. Zemsky and Massy (2004) depict e-learning as one of the most major – and ultimately one of the

\textsuperscript{16} As based on an understanding of recent research and literature.
most hyped – educational innovations in recent times. Links between education, technology and innovation have become increasingly pronounced as government policies link educational and economic interests and hurry to prepare students for a competitive, 'knowledge-based' global economy (Moyle, 2010).

But as has been long recognised, ICT does not in and of itself generate sustained change and innovation in teaching and learning (Somekh, 2007; Zemsky and Massy, 2004). Indeed, as reported in iTEC’s Knowledge Map, the potential for innovation that technology offers has not yet facilitated a transformation in classroom practice:

These studies provide an important cautionary note to any project seeking to transform ‘potential’ into real classroom practice, and emphasize the need to engage in rich debate about educational goals rather than technological potential alone, and to take account of assessment frameworks, professional development and existing cultures of schooling if real innovation is to be achieved. (Lewin et al., 2011, p. 18)

It is with this context in mind that this paper examines the nature of innovation in relation to technology-based educational practices within the iTEC project. The aim of iTEC is to bring together various partners to design, build and pilot technology-enhanced learning and teaching scenarios for the future classroom. The presumption that the scenarios and their implementation will combine technological and pedagogical innovation is built into the project’s goals and activities. Thus, a shared understanding of what ‘innovation’ means in the project is important for the successful development, implementation and evaluation of scenarios.

In particular this paper will address two questions17:

- What is meant by innovation in education?
- What is the nature of innovation in the iTEC project?

Understanding Innovation

The word innovation is derived from ‘novus’, meaning ‘new’. Rogers (1995) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p11). Others argue that an educational innovation is more than just a novel idea and must also be a change that creates positive value and is better or more effective than its predecessor (Miles, 1964; Kirkland and Sutch, 2009).

More precise definitions of educational innovation vary, but in line with iTEC’s focus, those related to technology-based pedagogical innovation will be highlighted. Mioduser et al. (2003) offer the following: ‘On the pedagogical level innovations are defined in terms of novel didactic solutions reflecting theoretical shifts (e.g., from a behaviourist to a constructivist perception of the learning process) or technological changes – as in ICT

17 This paper will focus on the nature of ‘innovation’ rather than the process or requirements for implementation, but it also acknowledges their importance.
implementation’ (p. 26). Michael Fullan (2007) goes further to argue that significant educational innovation – or ‘change in practice’ – must contain three elements:

1. use of new or revised materials (e.g. curriculum materials or technologies)
2. use of new teaching approaches (e.g. teaching strategies or activities)
3. alteration of beliefs (e.g. pedagogical assumptions)\(^\text{18}\)

Therefore, educational innovation is not just a shiny new tool or idea that is used within existing practice. It may involve novel resources or activities but must also incorporate changes in ways of working and thinking. Indeed, ‘current’ innovations can involve technologies that are not necessarily new but whose affordances for improvements in teaching pedagogies and practices have yet to be realised. The international Second Information Technology in Education Study (SITES) study found that many of the 174 case studies of innovative practice it gathered used ‘ordinary technology’ to do innovative things (Kozma, 2003).

Innovation can be particularly difficult to define because of its dependence on subjectivity. Concepts like ‘new’ and ‘better’ are highly dependent on the eye of the beholder, resulting in subjective assessments of the value or ‘difference’ of an innovation (Moyle, 2010). As Kozma (2003) found in the SITES study, ‘innovation often depends on the cultural, historical, or developmental context within which it is observed’ (p. 17). Not only does the definition of innovation depend on its local, regional and national setting, but as Somekh (2007) points out, 'the difficulty in understanding the process of innovation is that we see it necessarily from our own standpoint' (p. 8).

Thus, many have argued that educational and pedagogical innovation can only be successful when understood within context. No single tool or practice will be seen as 'innovative' in every classroom, nor will its implementation or impact be replicable, making it impossible to generalise about its affordances from one setting to another (Somekh, 2007). Educational practices have deeply embedded attitudes, historical and cultural assumptions and norms, and political priorities, all of which are critical components of the viability of an innovation being adopted and sustained. The disruptions caused by innovations and change to existing practices, rituals and relationships can be risky and accompanied by failure, characteristics often unwelcome in education systems driven by high, unyielding standards (Moyle 2010).

However, the importance of context need not stymie discussion on the potential of an innovation. Rather, recognising and accounting for the context where the innovation is introduced is critical for success. Effective educational changes must therefore also be committed to changing the context where the innovation happens (OECD, 2006). Fullan (2007) states: 'The real crunch comes in the relationships between these new programs and the ... subjective realities embedded in people’s individual and organizational contexts and their personal histories. How these subjective realities are addressed or ignored is crucial for whether potential changes become meaningful’ (p. 37). Zhao et al. (2002) provide a useful

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\(^\text{18}\) Fullan (2007) sees alteration of beliefs as the most difficult to change but the most important to ensure lasting reform.
'Distance and Dependence’ model that helps measure contextual factors such as distance from existing practices and dependence on resources that may enable or impede innovations. The international SITES study developed local definitions and understandings of ‘innovativeness’ to gather the case studies of innovative practice across 28 countries (Kozma, 2003).

Because defining innovation is contextually dependent, it can be difficult to pinpoint specific pedagogical practices recognised as innovative. However, research conducted by Manchester Metropolitan University for iTEC’s evaluation has compiled a list of pedagogical ‘innovations’ against which the iTEC scenarios will be measured in the mapping tool. These demonstrate a commonly recognised shift in pedagogical practices from more instructional-focused activities to those broadly based within social-constructivist approaches. Shifts include increases in student-centred and personalised teaching practices, collaboration, knowledge building and problem solving activities, cross-curricular approaches and new roles for teachers and learners. These also include shifts in assessment, involving increased formative, self- and peer-assessment, and an emphasis on authentic tasks and self-regulated learning (McLoughlin and Lee, 2010; Kozma, 2003).

Models of Innovation

It is commonly recognised that ‘end-user’ innovations – in this case, innovations led and managed by teachers – often offer a more localised, committed and effective way to address problems than more prescriptive initiatives from external forces (von Hippell, 2005; Sutch et al., 2008). End-user innovation is connected to Rogers’ (1995) ‘diffusion’ model of innovation, in that it sees how individual, small-scale changes can support and lead to a broader set of local innovations by other ‘end-users’. Indeed, Fierro-Evans’ research (OECD, 2008) identified that while micro-level interventions may not be grand, they ‘are usually the most permanent and make the deepest impact on practice’ (p. 17). In this sense, innovation need not be the same as ‘transformation’ but rather seen as a process of incremental, forward movements that can be shared in networked communities. Other recent research similarly suggests that Rogers’ original diffusion model and ‘adoption curve’ can be seen as a simplistic representation of a series of complex interactions and challenges (Johnson and Davies, 2007).

However, end-user innovations should not be viewed as solitary activities separate from external influence. The phenomenon of educational change is multi-faceted, and different models of innovation point to the importance of relationships between the different spheres of influence and activity. Zhao and Frank (2003) adopt an ecological framework to understand how innovations – particularly the use of technology – spread in schools. This framework recognises the dynamic relationships between factors supporting and hindering innovations and the important role of activity at the local – and often informal – level. Another model also addresses the relationships between different elements of the system and the wider impact an innovation on one level can have. The ‘layers of influence’ model examines the different elements that affect classroom practice at three levels: the micro (the innovator), meso (school and local) and macro (national and broader) levels in a school environment (Kirkland and Sutch, 2009).
Sources


Appendix A

iTEC partners who have been participants in the innovation sub-group meeting and contributed to the definition:

Futurelab Education
Manchester Metropolitan University
University of Bolton
European Schoolnet
AALTO University
Katholieke Universiteit Leuven
Appendix 6: The application of the mapping tool to cycles 2 and 3

For each scenario, every time an area is mentioned in the scenario a cross is put in the relevant column; two if it is judged to be core to the scenario.

Table 6: Mapping for cycles 2 and 3

<table>
<thead>
<tr>
<th>Scenarios - Name</th>
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</thead>
<tbody>
<tr>
<td>Cycle 2</td>
</tr>
<tr>
<td>Combining formative and summative assessment</td>
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<tr>
<td>Developing cooperative and collaborative approaches to learning about business</td>
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<tr>
<td>Homework and schoolwork flip</td>
</tr>
<tr>
<td>Schoolville Virtual engines</td>
</tr>
</tbody>
</table>

1. Technology (derived from iTEC vocabulary)

1. Virtual learning environment | x | x | x | x | x | x | x | x | x

2. Student information system (online portfolio, automated assessment tool, student reporting tool, task management tool)

3. Collaboration tools (e.g. calendar, social networking tool, social bookmarking tool, data sharing tool, wiki, feedback tool)

4. Communication tool (e.g. IM, video and audio conferencing, blog, forum, bulletin board)

5. Content management (e.g. file transfer client, online storage)

6. Digital resources and content (including databases, reference tools, animations, video clips, educational software, podcasts)

7. Data analysis tool*

8. Game
<table>
<thead>
<tr>
<th>Scenarios - Name</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
</tr>
</thead>
<tbody>
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<td>Schoolville Virtual engines</td>
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</tr>
<tr>
<td>9. Geotagging tool**</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>10. Media authoring tool (e.g. concept-mapping tool, image or video editor, word processor, web authoring tool, podcast client)</td>
<td>XX X X X X X X</td>
<td></td>
</tr>
<tr>
<td>11. Multi-media repository client (e.g., music/photo/video/slide sharing sites)</td>
<td>XX X</td>
<td>X X</td>
</tr>
<tr>
<td>12. Simulation software</td>
<td></td>
<td>XX</td>
</tr>
<tr>
<td>13. Syndication feed</td>
<td></td>
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<tr>
<td>14. Data capture device (e.g. microphone, video camera, camera, scanner, datalogger)</td>
<td>X X X X</td>
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<tr>
<td>15. Document reader (e.g. document camera/digital visualiser)</td>
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</tr>
<tr>
<td>16. Interactive teaching and learning device (e.g. IWB, multi-touch table, learner response device, interactive tablet, wireless slate)</td>
<td>X X XX X</td>
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<tr>
<td>17. Manufacturing device (e.g. 2D or 3D printer)</td>
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<tr>
<td>18. Mobile device (e.g. phone, netbook, PDA, tablet)</td>
<td>X X</td>
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<tr>
<td>19. Programmable robotic device</td>
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<tr>
<td>20. iTEC tools (e.g. TeamUp)</td>
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</table>
### Scenarios - Name

<table>
<thead>
<tr>
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<td>Schoolville Virtual engines</td>
<td>Schoolville Virtual engines</td>
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<tr>
<td>Other</td>
<td>Other</td>
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</tbody>
</table>

#### Other
- people bank: network of remote experts and peers
- ‘drag and drop’, online programming software, such as Scratch or Alice or app building software;
- Smartphone apps
- 3D modelling applications and software
- Online software for creating mediascapes/QR codes
- Free online social networking site
- “Flipping” school - time and homework time; high quality resources
- App

#### Total types of technology
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#### 2. Pedagogy
(from Futurelab report on pedagogies)

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<tr>
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<th>Project-based learning</th>
<th>Enquiry-based pedagogy</th>
<th>Game-based pedagogy</th>
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#### 3. Assessment

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<td>Role play, collaborative reflective teaching in blended learning contexts, xx: students as researchers, x: students as researchers</td>
</tr>
</tbody>
</table>

#### Other types of pedagogy - please specify
- Team teaching, teacher CPD
- xx: students as researchers, x: students as researchers

#### Total types of pedagogy
<table>
<thead>
<tr>
<th>Self-assessment</th>
<th>Other types of pedagogy - please specify</th>
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<td>Virtual engines</td>
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**Peer-assessment**

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<tr>
<td>Summative assessment</td>
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<tr>
<td>Other assessment - please specify</td>
<td>Feedback from experts</td>
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**Total types of assessment**

<table>
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<th>Cycle 2</th>
<th>Cycle 3</th>
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<tbody>
<tr>
<td></td>
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</table>

**4. Potential benefits**

(content from WP5 teacher questionnaire and external research)

<table>
<thead>
<tr>
<th></th>
<th>Cycle 2</th>
<th>Cycle 3</th>
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<tbody>
<tr>
<td>Use digital tools to support collaborative work (a)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Develop competencies and skills that allow students to search for, organise and analyse information (a)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Provide opportunities for students to communicate and express their ideas in a variety of media forms (a)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Use new pedagogical practices (b)</td>
<td></td>
<td>XX</td>
</tr>
<tr>
<td>Assess students in a new way (b)</td>
<td>XX</td>
<td>X</td>
</tr>
<tr>
<td>Create opportunities to learn beyond the boundaries of the classroom (b)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Explore different teacher and student roles and relationships (b)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Introduce new concepts which would be difficult to teach otherwise (b)</td>
<td>XX</td>
<td>X</td>
</tr>
<tr>
<td>Scenarios - Name</td>
<td>Cycle 2</td>
<td>Cycle 3</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Support teachers to meet the learning needs of each student through individualised instruction (b)</td>
<td></td>
<td>x x</td>
</tr>
<tr>
<td>Promote active and independent learning in which students take responsibility for their own learning activities or progress. (b)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Support collaborative, project-based learning in which students work with others on complex, real-world-like problems (b)</td>
<td>XX x xx x x</td>
<td>x x x xx xx</td>
</tr>
<tr>
<td>Communicate in new ways with the wider community (e.g. other teachers, parents, experts) (c)</td>
<td>x x x x x x x x</td>
<td>x xx</td>
</tr>
<tr>
<td>Increase access to services that enhance learning for all students (c)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Increase access to educational content for all students (c)</td>
<td></td>
<td>x x</td>
</tr>
<tr>
<td>Improve social cohesiveness and understanding by having students interact with groups and cultures they would not otherwise</td>
<td>x</td>
<td></td>
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<tr>
<td>Improve management of educational resources (become easier, more efficient or more effective)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><strong>Total types of activities</strong></td>
<td>3 2 4 2 2 3 3 5 4 2 5 4 5 6 5 4 2</td>
<td></td>
</tr>
</tbody>
</table>

5. Environment

<p>| Classroom                                                                 | x x x x xx x x x x x x x x x x x |
| School campus (beyond classroom)                                         | x x x |         |
| Local community                                                          | x     | xx     |</p>
<table>
<thead>
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<td>Other schools (local, national, international)</td>
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<td>6. People</td>
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<td>Other people in the school</td>
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<td>Learners in classroom</td>
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</tr>
<tr>
<td>Learners beyond the classroom (in school, other schools, international)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents/families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside experts</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Others in the community</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other people</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total types of people involved</strong></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7. Transversal Competences (from EU Key Competences)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication in the mother tongue</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

135
## Scenarios - Name

<table>
<thead>
<tr>
<th>Scenarios - Name</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication in foreign languages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematical literacy and competence in science and technology</td>
<td>X</td>
<td>x x x</td>
</tr>
<tr>
<td>Digital competence</td>
<td>X x x x</td>
<td>x x x x</td>
</tr>
<tr>
<td>Interpersonal, intercultural and social competences</td>
<td>X</td>
<td>x x</td>
</tr>
<tr>
<td>Learning to learn</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>XX</td>
<td></td>
</tr>
<tr>
<td>Civic competences</td>
<td>X x</td>
<td></td>
</tr>
<tr>
<td>Cultural expression</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total number of competences addressed</strong></td>
<td>4 2 3 0 1 4 1 4 3 1 4 3 3 3 3 5 3</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

- Software used to sort through data in order to identify patterns and establish relationships.
- **Software that allows users to add latitude and longitude coordinates to various media like photographs and videos.**
  - (a) Relates to benefit: 'Increasing appropriate and effective use of digital technologies to support teaching and learning'
  - (b) Relates to benefit: 'Increasing the range of pedagogical strategies used'
  - (c) Relates to benefit: 'Increasing access to educational resources (people, tools, services, content)'
  - (d) Relates to benefit: 'Improving management of educational resources'
Appendix 7: Summary report survey and power league

In order to provide contextual background and ensure stakeholder input to the scenario development process, two tools were developed to gather information from teachers and students. A survey was distributed to teachers to gather their attitudes and perceptions of the use of technology in classrooms, and an online voting activity was used with students to learn about their preferences for the future classroom.

More than 1200 teachers across Europe completed the survey and the online activity gathered more than 284,000 votes. It should be acknowledged that the survey respondents and participating students comprised a specific cohort. Teacher survey respondents were self-selected and not a representative sample across participating countries. More than half of the participants (teachers and students) are from five countries (Estonia, Hungary, Lithuania, Portugal, Turkey) out of fifteen participating countries. Furthermore, student participants were involved via self-selection of their teachers and came from a non-representative geographical sample. It is acknowledged that a more balanced involvement of the different countries would have been desirable. But despite this sample, the findings still provide an indication on how the iTec project can respond to and address the realities of responding teachers and preferences of students.

The following provides the core findings from both the survey and online activity and resulting recommendations for the iTec project. These findings directly fed into the second cycle of scenario development and the recommendations have been considered by WP2 within subsequent scenario development work.

Summary of findings: Teachers’ survey

Teachers’ confidence and use of technology

- Respondents were generally experienced teachers who see themselves as regular to high users of technology with perceptions of high levels of personal competence at using it.
- While teachers generally rank their IT competency as competent to high, many are not using it for a majority of the time in lessons. It is difficult to ascertain why this is the case; they may be using astute judgment of when technology use is appropriate, have poor access or be unsure how or why to use it in classrooms.
- Despite a wide variety of usage in the classroom in terms of proportion of use within lessons, a majority feel they are using it more than typical colleagues do and are using it in increasing amounts. Respondents therefore appear to consider themselves to be invested users of technology for learning, regardless of the amount used.
- Teachers use a wide range of technologies with different affordances but find the ‘most useful’ to be those most associated with teacher-led, didactic classroom practice (e.g., IWB, projector).
Perceptions on enablers and barriers to using technology

- *Teachers who report confidence and competence at using digital technologies may not be as confident or skilled at using new technologies for educational purposes or to promote learning.* More than a quarter still found it difficult to introduce new technologies in their teaching, a very high majority of respondents across all countries desired additional training on using technology in the classroom, and a large cohort would also like evidence of its utility for teaching and learning.

- *Barriers often assumed to get in the way of using technology did not appear to be an overwhelming issue for responding teachers.* Issues such as curriculum restraints and e-safety concerns were seen to be barriers by some teachers but not by an overwhelming majority. Assessment systems appear to provide a bigger challenge to the use of technology but were not seen to be a barrier by a majority of teachers.

- *Teachers report large variations in levels of technical support, access to technology and supportive teacher networks between participating countries.* This is also emphasised by the variability seen in the use of different digital technologies. These may be contributing factors to why more than a quarter of responding teachers find it difficult to integrate new technologies into their teaching, particularly interesting when considering the high reported levels of confidence and competence reported by these teachers.

Value and benefits of using technology

- *Teachers recognised the value of using technology in the long-term but identify a short-term impact on workload.* This point is particularly important for the iTEC project to recognise, as the pilots will be asking teachers to use new technologies and thus increase their workload.

- *Respondents appeared positive about the benefits and value of using technology in the classroom, but areas of teaching and learning that are often more complex (developing critical, intellectual and social skills) were the areas that showed the highest lack of conviction from respondents.* This is important to consider within the project, as these are areas of learning present in many scenarios in cycles 1 and 2 and that may require additional support for teachers.

Summary of findings: Power League Student Activity:

- *There is a clear preference from students for the presence and use of technology in schools.* It is unclear how much preference relates to use of technology in learning or is more related to having general access to computer equipment and the internet. Certainly students identified strong preferences in relation to access of hardware, software, and internet access in schools.
• There is a related interest and perceived importance of media use and studies. This suggests that related curriculum content, such as media studies and digital literacy, are also student preferences.

• Responding students seem to prefer pedagogies, learning activities and content areas that offer alternatives to the more conventional teacher-led learning. Specific areas that were highly ranked include collaboration, game-based learning, play, project- and discovery-based learning and students working in teams.

• Students appear to prefer more child-centred, collaborative approaches to learning. This includes teachers understanding and building links with children’s interests outside of school.

• Flexibility in learning also factors strongly, both in terms of learning spaces and how, when and with whom learning can happen.

• Students demonstrated strong interests in schools helping them become prepared for the world beyond formal education. Relevant highly ranked areas of education included gaining ‘21st Century skills’ and skills for specific jobs (rather than basic skills), performing authentic tasks and undertaking real challenges.

Recommendations for using these findings within iTEC

The survey and Power League activity provide important perspectives from teachers and young people on their attitudes and preferences of technology use in future classrooms. Guidance and recommendations these findings offer for the remainder of the iTEC project particularly resonate in the development of scenarios and support provided to teachers involved in the piloting of scenarios across Europe. Recommendations are as follows:

1. Acknowledge and challenge teachers’ current use of technology in classrooms through scenario and technology development. There appears to be a strong teacher preference (in terms of utility) towards more conventional, hardware-based and often didactic teacher-led technologies. iTEC scenarios should consider how to challenge the use or application of these often-preferred tools so they are used in more innovative ways that also respond to student preferences for more collaborative, child-centred forms of pedagogy. Additionally, a number of more collaborative technology tools were not commonly used across most countries and therefore could represent an opportunity to be introduced as innovative where appropriate for learning activities. Tools including the use of games, social networking, mobile technology, video conferencing, virtual simulations and high-tech instruments have low take-up rates within most countries represented here. Even commonly used tools such as collaborative tools and digital resources are still not perceived as being exceptionally useful by most teachers, providing an opportunity for iTEC to demonstrate where they can be innovative and useful within scenarios.

2. Provide training for teachers that include evidence of the benefits of new technologies for learning and also incorporates pedagogical, as well as technical,
training on the use of technology in classrooms. Just because technology is used by teachers who are seen to be competent and confident at using different tools, it may not be used effectively in terms of teaching and learning. The majority of teachers also still wanted both evidence of benefits and additional training when using new technologies in the classroom, despite their self-perceptions as competent, invested users of technology.

3. **Recognise and facilitate the short-term investment of technology use required by teachers.** Many teachers recognise that a short-term investment in time and resources to use technology will reduce workloads (while also providing many benefits to students) in the long run. iTEC’s ability to motivate teachers to commit to the short-term investment with engaging scenarios and adequate support and is an important determinant of long-term success.

4. **Incorporate student preferences into the content, pedagogy and assessment elements of scenarios.** Student preferences should be considered and integrated into the scenario development process, including more opportunities for flexible learning, learning outside the classroom, collaboration, play and game-based learning, authentic learning experiences, and project- or discovery-based learning.

5. **Consider how to employ the enablers many teachers have identified that support use of technology in the classroom.** These enablers include involvement of students in the teaching and use of technology, additional training, and providing evidence on the educational value of using technology. These enablers should be considered during the scenario development process and could also apply to the training and ongoing support provided to teachers.

6. **Involve teachers and students in the development, preparation and facilitation of the iTEC process.** Teachers should be more directly involved in the scenario development process. Additionally, in order to accommodate the overlap and address the tensions between the students’ preferences and teachers’ realities, future scenarios should re-iterate and further explore how student preferences can be included in the scenarios through additional research and input from learners.

7. **Augment these findings with additional research and data gathering.** The difficulties with bias and representation presented in this survey can be somewhat alleviated through continued research and data gathering from similar studies. Additional involvement of teachers in the iTEC project can provide qualitative data to support or challenge the results found here. Additionally, European Schoolnet is leading on Survey of Schools: ICT and Education, a survey of heads, teachers and students from 35,000 schools in 31 countries (including all iTEC partners). This will provide a complementary data set about digital competence, use and attitudes that will prove useful in subsequent iTEC cycles.

8. **Accommodate for the diversity of access and use of technology in classrooms.** Classrooms within and across countries are widely varied and this local context must be recognised in the development of scenarios, training processes and evaluation.
This could include recognition of local context and need during piloting, as well as a wider range of scenarios or options within scenarios.
Appendix 8: Scenario evaluation criteria

Evaluation criteria for the iTEC scenarios

1: Purpose of this paper
To outline a set of criteria for assessing iTEC scenarios and identify those showing the greatest potential for bringing about the classroom of tomorrow.

2: Evaluation criteria
There are five components:
- A: Match to identified trends and challenges
- B: Feasibility of pedagogical implementation
- C: Feasibility of technological implementation
- D: Innovative/transformational character
- E: Prospects of impacting at scale, if validated successfully

3: Evaluation process
Reviewers are asked to assess each scenario in terms of these five criteria, using the questions below as prompts to arrive at a score (1-5 for each component) and to formulate written comments (also to assist in the development of future scenarios). Scores given by, for example, the Pedagogical Board and MoEs, can be given more weight, thus, say, 50% of the final score is determined by certain groups.

<table>
<thead>
<tr>
<th>Scenario title</th>
<th>Criterion</th>
<th>Score</th>
<th>Comments (using questions below as prompts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Trends and challenge match</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B: Implementation feasibility - pedagogical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C: Implementation feasibility - technological</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D: Innovative character</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E: Large-scale impact prospects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total /25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General comments (e.g. what could be done to improve the scenario, what is it similar to)

A: Match to identified trends and challenges
• Does the scenario respond to current educational challenges in relation to learning, technology and policy?

• Does the scenario have the potential to overcome challenges identified by the current trends and drivers that affect and are affected by education identified for the iTEC project (see appendix 1 for the key trends identified by WP2 partners and ranked by stakeholders in cycle 1)?

• Is the scenario perceived to contribute effectively to teachers' objectives, practices and pressing issues and challenges?

B: Feasibility of pedagogical implementation

• Does the scenario have a specific and clear educational focus (e.g. pedagogy/assessment/ home-school relationships/Continuing Professional Development)?

• Will the scenario engage and enthuse teachers? Will it encourage teachers to try out new tools and teaching and learning practices?

• Is the scenario educationally feasible? Do schools have the capacity and conditions to implement the scenario practically/quickly/cost-effectively in terms of the appropriate elements (e.g. curriculum and scheme of work, school priorities, timetabling, training needs, ICT competences of teachers / students)?

• Is the scenario adaptable? Can it be customised to fit different local conditions?

C: Feasibility of technological implementation

• Does the scenario use digital tools effectively and appropriately?

• Do schools have the capacity and conditions to implement the scenario practically/quickly/cost-effectively in terms of the appropriate technological elements (connectivity, access to ICT equipment, provision of ICT equipment)?

• Does the scenario offer opportunities to make use of technologies and tools developed in iTEC? Do the scenarios provide opportunities to try out tools under development in iTEC?

D: Innovative / transformational character in your country

• Does the scenario feel like the classroom of tomorrow? Does it feel worth the investment in iTEC? Will it make a difference?

• Is the scenario relevant? Does the scenario address current issues and challenges for learners, teachers and schools whilst also encouraging 'innovative' and 'cutting-edge' teaching and learning practices and technologies?

• Does the scenario have the potential to change/transform teaching and learning? For example ‘novel instructional formats, increased delegation of responsibility and
control over the learning process to the students, or alternative methods for the assessment of learning’ (WP5 evaluation plan)

- Does the scenario have a balance between pedagogic and technological content/aims/objectives/innovation?

**E: Prospects of impacting at scale, if validated successfully**

- Is the scenario potentially scalable in other schools cost-effectively beyond pilots and iTEC?
Appendix 9: Template for the elicitation of innovative examples

Examples of innovative practice

To ensure the iTEC scenario development process draws on the experience and knowledge of ALL iTEC partners and builds on existing innovative practices in Europe and beyond, we are asking those involved in the project to contribute examples of innovative practice within education. Futurelab will also be gathering examples of innovative practice through desk research and workshops with students. The most appropriate examples that are collected will be further developed into mini-scenarios for iTEC’s 3rd cycle.

In short, we are seeking inspirational and creative examples of innovative practice in education that can lead to compelling, sustainable and scalable scenarios.

The examples of innovative practice should meet the following criteria:

- Must include examples of innovative pedagogy and/or innovative use of technology for teaching and learning
- Must relate to school-based classroom teaching and learning (though they may also include spaces other than the classroom)
- Must be relevant to iTEC objectives
- Should be based within Maths, Science or Technology areas of learning or adaptable to these subjects
- Should have clear tasks and activities for teachers and students
- Should include elements of assessment if possible

Please use the following template to record high-quality examples of innovative practice (written in English please) that you have experienced, read about or witnessed. Please provide as much information as possible but do not worry if you are unable to fully complete each form.

As a guide, each partner organisation is asked to submit up to 3 examples to ensure that we gather the most inspirational and relevant material for creating scenarios. However, if you have additional examples you would like to contribute, please send them to Futurelab at the email address below.

Please send completed forms to itec@futurelab.org.uk by 27 October at the latest (before that if possible).

Queries should be sent to sue.cranmer@futurelab.org.uk.
# Examples of Innovative Practice

(Please complete in English)

<table>
<thead>
<tr>
<th>1: SHORT DESCRIPTIVE TITLE OF INNOVATIVE PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e.g. Using games for personalised assessment)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2: AIM OF INNOVATION - WHAT DOES IT ASPIRE TO DO OR CHANGE?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3: DESCRIBE THE CONTEXT OF THE INNOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e.g., location, type of system or classroom, subject area, background of students, what catalyst led to or started the innovation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4: BRIEF DESCRIPTION OF THE INNOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e.g. What happened? What makes it innovative? What is the relevance to iTEC objectives? What are the challenges of implementation?)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5: FEATURES OF THE INNOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this innovation (Please indicate which phrase best describes your example)?</td>
</tr>
<tr>
<td>a) An individual case</td>
</tr>
<tr>
<td>b) Something that happens only in a few schools</td>
</tr>
<tr>
<td>c) Something that happens in a large number of schools</td>
</tr>
<tr>
<td>d) Typical across the system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>PHYSICAL ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the learning and teaching activities?</td>
<td>Where does it happen?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PEOPLE &amp; ROLES</th>
<th>INTERACTIONS (INCLUDING PEDAGOGIES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is involved? What do they do?</td>
<td>How do the people involved interact? Describe the relationships.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACT AND SCALABILITY</th>
<th>RESOURCES (INCLUDING TECHNOLOGIES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any evidence of the innovation’s impact or likelihood of scalability?</td>
<td>What resources are required, both at school and out of school?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6: SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the source for this example? Where did you find out about it? Do you have any references about it? (e.g. research papers, websites, blogs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUBMITTED BY (your name):</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORGANISATION:</td>
</tr>
</tbody>
</table>
## Appendix 10: Template for the evaluation and improvement of scenarios (workshop 3)

<table>
<thead>
<tr>
<th>Inspiring</th>
<th>Young People’s Views (see Young People’s Workshop – Commonalities handout)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How inspiring is this scenario?</td>
<td>How well are young people’s views represented or included in this scenario?</td>
</tr>
<tr>
<td>• Will it engage and enthuse teachers to change their practice?</td>
<td>• How well do the scenarios reflect the issues raised and ideas proposed by the young people in the ITEC Young People’s Workshops?</td>
</tr>
<tr>
<td>• Does it feel like the classroom of tomorrow? Does it feel worth the investment in ITEC? Will it make a difference?</td>
<td>• Which of the young people’s suggestions are represented or included in this scenario?</td>
</tr>
<tr>
<td>• What changes would make it more motivating and inspiring for teachers?</td>
<td>• Could/should the scenario be changed to better include young people’s ideas and suggestions? What changes could be made whilst maintaining the core purpose of the scenario?</td>
</tr>
<tr>
<td>Feedback:</td>
<td>Feedback:</td>
</tr>
<tr>
<td></td>
<td>Suggested improvement:</td>
</tr>
<tr>
<td>Suggested improvement:</td>
<td>Suggested improvement:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovative</th>
<th>Feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>How innovative is this scenario?</td>
<td>How pedagogically feasible is this scenario?</td>
</tr>
<tr>
<td>• How well does the scenario respond to current educational issues and challenges for learners, teachers and schools (including trends)?</td>
<td>• Do schools have the capacity and conditions to implement the scenario practically/quickly/cost-effectively (e.g. consider: curriculum and scheme of work, school priorities, timetabling, training needs, ICT competences of teachers/students)?</td>
</tr>
<tr>
<td>• Does the scenario have the potential to change or transform teaching and learning practices? Why and how?</td>
<td>• Is the scenario adaptable? Can it be customised to fit different locations?</td>
</tr>
<tr>
<td>• Does the scenario have a balance between pedagogic and technological innovation?</td>
<td>• Do you have any recommendations for changes to the suggested pedagogical approaches and the assessment methods? Consider the Pedagogical Approaches document (on table).</td>
</tr>
<tr>
<td>• In your opinion, should/could the scenario be made more innovative? How could this scenario be more transformative?</td>
<td></td>
</tr>
<tr>
<td>Feedback:</td>
<td>Feedback:</td>
</tr>
<tr>
<td></td>
<td>Suggested improvement:</td>
</tr>
<tr>
<td>Suggested improvement:</td>
<td>Suggested improvement:</td>
</tr>
</tbody>
</table>
### Appendix 11: Draft list of EU projects

Potentially to be linked to by iTEC/provide inspiration for iTEC scenarios

<table>
<thead>
<tr>
<th>Project</th>
<th>Brief description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGITAL EARTH</td>
<td>EU-funded network project with the goal of raising the profile of teaching and learning with digital geo-media across the EU.</td>
<td><a href="http://www.digital-earth.eu">http://www.digital-earth.eu</a></td>
</tr>
<tr>
<td>ESTABLISH (European Science and Technology in Action, Building Links with Industry, Schools and Home)</td>
<td>Encourages the use of inquiry-based teaching methods in science education in Europe, aims to create authentic learning environments</td>
<td><a href="http://www.establish-fp7.eu">www.establish-fp7.eu</a></td>
</tr>
<tr>
<td>Fibonacci</td>
<td>Aims to design, implement, test and formalise a process of dissemination of inquiry-based teaching and learning methods in science and maths in Europe.</td>
<td><a href="http://www.fibonacci-project.eu">www.fibonacci-project.eu</a></td>
</tr>
<tr>
<td>iCLASS</td>
<td>iClass project (now completed) aimed to bring an innovative model for teaching and learning to schools in order to address issues of disengagement. Outcome of the work was a suite of pedagogically coherent tools and a set of pedagogical methodologies, validated through research and of end-user feedback.</td>
<td>Main website no longer available. <a href="http://insight.eun.org/shared/data/insight/documents/iclass/IClas_brochure_2pages.pdf">http://insight.eun.org/shared/data/insight/documents/iclass/IClas_brochure_2pages.pdf</a></td>
</tr>
<tr>
<td>ITILT (already linked with iTEC)</td>
<td>Interactive Technologies in Language Teaching aims to promote best practice in communicative language teaching using interactive whiteboards.</td>
<td><a href="http://itilt.eu/">http://itilt.eu/</a></td>
</tr>
<tr>
<td>NEXT-TELL (Next Generation Teaching Education and Education for Life)</td>
<td>Aims to bring about a vision of 21st Century classroom learning by providing resources and ICT support for teachers and students to develop learning activities appropriate for 21st Century learning based on this conceptual framework for assessing ICT enhanced learning. Also has a strand focusing on learning beyond the classroom. Has produced an 'innovation platform'/NEXT-TELL software system for teachers.</td>
<td><a href="http://www.next-tell.eu">http://www.next-tell.eu</a></td>
</tr>
<tr>
<td>OSR – Open Science Resources</td>
<td>Developing a digital repository for formal and informal science education. The portal gives various users access</td>
<td><a href="http://www.openscienceresources.eu/">www.openscienceresources.eu/</a></td>
</tr>
<tr>
<td>Project</td>
<td>Brief description</td>
<td>Website</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>PATHWAY</td>
<td>Aims to develop a standard-based approach to teaching science by inquiry, to support the adoption of inquiry teaching and to demonstrate and disseminate methods &amp; exemplary cases of both effective introduction of inquiry to science classrooms and professional development programmes.</td>
<td><a href="http://pathway.ea.gr/">http://pathway.ea.gr/</a></td>
</tr>
<tr>
<td></td>
<td>Best practices:</td>
<td><a href="http://pathway.ea.gr/nod">http://pathway.ea.gr/nod</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e/4</td>
</tr>
<tr>
<td>Roberta</td>
<td>Addresses disengagement and gender issues in STEM by using robots as an educational tool to learn the basics of STEM. Offer robotics courses particularly aimed at girls and training for teachers</td>
<td><a href="http://www.roberta-home.de/en">www.roberta-home.de/en</a></td>
</tr>
<tr>
<td>ROLE (Responsive Open Learning Environments)</td>
<td>Main aim is to deliver and test prototypes of highly responsive Personal Learning Environments and to design and develop widgets/other software to support this aim. Has a 'showcase' of software and widgets that have been developed.</td>
<td><a href="http://www.role-project.eu/">www.role-project.eu/</a></td>
</tr>
<tr>
<td>SceTGo (Science Centre to Go)</td>
<td>The Science Center to Go project is developing innovative systems of experiential learning using Augmented Reality (AR) technology; it highlights key trends in digital technologies to help better understand how science works.</td>
<td><a href="http://www.sctg.eu">www.sctg.eu</a></td>
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<tr>
<td>TEACH.US</td>
<td>Teach.us is a web community for teachers interested in integrating Web 2.0 in classes at school. It aims to support Web 2.0 projects in schools and motivate teachers to use modern Internet technologies in classes. Provides examples of Web 2.0 projects carried out in schools.</td>
<td><a href="http://www.teachus.eu">www.teachus.eu</a></td>
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<tr>
<td>TEL-MAP Project. Possible Futures for Technology Enhanced Learning – Dynamic Roadmapping for Uncertain Times.</td>
<td>TEL-map focuses on exploratory 'Roadmapping' activities of new forms of learning to support the adoption of those new forms. Aims to build</td>
<td><a href="http://www.telmap.org">www.telmap.org</a></td>
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<tr>
<td>Project</td>
<td>Brief description</td>
<td>Website</td>
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<td>awareness and knowledge of the results of EU teaching enhanced learning projects and their adoption and use. The project maps, compares and makes sense of key emerging research and technology developments and their novel uses impacting on the desired futures of TEL stakeholders.</td>
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<tr>
<td>UniSchooLabS</td>
<td>Provides schools with an online toolkit for accessing high quality university science laboratories remotely and creating inquiry-based learning activities for students.</td>
<td><a href="http://unischoolabs.eun.org/">http://unischoolabs.eun.org/</a></td>
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</tbody>
</table>
Non-EU funded projects and other initiatives that may be of interest:

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<thead>
<tr>
<th>Project</th>
<th>Brief description</th>
<th>Website</th>
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<tbody>
<tr>
<td>HP Catalyst</td>
<td>An HP funded network of leading educators, education institutions, and key stakeholders exploring innovative approaches to various aspects of STEM education including teacher training, online STEM education, technology supported collaborative student problem solving, creating networks of online opportunities for students, competency assessment and entrepreneurship. Have extensive listings of vetted projects exploring uses of emerging technologies.</td>
<td><a href="http://www.hp.com/go/hpcatalyst">www.hp.com/go/hpcatalyst</a></td>
</tr>
<tr>
<td>ITL (Innovative Teaching and Learning)</td>
<td>Microsoft funded research project to investigate the factors that promote the transformation of teaching practices and the impact those changes have on students’ learning outcomes across a broad range of country contexts.</td>
<td><a href="http://www.itlresearch.com/">www.itlresearch.com/</a></td>
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<tr>
<td>FutureSchools@Singapore</td>
<td>A collaboration between the Singapore Ministry of Education and six Singapore schools to provide possible models for the ‘seamless and pervasive’ integration of technology including interactive digital media into classrooms. Working with industry to develop and create apps such as TrailDog – an iphone and free online browser based app that allows students to create their own experiential indoor and outdoor learning trails. The mobile version includes features such as an augmented reality ‘way-finder’ and code scanner and a means of allowing teachers to monitor pupil progress.</td>
<td><a href="http://www.springwise.com/education/in-singapore-schools-tech-enabled-program-self-directed-learning/">www.springwise.com/education/in-singapore-schools-tech-enabled-program-self-directed-learning/</a></td>
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Appendix 12: Dissemination and impact plan

Introduction

This dissemination and impact plan outlines the ways in which Futurelab intends to raise awareness of the iTEC project – particularly the work carried out within WP2 – and its outcomes.

The main focus is to ensure that, within overall iTEC project dissemination guidelines, the project’s activities and outcomes are disseminated widely by Futurelab to the intended target communities using appropriate and relevant communication methods.

For the purpose of this document, target groups for the promotion of iTEC are taken to include teachers, teacher trainers, school management professionals, policy makers, educational researchers and ICT vendors.

Planned dissemination activities

Futurelab and NFER have an extensive network of teaching professionals and education practitioners with whom both organisations regularly communicate.

The following communications channels will be used in the dissemination and communication of the iTEC project:

- NFER has a regular, monthly newsletter which is emailed to its own and to Futurelab's network of education practitioners, communicating details of latest research, project work, events, resources and publications.

- Information about iTEC is situated on Futurelab's own website. This is a readily updatable outline of the project and includes a link to the main iTEC project website.

- Futurelab has a considerable network of practitioners, education professionals, academics and researchers who follow its @futurelabedu twitter account. This account will be used to communicate short headlines about iTEC, with links to further information. In addition a number of the researchers working on the iTEC project for Futurelab use twitter for work purposes and tweet about interesting iTEC events (such as the Scenario Development workshops) or links to the iTEC website. All Futurelab tweets about iTEC will use the official hashtag (#itec_EU) where possible.

- Researchers working for Futurelab on iTEC will continue to produce short accessible outputs such as articles for the iTEC website and newsletters in addition to the webinar and other activities (details provided in section 8 Dissemination). If funding is available from other sources, researchers will aim to present the project at national and international conferences with a view to producing academic articles in due course. For this purpose, Futurelab have drawn up a list of potentially relevant conferences which could provide opportunities for iTEC dissemination and is working closely with European Schoolnet to ensure a joined up approach.

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- NFER produce *Impact: NFER’s research news for schools*[^1], a regular magazine of research insights aimed at school teachers which is available free in hard copy and to download online. This could be used to disseminate information about iTEC’s project outputs.

- NFER has a dedicated communications department that can enable the dissemination of project findings and outcomes via relevant practitioner focused magazines and websites.

### Summary of dissemination channels

| **Immediate/short-term** (announcement of news, quick project updates, links to materials produced) | Twitter: @futurelabedu (approx 4800 followers)  
NFER E-newsletters  
Futurelab website 'latest news' section  
www.futurelab.org.uk |
|---|---|
| **Medium-term** – communication of specific messages arising from the project /dissemination of project materials | Webinars, articles for the iTEC website and newsletters  
Conferences  
iTEC page on Futurelab website  
*Impact: NFER’s research news for schools* |
| **Long-term** -communication of outcomes from the project | Academic journal articles |

[^1]: *Impact: NFER’s research news for schools*: [http://www.nfer.ac.uk/schools/impact/](http://www.nfer.ac.uk/schools/impact/)