Combined Deliverable D6.7 and D2.9

Final Report on Pilot Studies
Final Report on Classroom Research with STEM and TESL Assessment

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1 Executive Summary

This Deliverable is the final report on pilot studies within the NEXT-TELL project (D6.7) and furthermore comprises the Deliverable on Classroom Research with STEM and TESL Assessment (D2.9) in order to avoid redundancies between those two Deliverables. We will provide the reader with NEXT-TELL’s aims and give insight into two theoretical frameworks on technology integration in the educational context that will be used later in this report, present studies in the context of the Deliverables 2.9 as well as 6.7 in a condensed way, will furthermore report on the work with schools that has been going on since the submission of the last WP6 deliverable and will finalize this joint Deliverable with conclusions from our Pilot Studies as well as recommendations for further training and disseminating our methodologies.

We start with a summary what NEXT-TELLs intentions were in the beginning and what we promised to undertake in terms of classroom research and methods development in the years from 2010 to 2014 (chapter 3) by revisiting the objectives and performance indicators.

In chapter 4, we will provide some insight into the frameworks of TPACK and RAT, which will be used to help analysing and evaluating some of our findings and to draw recommendations for further training and disseminating our methodologies in a later chapter.

Chapter 5 is designated to the assessment methods developed and represents the Deliverable 2.9. The studies that support the development of assessment methods are presented and reviewed in a synthesised way, as they have previously been presented in other deliverables.

From chapter 6 on, we will cover the intentions of Deliverable 6.7 and will start with the report on the work with schools that has been going on between June (submission date of D6.6) and October (end of project) and therefore was not reported in any other WP6 Deliverable before.

In Austria we conducted a questionnaire-based survey with teachers on the usefulness of different visualizations that are used in the OLM. Additionally, we report on a focus group discussion about the implementation of myClass in the classroom.

For England, we refer to conducted TISL studies that involve teachers engaging in inquiries in a broader range of contexts.

In Germany, we engaged with two schools. The first school we are reporting on should get some special attention as the school leader decided to use NEXT-TELL tools myClass and OLM as school wide solutions for documenting students’ learning progression and for facilitating teacher-parent meetings, weekly teacher-student reflection and feedback talks in their newly adopted school approach of a community school. The second report involves one teacher who used the Repertory Grid to gain insights into his students understanding of technical terms in Economy.

Three ESL teachers in the Netherlands have been using the nextTALK approach in their regularly taught classes to facilitate participatory decision-making.

In Norway, we investigated if the OLM can be used by teachers on their own and how they would use the OLM as part of their overall pedagogy and teaching activities in their daily practices.

After that we will provide the reader with an overview of schools’ engagement during the projects runtime in chapter 7 and will furthermore make short reviews of all formerly reported studies in chapter 8 that contributed to NEXT-TELLs developments available. We do so in order to facilitate the reading of our concluding sections on contributions and key findings within the NEXT-TELL project (chapter 9).

Chapter 9 will end with identified challenges and pitfalls that can occur when working in a research project with schools and recommendations for further training and dissemination of our methodologies.
2 Introduction

2.1 Purpose of this Document

The purpose of this final report on classroom research and pilot studies within the NEXT-TELL project is manifold:

This deliverable will

1) review initial objectives of the NEXT-TELL project,
2) formulate a theoretical basis that will be used as a classification frame for the pilot studies and developed methods,
3) report on studies that inform IT-based assessment for STEM and TESL subjects
4) discuss methods for integrating IT-based assessment activities with IT-based learning activities
5) report on pilot studies that have been going on and have not been reported yet in other WP6 deliverables,
6) highlight the key strengths and findings of NEXT-TELL by reviewing and referencing to former pilot studies,
7) provide lessons learnt on working with schools within NEXT-TELL,
8) generate recommendations for further training and dissemination of the methodologies.

2.2 Scope of this Document

The main information presented in this Document is about the pilot studies that were out taken in the NEXT-TELL project in the past four years (part of D6.7) including assessment methods development since September 2012 (part of D2.9).

This joint Deliverable will inform about initial goals NEXT-TELL had in terms of number of participants and conducted trials and will compare those to actual number of participants and conducted trials. Furthermore, this Deliverable provides the reader with key findings of the project and lessons learnt from our conducted pilot studies as well as recommendations for further training and disseminating NEXT-TELL methodologies.

2.3 Status of this Document

This is the final version of D6.7/D2.9.

2.4 Related Documents

Before reading this document it is recommended to be familiar with all former Deliverables of WP6 as well as D2.8.
3 Computational and Methodological Support

This chapter revisits the original goals and objectives for NEXT-TELL. We do so in order to provide a basis for the reader in terms of measurable outcomes that can be evaluated later in this deliverable.

3.1 The NEXT-TELL project

The NEXT-TELL project aims at providing computational and methodological support for teachers and students in order to make nuanced information about learning available when it is needed and in a format that supports the pedagogical decision-making in schools. Our main focus hereby was, to develop tools and software components that cover all stages of a formative e-assessment and thus optimize the level of stimulation, challenge, and feedback density. The way these tools and software components were developed was inspired by a design-research based approach, meaning that we directly wanted to involve teachers and students into the developmental process by testing our tools in school settings, receiving feedback by teachers and students and integrate this feedback into the further development of tools and methods in a recurring cycle.

We chose the design-research approach because it allows mutually reflective, incremental and empirically based development of theory and technology, as well as pedagogy. Our approach consisted of four different study types that built on each other. We conducted Baseline Studies (BS) in year 1 to describe current state of the art of ICT use in schools and teaching. Also in year 1, we planned Requirement Analyses (RA) in order to develop a first version of pedagogical tools and learning scenarios which were to be implemented in two rounds of Researcher-led Design Studies (RDS) (year 2). The last two years of NEXT-TELL aimed at conducting Teacher-led Design Studies (TDS) in which teachers were to investigate their students’ learning more closely. A goal of NEXT-TELL was to support teachers in gleaning information about their students’ learning processes. More specifically, the focus was on supporting teachers in handling information about student learning in real time, and support them in individualising and optimising the learning environment while the learning is ongoing. And as an extension of this, NEXT-TELL set out to approach the whole classroom as an ecology, rather than focusing a single piece of learning technology. That means that NEXT-TELL aimed at studying of how advanced learning technologies could be integrated into teacher practices, workflows and communications with students, other teachers and stakeholders such as parents.

3.2 NEXT-TELL objectives

To support the vision of the 21st century classroom as a technology- and data-rich environment where teachers are able to use the diverse information sources to support pedagogical decisions and in particular to carry out student learning-related diagnostic work, the main objectives of NEXT-TELL have been the following:

- **O1:** Articulate a conceptual framework for designing and implementing methods that can be used to appraise learning with modern learning technologies, and to negotiate the appraisal process amongst stakeholders.
- **O2:** Provide resources and IT support for teachers and students to develop learning activities and appraisal methods appropriate for 21st Century learning based on this conceptual framework.
- **O3:** Provide IT support in the classroom so that teachers and students have available nuanced information about students’ learning when it is needed and in a format that is supportive of decision-making, thus optimizing levels of stimulation, challenge, and feedback.
- **O4:** Provide IT support for making students’ activities in informal learning places - and in general in the “learning ecology” outside of school - part of “accountable work”, thus building on students’ interests, fostering their identity development and supporting their social networks.
O5: Foster in-service teachers' professional development by providing new methods and tools for learning from students' learning and for learning from peers' teaching.

O6: Increase a school's capacity for data-driven decision making by means of leadership development, including IT support for the strategic planning of teachers' professional development.

The overall objectives relate with varying degree to the different work packages. The objectives that apply to WP2 are O1 and O2. The ECAAD (Evidence-Centered Activity and Assessment Design) method pertains to planning lessons and assessments in a comprehensive way, and was intended to (1) support assessment design and to (2) answer the question of how to integrate ICT-based assessment activities with ICT-based learning activities into a learning sequence (learning design). These questions are addressed using a meta-modelling approach. The main outcomes of WP2 are the classroom studies that inform STEM and TESL assessment described in D2.8 and this deliverable, and the tools and methods developed in support of assessment such as ProNIFA’s SecondLife chat log analysis module, RGFA, Sonic Divider, 1x1 Ninja, myClass, and LIP, all reviewed in this deliverable.

The work carried out for work package 6 is about gathering of empirical evidence to inform the initial understanding of requirements in the design-based research-inspired development process, and in the following to inform the incremental refinement of both NEXT-TELL software and methods. As WP6 contributes with this to all other work packages, all of the above specified objectives pertain to it to a certain level.

A main outcome on WP6 level for all this objectives can be seen in the research conducted in schools that applied our framework (Cognitive Density and Classroom Orchestration as articulated in D6.4 [Cierniak, 2012] and further elaborated in a chapter of the NEXT-TELL book [Biel, forthcoming] – to be published in April 2015) and the developed tools and methods that was reported throughout the whole project duration.

We would furthermore like to stress that we focus in this joint Deliverable of WP2 and WP6 on the measurable outcomes that were achieved within the respective two work packages.

Initial to the project start, a set of performance indicators were specified in addition to the main objectives, pertaining to concrete goals for the research and methods development in terms of numbers of developed assessment methods and of trials, including number of schools and participants such as teachers, classes and students. The performance indicators are intended to quantify progress for NEXT-TELL. The actual indicators are partly chosen because they are easily identifiable, partly because they signal the kind of progress the NEXT-TELL project members find important, such as assessment methods developed, and number of participating schools.

The applying overall performance indicators for WP2 and WP6 that will be given attention to in this joint deliverable are the following:

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<tr>
<td>Number of trials</td>
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<tr>
<td>Involved schools</td>
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<tr>
<td>Participating teachers</td>
<td>60-80</td>
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<td>Participating classes</td>
<td>60-80</td>
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<td>Involved countries</td>
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Table 1. Overall performance indicators

These indicators are discussed in more detail in chapters 5 and 7.
4 Evaluation Methodologies and Frameworks

The chapter is dedicated to sketching the methodologies used for a critical retrospective classification, explanation, and analysis of developed tools/methods and conducted pilot studies as well as a basis for further training and dissemination recommendations in this joint deliverable of D2.9 and D6.7. The chosen methodologies are TPACK (by Mishra and Koehler [Mishra, 2006]) and the RAT framework (by Hughes [Hughes, 2005]). Both are frameworks that should be considered when using or introducing technology in teaching or planning technology use for teaching. They furthermore align well with both theoretical foundations of the NEXT-TELL project, and also highlight aspects about introducing Technology Enhanced Learning that have been important in the project work. The frameworks are used in this context as an overarching approach to evaluate our studies, and as such have not been involved in evaluating our empirical findings.

TPACK is chosen mainly as it is focused on teachers, a central addressee of the NEXT-TELL project, and furthermore that it entails paying close attention to their practices. The main strength of the TPACK model is its attention to the complex interplay between the pedagogical and technological aspects of teacher practices, also including content or subject matter issues. Furthermore, part of the NEXT-TELL project has been about developing new tools aimed at improving teaching and learning situations, and the tools developed are associated with specific pedagogical affordances, i.e. they support a particular teaching style or particularly organised way of carrying teaching. TPACK has additionally a history of being used as a tool for evaluating teacher skills. For example, in an extensive literature review aimed at finding the theoretical base and practical use of this model, Voogt et al. (2012) identified 55 different high quality peer-reviewed journal papers where it was used to for example study teacher beliefs and knowledge and ways of developing methods of measuring TPACK (Voogt, 2012). Finally, the model highlights technology as an integral part of teacher knowledge – along with the pedagogical and subject matter knowledge previously taken more for granted in the teacher profession.

The RAT framework also focuses on teachers and bears resemblance to the popular SAMR Model by Ruben Puentedura [Puentedura, 2014]. As we were not able to find a single publication or scientific article for the latter one, we decided to use the RAT framework.

RAT describes different levels of technology integration (Replacement, Amplification, Transformation) in instructional situations and is intended to be used by teachers as a kind of self-assessment instrument to reflect upon their technology use and integration by critically considering what a specific technology does to aspects of students learning, teachers instruction, or the curriculum goals [Hughes, 2006].

From a NEXT-TELL perspective, especially the third level of integration (transformation of learning) is interesting and in the literature already in 1985 recognized as the biggest potential for learning with technology [Pea, 1985]. Although we did not propose the RAT framework to our teachers for their self-assessment of technology integration, we would like to use the framework by swapping the focus to a meta perspective in order to make it usable to classify if our tools hold the potential in them to be used in a transformative way. Of course, almost every technology can be used transformatively but we believe that the design of a tool and affordances or prompts in a tool could lower the threshold and needed knowledge to use it in a transformative and also in a student-centred way. We would furthermore like to use both frameworks to strengthen our further training and dissemination recommendations.

4.1 Technological Pedagogical Content Knowledge (TPACK)

The Technological Pedagogical Content Knowledge model (TPACK) is a framework for understanding the complex, contextually bound and multi-faceted nature of teaching where digital technology is involved, geared towards integrating technology in education. Building partly on a temporally longitudinal design experiment [Brown, 1992; Collins, 1992] research process Mishra and Koehler [Mishra, 2006] expand Shulman’s [Shulman, 1986] concept of pedagogical content knowledge to include technology, and propose that this model is suitable for informing the integration of technology to teaching.

Shulman’s (1986) starting point was the dichotomisation or branching of teacher knowledge as either a matter of content or pedagogical knowledge, often evident in teacher education programs for example. Shulman’s
idea was that having knowledge of both pedagogy and the content or subject matter was important for teaching, yet insufficient in itself. His concept of pedagogical content knowledge (PCK) highlights how aspects of the content are organised and represented for instruction [Mishra, 2006]. According to Shulman (1986), PCK is where content and pedagogy overlaps. It contains “the most regularly taught topics in one’s subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations and demonstrations - in a word, the ways of representing and formulating the subject that makes it comprehensible to others” [Shulman, 1986, p. 9]. PCK is the knowledge about the content that is related to the teaching process, in terms of how to make it accessible to others, or transformation of a subject matter into form of communication with students. It can be seen as a special form of teachers’ professional knowing and understanding of a subject domain that is deeply rooted in teacher experience [Wasson, forthcoming].

Teaching thus involves transformation of content, as the teacher “interprets the subject matter, and finds different ways to represent it and make it accessible” [Mishra, 2006, p. 1021].

Mishra and Koehler (2006) argue that education has changed since Shulman developed his concept of PCK, with reference to the increase in availability of digital technology [Mishra, 2006]. While there is a long history of technology use in classrooms [Cuban, 1986], they refer to “digital computers and computer software, artefacts and mechanisms that are not yet part of the mainstream” [Mishra, 2006, p. 2023], and as such require work in terms of finding out how to put them to sound educational use. Mishra and Koehler highlight the potential for representation of content regarding digital technology. The transient and ever evolving nature of digital technology causes Mishra and Koehler (2006) to distinguish it as a separate skill set that needs to be learned, and together with content and pedagogical knowledge forms the basis of teaching. Additionally they argue that these three aspects are highly interlinked [Mishra, 2006]. This is modelled as follows:

![Figure 1. TPACK. Reproduced by permission of the publisher, © 2012 by tpack.org](image-url)
The model highlights the complex interplay between content, pedagogical and technological knowledge. These three kinds of knowledge and their intersections are summarised as:

- **Content knowledge**: knowledge about the subject matter that is to be taught.
- **Pedagogical knowledge**: knowledge about the processes and methods of teaching, including overall purposes, aims and values of education.
- **Pedagogical content knowledge**: knowledge of pedagogy that is applicable to teaching of specific content. Knowledge both of teaching approaches that are appropriate for the content, and how the content can be arranged for better teaching.
- **Technology knowledge**: knowledge or literacy of any technology applicable to teaching.
- **Technological content knowledge**: knowledge about the reciprocal relation between technology and content, including how use of technology can change the subject matter, and facilitate new forms of interactions with it.
- **Technological pedagogical knowledge**: knowledge of the existence, and capabilities of technologies used for teaching and learning, including how teaching may change as a course of using these technologies.
- **Technological pedagogical content knowledge**: an emergent form of knowledge that extends the previously described components of the model. It "represents a class of knowledge that is central to teachers’ work with technology. (...) not typically held by technology proficient subject matter experts, or by technologists who know little of the subject or of pedagogy, or by teachers who know little of that subject or about technology" [Mishra, 2006, p. 2029].

TPACK represents a kind of knowledge that teachers bring to play anytime they teach, one that arises from the interaction between the content, pedagogy and technology knowledge [Koehler, 2008]. The introduction of new technology disrupts their current understanding of not only the technology, but also requires revision of their understanding of content and pedagogy.

### 4.2 Replacement, Amplification, and Transformation (RAT framework)

The RAT framework was developed by Joan Hughes in 2005 and further elaborated in the following years. It is a framework that describes different levels of technology integration and aims at providing teachers with an evaluative framework for assessing their own achievements in that area in order to enhance their decision-making when it comes to technology integration. Teachers can use the framework to assess and reflect upon their technology use in order to achieve higher levels of integration. The framework systematically guides this assessment and reflection as it invites the teacher to carefully think about the potential effect of a specific technology to aspects of students’ learning, teachers’ instruction, or the curriculum goals [Hughes, 2005, 2006].

Hughes examined in a study the nature of teachers’ learning during technology professional development activities for specific content areas and concluded to what extent their technology-supported pedagogy was innovative [Hughes, 2005].

In general, Hughes conceptualizes “technology integration” as the use of technology by teachers that support constructivist and socio-constructivist pedagogy of subject area content. The integration occurs as teachers apply their knowledge in order to choose a particular technology that should support content learning [Hughes, 2013].

She identified that teachers with less professional knowledge and/or less intrinsic motivation for using technology need more guidance in implementing innovative technology use than more proficient teachers [Hughes, 2005], therefore it is reasonable to connect the frameworks of TPCK and RAT.

According to the framework, technology can be integrated to different extents into teaching processes (therefore support the pedagogical approach in different ways):

1) Technology as **Replacement**: Technology is used as a substitute for another analogue tool but does not provide any additional functionality.

2) Technology as **Amplification**: Technology is used as a substitute for another tool with additional functionality/effectiveness.
3) Technology as *Transformation*: Technology is used to allow the design of tasks that were not possible without the technology [Hughes, 2006].

These categorization levels were theoretically defined by leaning on former research, theories of technology in education, as well as own analysis of classroom observations and teacher interviews and can be applied to different dimensions of different themes (i.e. instructional method, students learning, curriculum goals) in instructional events [Hughes, 2006]. It is influenced by the work of Roy Pea in the 1980s who already stated that “[...] a primary role for computers is changing the tasks we do by reorganizing our mental functioning, not only by amplifying it” [Pea, 1985, p.168].

The first two categorization levels can be seen as technology integration that mainly aims at an *enhancement* of learning processes, whereas the last one aims at - as the name already implies - a *transformation* of learning processes which furthermore could activate or mean a change of pedagogical practice and potential for innovation [Hughes, 2005]. Tools integrated in a transformative way “[...] improve the process of bringing thought into communicable expressions in such significant ways that, once the tool is understood and used regularly, the user feels wanting if it is not available because it has opened up new possibilities of thought and action without which one comes to feel at a disadvantage. It becomes an indispensable instrument of mentality, and not merely a tool.” [Pea, 1985, p.175].
5 Formative Assessment Methods and Technology

This chapter is dedicated to represent the content of Deliverable D2.9.

5.1 NEXT-TELL studies that inform IT-based assessment for STEM and TESL subjects

This section of the text provides an account of the studies that have taken place to support development of IT-based assessment methodologies within the area of Science, Technology, English and Mathematics (STEM), and Teaching English as Second Language (TESL) since the previously published report on classroom studies in STEM and TESL (i.e. D2.8). The studies are presented as composite bullet lists, as they have been thoroughly presented in previously submitted deliverables. The deliverable where the study has been presented is indicated in the title for each study. The bullet lists include background and context for the study, including which NEXT-TELL tools were being used, research aims and methods for the study and a list of the most important results and main findings. Before starting with the review, we will provide an overview of the studies that will be investigated here:

<table>
<thead>
<tr>
<th>Study name</th>
<th>NT tool/method used</th>
<th>Initially reported in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaining e-Assessment tools to Detect and Resolve Students’ misconceptions</td>
<td>RGFA, OLMlets, OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>Mathematics with Classroom Network Technology</td>
<td>ECAAD Planner (retrospectively by researchers)</td>
<td>D6.4</td>
</tr>
<tr>
<td>Supporting problem-based learning through e-Assessment</td>
<td>Google Spreadsheets, OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>Critical Questioning and Thinking: The 6 Thinking Hats Method Adopted in Science Teaching</td>
<td>Moodle, Mahara, OLM</td>
<td>D6.5, D6.6</td>
</tr>
<tr>
<td>Orchestrating and Assessing Second Language Learning in OpenSIM</td>
<td>OpenSim/Chatterdale, ProNIFA, Teacher Control Center, OLM</td>
<td>D6.4</td>
</tr>
<tr>
<td>First Steps Towards TISL in Norway</td>
<td>n/a</td>
<td>D6.4</td>
</tr>
<tr>
<td>Developing a tool for the TISL Heart Method and its model</td>
<td>n/a</td>
<td>D5.6</td>
</tr>
</tbody>
</table>

Table 2. Overview on studies for assessment methods development

5.1.1 Chaining e-Assessment tools to Detect and Resolve Students’ misconceptions (see D6.5)

Background/NT tools and methods:
- This research in Norway was based on former work in project year 2, where teachers experienced in assessment for learning had set up a science unit on Energy for the Future, but only with limited use of technology.
- RGFA, OLMlets, OLM
Aims:

- To conduct a teacher-driven study (TDS) with NT-tools
- To increase the use of NEXT-TELL e-Assessment technology within this unit
- Find effect on motivation for students
- Find effect on students’ overview of own competencies

Methods/data:

- 50 students, two teachers
- field notes, observations, pictures, interviews
- assessment results
- questionnaire about the OLM for teachers and students
- teachers-tool-reflecting-tasks

Results/ main findings:

- The teachers found it problematic to put the competencies as listed into OLM. The reason for this is because the competencies listed are really combination of activities and knowledge building: carry out experiments and explain, describe or elaborate principles and functions. This understanding of competencies as a combination of skills and knowledge, and also attitudes is not unusual. Still, the teachers became confused as to whether to place the skills, described as an activity (in the curricula), as: 1. a competence or, 2. an activity. The teachers are used to think about competence, but not necessary dividing them into skills or knowledge. What turns out even more difficult for them is the notion of activity being separated from competence, since doing something is also a competence. Furthermore, one researcher opened a discussion as to whether the skills should be divorced from the content (e.g., have the competence “explain” and not “explain sun traps”, and rather have “sun traps” as a sub-competence). This was too much for the teachers at this point (although it came up again when the competencies collaboration).

- Taking a course (e.g., the dog course) in order to let the students understand the concept, before the course on Solar cells, solar traps and heat pumps was very important. Carrying out this course first made the students able to concentrate on the unit course (OLMlets), and learn and reflect on the theme, rather than having to solve user issues such as understanding what to do next and how to “read” the tool.

- Although it might have been difficult to select an element that was different, and to give a reason why the two remaining elements were like, the students managed to do this. What they found more difficult, however, was ranking the other elements against the “different” or “alike” reasons. The main problem was in understanding how to rank elements that do not seem to have anything to do with either the “different” or “alike” reasons. One of the questions from the students was “how do I rank elements that don’t fit into my reasoning?” This element could be ranked “3” as it is equally between the “different” explanation and the “like” explanation, however, this is not obvious. Eventually the teachers explained this to the students, but they still found it difficult.

5.1.2 Mathematics with Classroom Network Technology (see D6.4)

Background/NT tools and methods used:

- Researcher-led study with classroom observation in TI Navigator connected classrooms in the Netherlands
- system in use was new to teachers (experience about 5 months)
- ECAAD planner (post-hoc by researchers)
Aims:

- analysing how formative assessment looks like in the technology-rich mathematics classroom
- developing routines with regard to formative assessment
- developing ideas how to connect NEXT-TELL’s OLM to the network system in use

Methods/data:

- 3 STEM teachers (Mathematics), 5 classes, 48 students in secondary school offering European Baccalaureate
- data were collected during 3 face-to-face (audio tapes of interviews and reflection talks), field notes in 5 classroom observations, and several technology mediated communication (email, skype meetings)
- field notes were “translated” into models in ECAAD (by the researchers)
- field notes were furthermore analysed and reflected upon using Korthagens ALACT model [Korthagen, 1999]

Results/main findings:

- the usage of the same technology can be manifold depending on the teacher and just having a digital opportunity for formative assessment students with this technology does not necessarily mean that it is used by teachers
- based on the usage of the TI Navigator system (in particular with the poll functionality), a routine was developed in the ECAAD planner v1.0 to assess and possibly change misconceptions as a suggested orchestration pattern with regard to the TI-system (Figure 2 and 3 – for details please look at D6.4, p.39f.)
Figure 2. Suggested orchestration pattern for dealing with misconceptions in TI Navigator classrooms
5.1.3 Supporting problem-based learning through e-Assessment (see D6.5)

Background/NT tools and methods used:

- Two Ministry of Education-selected “Future Schools” that participate in projects exploring innovation of ICT use in school. This first one is Juron Secondary School (JSS), a public school.
- One class of 30 upper secondary students and their teacher
- Exploration of instructional method: Problem-based learning (PBL), in particular to increase question development in biology
- Google Spreadsheet for storing problem analyses
- OLM for self- and peer assessment of question generation competences
- Study outcomes were presented at the ICTLT 2014 conference in Singapore

Aims:

- Teacher wants to explore if students’ question generation competences can be enhanced in the context of other competences required for PBL.
Methods/data:

- Teacher-led design study
- The main intervention was a check-list for self/group-reflection on question quality.
- Teachers’ observations on students’ performance and achievements

This image shows where in the PBL cycle the intervention was targeted:

![Intervention cycle diagram](Image)

**Figure 4. Intervention cycle**

Main results/findings:

With respect to the question generation aspect, the main finding was that while the quantity of question was reduced, the question quality increased after the intervention:

![Quality and Quantity of questions before and after intervention](Image)

**Figure 5. Quality and Quantity of questions before and after intervention**
The OLM was used regularly, but in itself not the subject of research. Here is an example for its use in this study:

![An example of a Radar Plot](image)

**Figure 6. Example of OLM use**

5.1.4 Critical Questioning and Thinking: The 6 Thinking Hats Method Adopted in Science Teaching (see D6.5/D6.6)

**Background/NT tools and methods used:**

- Two teachers at Hwa Chong Institute (HCI), and their students
- Multi-week science project involving on-line work, classroom activities and laboratory experiments
- Moodle, Mahara and OLM
- Students work in science lab, both individually and in groups. Questions and answers are posted to Moodle Forum. Artefacts from their work are kept in an e-portfolio in Mahara. These are linked to competencies in OLM.
- Study outcomes were presented at the ICTLT 2014 conference in Singapore

**Aims:**

- The study is aimed at investigating the application of De Bono’s framework for creative thinking to problem-based learning pedagogy, which supports HCI’s approach to science education [de Bono, 1985].
- Investigate the role of questioning in science projects.
- Investigate how learning with “thinking hats” (generating questions from different perspectives) promotes questioning and thinking in science projects.

**Methods/data:**

- Teacher-led design studies
Teachers’ observations on students’ performance and achievement

Main results/findings:

The main finding was that the quality of questions and the number of questions increased from pre- to post-test. With respect to the use of the OLM, the main findings are summarised here:

Figure 7. Overview of data gathered

Figure 8. Findings on Visualisation models
Figure 9. View on an individual student account

Figure 10. Example of conclusions from teachers' OLM analysis

This radar plot tells the teacher that the students have over assessed themselves. Perhaps an intervention will be to follow up with respective students to help them better understand their needs as individuals and as a group, and can therefore enable teachers to adapt their teaching.
5.1.5 Orchestrating and Assessing Second Language Learning in OpenSIM (see D6.4)

Background/NT tools and methods used:
- OpenSim/Chatterdale
- ProNIFA(cbKST)/TCC (teacher control center)
- OLM

Aims:
- Developing a method for automated assessment and reflection in virtual environments
- Make virtual environments more usable for everyday classroom situations

Methods/data:
- Several trials with various schools and pedagogical settings

Main results/findings:
General method for automated assessment and reflection in virtual world’s teaching contexts:
1) Select competencies from relevant curricula (see figure 11, column 1: “curriculums aims”)
2) Think about how to design tasks in a way that those competencies are shown by participating avatars (students) (see figure 11, column 2: “assessment measures”)
3) Define rules for ProNIFA: how does a certain evidence change our belief into a student’s competencies
4) Think about how to observe and track those manifestations of competencies e.g. via logfiles or non-playing characters (see figure 11, column 3: “evidence provided by”)
5) Transfer collected evidence to ProNIFA and let ProNIFA update competencies
6) Transfer updated competencies to the OLM
7) Reflect on student’s learning by exploring the data in the OLM (after class)
5.1.6 First Steps Towards TISL in Norway (see D6.4)

**Background/NT tools and methods used:**
- Researcher-led study
- TISL - first model (D5.1)

**Aims:**
- Analysing how teachers investigate student learning in order to develop and change their teaching
- Developing ideas on how to implement the TISL method (see D5.1) at a Norwegian school

**Methods/data:**
- 10 teachers, 6 STEM teachers and 4 English teachers from an Upper Secondary school
- Focus group discussion

**Results/main findings:**
- Teachers collect, save, and use student data for professional development
- Teacher lack tools to collect and use student data with a unified and harmonised way
- Teachers collect and save student data, but not in a unified and harmonised approach.
- Findings resulted in 3 models on how teachers collect, document, analyse, and share data on student learning for professional development

---

**Figure 11. From competencies to evidence**

<table>
<thead>
<tr>
<th>curriculum aims / CEFR / 21st Century Skills</th>
<th>assessment measurement</th>
<th>evidence provided by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student understands the assignment (reading D1 CEFR)</td>
<td>Students start looking for the right place / person (time for start moving / arriving)</td>
<td>automated locator/greater script (triggered when entering target area)</td>
</tr>
<tr>
<td>Main point was identified and addressed in conversation with NPCs (NPC feedback)</td>
<td>NPC’s feedback dialog prompted when student leaves</td>
<td></td>
</tr>
<tr>
<td><strong>Approach and Ask NPCs for help (speaking A1 or more CEFR/F116!!!)</strong></td>
<td>Is student approaching NPCs and talk to them? (Location sensor A after B)</td>
<td>automated locator/greater script, chat time statistics</td>
</tr>
<tr>
<td>Who is talking how much? (timing)</td>
<td>chat time statistics</td>
<td></td>
</tr>
<tr>
<td><strong>Level of language used?</strong></td>
<td>NPC’s feedback dialog prompted when student leaves</td>
<td></td>
</tr>
<tr>
<td><strong>Which vocabulary was used? (Chatlog analysis; ask NPC’s to key in important vocabulary)</strong></td>
<td>chat log/recording analysis</td>
<td></td>
</tr>
<tr>
<td><strong>Approach and Ask NPCs for help (speaking A1 or more CEFR/F116!!!)</strong></td>
<td>Logged gestures triggered by NPC (e.g. via additional text/chat)</td>
<td>n/a currently</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td><strong>Assess the speaking? (Audio recording, teacher assessment &amp; feedback)</strong></td>
<td>recording, to be analyzed/tagged in EVA tool or Soundcloud</td>
</tr>
<tr>
<td><strong>Understand the content of the clue/aftefact (reading B1 CEFR/F109)</strong></td>
<td>Did the student react/answer to the said appropriately? (NPC feedback)</td>
<td>NPC’s feedback dialog prompted when student leaves</td>
</tr>
<tr>
<td></td>
<td>Did the student move to the right place given the directions by NPC (location sensor X + Y, timing)</td>
<td>automated locator/greater script (triggered when entering target area)</td>
</tr>
</tbody>
</table>
5.1.7 Developing a tool for the TISL Heart Method and its model (see D5.6)

Background/NT tools and methods used:
- Teacher-led study
- Observe teacher’s use of the TISL Heart method and mode (no NEXT-TELL tool was used)

Aims:
- To investigate how teachers understood and used the TISL Heart method and model.
- To identify the requirements for a tool that would scaffold the TISL Heart method.

Methods/data:
- 4 groups: 1. Two female teachers (STEM), 2. One male teacher (STEM), 3. Two female teachers (Language: Hearing impaired teachers) Group, 4. One male, and one female teacher (Language: French and Spanish)
- Video recording, Audio recording of group discussions, Observation notes, Post-it notes written by the teacher, Pictures of the posters with post-it notes

Results/main findings:
- In relation to the method, understanding step 2 in the method, assumptions, seemed to be difficult. The teachers’ assumptions tended not to be assumptions, but rather questions or tasks for a method – even before they had formed a clear research question.
- The workshop identified a number of goals for the TISL Heart tool. The tool should:
  - Scaffold the teacher to develop their awareness of the different steps involved
  - Support the planning of the TISL Heart method steps
  - Support the execution of the planned TISL Heart method steps
  - Support the recording and organisation of the data collected during the execution
  - Support the analysis of the data collected
- Furthermore, our specific suggestions for the TISL heart tool are as follows:
  - The TISL Heart model should be visible when entering the tool.
  - The TISL Heart steps should be visualised by different colours (since there are seven steps in the method, we suggest the colours of the rainbow)
  - The tool should be easy to use (e.g., as social media) and entries should be easily manipulated.
  - The tool should be available for tablets, with touch screen manipulations.

5.2 Review of tools and methods for integrating IT-based assessment activities with IT-based learning activities

The performance indicators provided in the Description of Work (Annex I, section B1.2.4) set a target for twelve STEM and TESL assessment methods modelled by the end of the project year four (see Table 1 in chapter 3). Adding up the numbers with respect to this, eleven or twelve methods can be identified depending on how the counting is done - Google Spreadsheet is not a tool particular to NEXT-TELL, but has been adapted to fit with NEXT-TELL assessment methods and scenarios. This can also be said for OpenSim, but this has also been used in several NEXT-TELL scenarios such as the Granny Quest described in D2.6, and is part of several NEXT-TELL software solutions.

The first deliverable within this work package describing the tools developed, D2.2, accounts for three tools; ECAAD Designer and ECAAD Planner. ECAAD Designer is for supporting teachers in designing formative
assessments, while Planner is for planning learning activity sequences. A TESL scenario with Google Spreadsheet is provided, and

Deliverable 2.4 describes the tools Sonic Divider, and the ProNIFA modules for SecondLife and CLIL. Sonic Divider is a division-practicing tool for the primary school level, which includes a formative, competence feedback mechanism on student performance. ProNIFA, an acronym for Probabilistic non-invasive formative assessment, is a tool for supporting teachers in the evaluation process. Using performance data (student test scores for example), ProNIFA updates the probability of predefined competencies, thus enabling teachers to carry out semi-automated assessments. The SecondLife module enables analysis of chat log modules in the virtual world of SecondLife, including for example number of text items and frequencies of activity. The CLIL module allows analysis of standardised language test results. Additionally, a pixel cloud visualisation tool for ProNIFA output and an Excel spreadsheets-based tool for organising competencies in dependencies.

In D2.5 MyClass is presented. MyClass is a browser-based tool for tracking student activities, to be used on tablets or smartphones (it also works on PCs). It allows teachers to keep a diary of student activity, which can serve as an information source for ProNIFA, track activities on the go, adjust a table of student competencies and to create visualisations of the information. It is designed with speed of interaction in mind, with an interface supported by screen touch, to serve the purpose of real-time use in class by a teacher.

The final deliverable describing the finalised software development process for ECAAD-related tools (D2.6) presents two new tools: LIP (Learning Is Personal) and 1*1 Ninja. 1*1 Ninja is an online multiplication trainer for primary school students. A teacher can adjust the scoring system and difficulty levels. A teacher can also choose between different feedback modes presented to students, with combinations of visual and audio feedback on correct/incorrect, and no feedback. Data on individual student performance is also available to the teacher, organised around number of played sessions, percentage of correct answers, total time played and percentage of correct answers tied to multiplicand and multiplier. LIP is a tool for collecting real-time performance data and support for teachers whilst in class. It collects information about students and groups of students, competencies, materials used in class linked to competencies, tasks linked to competencies and observations made on the spot by the teacher. A teacher can log details daily, including for example which student did which activity with whom, tied to which material, task and organisational context. LIP can then present the outcome as graphical models, for example about connections between students, activity related to time and social interaction related to subject.

The development of ECAAD tools are summed up in the table below, including tool name and the deliverable where the first development cycle of the tool is first described:

<table>
<thead>
<tr>
<th>Assessment tool</th>
<th>First described in</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECAAD Planner</td>
<td>D2.2</td>
</tr>
<tr>
<td>ECAAD Designer</td>
<td>D2.2</td>
</tr>
<tr>
<td>OpenSIM</td>
<td>D2.2</td>
</tr>
<tr>
<td>Google Spreadsheet</td>
<td>D2.2</td>
</tr>
<tr>
<td>Sonic Divider</td>
<td>D2.4</td>
</tr>
<tr>
<td>ProNIFA SecondLife Module</td>
<td>D2.4</td>
</tr>
<tr>
<td>ProNIFA CLIL Module</td>
<td>D2.4</td>
</tr>
<tr>
<td>Pixel cloud</td>
<td>D2.4</td>
</tr>
<tr>
<td>Excel Reader</td>
<td>D2.4</td>
</tr>
<tr>
<td>myClass</td>
<td>D2.5</td>
</tr>
<tr>
<td>1x1 Ninja</td>
<td>D2.6</td>
</tr>
<tr>
<td>LIP</td>
<td>D2.6</td>
</tr>
</tbody>
</table>

Table 3. ECAAD tools
The classroom studies carried out in support of WP2 are summed up in Table 4 below.

<table>
<thead>
<tr>
<th>Study name</th>
<th>NT tool/method used</th>
<th>Initially reported in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatterdale Mystery scenario</td>
<td>OpenSim, Chatterdale, ProNIFA</td>
<td>D2.8, D6.3</td>
</tr>
<tr>
<td>Web TV scenario</td>
<td>OpenSim, Chatterdale, ProNIFA</td>
<td>D2.8, D6.4</td>
</tr>
<tr>
<td>RGFA at Rynkevagn upper secondary school</td>
<td>RGFA</td>
<td>D2.8, D4.2</td>
</tr>
<tr>
<td>Energy for the Future</td>
<td>ECAAD Planner, (OLM retrospectively)</td>
<td>D2.8</td>
</tr>
<tr>
<td>Ethnographic overview of assessment methods in use</td>
<td>n/a</td>
<td>D2.8</td>
</tr>
<tr>
<td>Chaining e-Assessment tools to Detect and Resolve Students’ misconceptions</td>
<td>RGFA, OLMlets, OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>Mathematics with Classroom Network Technology (see D6.4)</td>
<td>ECAAD Planner (retrospectively by researchers)</td>
<td>D6.4</td>
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<td>D6.5, D6.6</td>
</tr>
<tr>
<td>Orchestrating and Assessing Second Language Learning in OpenSIM</td>
<td>OpenSim/Chatterdale, ProNIFA, Teacher Control Center, OLM</td>
<td>D6.4</td>
</tr>
<tr>
<td>First Steps Towards TISL in Norway</td>
<td>n/a</td>
<td>D6.4</td>
</tr>
<tr>
<td>Developing a tool for the TISL Heart Method and its model</td>
<td>n/a</td>
<td>D5.6</td>
</tr>
</tbody>
</table>

Table 4. Classroom studies that supported Assessment methods development
6 Report on Recent Work with Schools

In this section we will give insights into the recent work that was undertaken in schools and has not been reported in any other deliverable before. In order to provide an overview, we will present a table in which we sketch the recent work with schools.

<table>
<thead>
<tr>
<th>Country</th>
<th>Study name</th>
<th>NT tool/ method used</th>
<th>Study format</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Evaluation of visualisations used in the Open Learner Model</td>
<td>n/a</td>
<td>Questionnaire survey</td>
<td>21 teachers</td>
</tr>
<tr>
<td>Austria</td>
<td>Applying myClass in the classroom</td>
<td>myClass</td>
<td>Focus Group discussion in training workshop</td>
<td>20 teachers</td>
</tr>
<tr>
<td>England</td>
<td>Inquiry into a broader range of contexts</td>
<td>TISL</td>
<td>Teacher inquiry</td>
<td>Several teachers</td>
</tr>
<tr>
<td>Germany</td>
<td>Supporting a school in becoming a community school</td>
<td>myClass, OLM</td>
<td>Semi-structured interview, informal talks, training workshops</td>
<td>22 teachers</td>
</tr>
<tr>
<td>Germany</td>
<td>Using Repertory Grid for getting insights into students’ understanding of technical terms in Economy</td>
<td>RGFA</td>
<td>Written reflection by teacher, informal talks</td>
<td>1 teacher 22 students</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Teacher-led studies into the nextTALK method - Peer-facilitated participatory decision making</td>
<td>nextTALK</td>
<td>Audio recordings of students’ communication, informal talks</td>
<td>3 teachers several students</td>
</tr>
<tr>
<td>Norway</td>
<td>Teachers (almost) on their own when using the Open Learner Model</td>
<td>OLM</td>
<td>Meeting notes, email exchange, informal talks</td>
<td>1 teacher</td>
</tr>
</tbody>
</table>

Table 5. Overview on recent work with schools

6.1 Austria: Evaluation of visualisations used in the Open Learner Model

6.1.1 Introduction

Visualisations presented in the context of NEXT-TELLs Open Learner Model aims at bringing benefits not only for students but also for teachers. Especially teachers are provided with different and detailed visualisations allowing them to get an overview of the learning progress of a whole class, a group of learners, or individual learners. The expected benefit is an empowerment of teaching by – for instance – i) allowing teachers to individually adapt their teaching to the individual needs of a student [Kay, 1995; Bull, 1997]; ii) supporting teachers in providing personalized guidance and instructions [Papanikolaou, 2008; Bull, 2007a]; iii) supporting teachers in better understand students’ needs and thus to help students with particular problems [Bull, 2002; Mazza, 2007; Bull, 2007b]; and iv) controlling the learning progress of the whole class [Mazza, 2007].

The main aim of the questionnaire-based evaluation study presented in this section is to investigate the usefulness and efficacy of six different visualisation ideas that are used in NEXT-TELLs Open Learner Model. The main purpose of these visualisations is to support teachers in their teaching by providing a quick and understandable overview on the current status of learning. The overall question being answered by this study
is whether these six visualisations serve their intended purpose to suitable visualise learner data. The following sections outlines the method and the results of this questionnaire-based evaluation study.

6.1.2 Method

Participants

In total 21 teachers (12 female, 9 male) have completed the survey. Participants were recruited by email that was sent out to a list of over 100 European schools at the beginning of July and at the start of the new school year in September. Respondents were on average 47 years old (M = 46.81, SD = 11.01), with a range from 27 to 63 years. Their average teaching experience was 21 years (SD = 11.93) ranging from 3 to 41 years. The participating educators principally cover all age groups of children ranging from age level 10 to 14 (11 teachers) and 15 to 18 (9 teachers).

Materials

Visualisations

The questionnaire contained a selection of visualisations showing learners’ current state of understanding and competencies either on group or on individual level. Five different visualisations have been addressed on a group level (see Figure 12). These visualisations allow for comparing a group of students against each other in terms of one competency.

![Group level visualisations](image)

**Figure 12. Group level visualisations:** A) Skill Meter Visualisation, B) Table Visualisation, C) Smiley Faces Visualisation, D) Radar Plot Visualisation, and E) Histogram

On an individual level by showing the competencies’ level of achievement for one individual student, six different visualisations have been presented (see Figure 13).
Overall, visualisations referring to both groups and individuals can be categorized into the following six types of visualisations:

1) **Skill Meter Visualisation**: Skill meters show the level of competency. Blue is inferred to be level of confirmed competency or understanding, whilst grey indicates lack of competency or understanding.

2) **Table Visualisation**: The table representation shows student understanding or competency on a 5-point scale of “very weak” to “very strong”. A circle is placed in the category in which the data item falls.

3) **Smiley Faces Visualisation**: The Smiley Faces representation shows student competency using an emotion-based metaphor; the larger the smile, the stronger the understanding, the sadder the face, the weaker the understanding. The 5-point scale used is the same as the table visualisation (see above section).

4) **Radar Plot Visualisation**: The Radar Plot shows competency broken down by each information source (teacher and student) as a different colour. Each item to be represented is an axis. The further away from the centre the plotted points are, the stronger the competency. The number of axis is dependent on the number of items to be represented. Competency is shown in blue for teacher assessments and orange for student self-assessments.

5) **Histogram Visualisation**: The histogram visualisation gives an overall shape to the distribution of information. The horizontal placing of an item shows the strength of understanding or competency. The left hand side of the scale is weak and the right hand side of the scale is strong. The vertical placement of items does not represent anything.

6) **Hasse Diagram**: An Hasse Diagram allows for displaying what a learner can do or knows at the moment on the one hand. On the other, it indicates what competency can or should reasonably
taught to a specific learner as a next step. Thus, it can be seen as a clear recommendation about future teaching on an individual basis. That’s because, this type of visualisation is only displayed in terms of individual student’s visualisations.

Questionnaire
A survey was created consisting of three parts – demographic questionnaire, questionnaire for assessment of group level visualization, and questionnaire for assessment of individual level visualization. The whole questionnaire was implemented and administered as an online survey using the LimeSurvey tool. There are two versions available, one German (http://css-kmi.tugraz.at/limesurvey/index.php?sid=14325&lang=de) and one English version (http://css-kmi.tugraz.at/limesurvey/index.php?sid=18868&lang=en). The English version can also be found in the Appendix.

To gather information about relevant user variables, a short demographic questionnaire had to be filled out by the participants. This background questionnaire included only questions on gender, age, teaching experience, and age level of students.

The questionnaire related to group level as well as individual level visualizations contained the same questions referring to the following three main parts usability, comprehension, and preference.

Usability of the different visualisation types was assessed with two items, i.e. statements that had to be answered on a five-point rating scale with the end poles strongly disagree (=1) and strongly agree (=5).

<table>
<thead>
<tr>
<th></th>
<th>group level visualisation</th>
<th>individual level visualisation</th>
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<tbody>
<tr>
<td><strong>Usability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– I find this figure suitable for getting an overview of the current status in the learning process.</td>
<td>– I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.</td>
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</table>

Table 6. Items for usability assessment of visualisations

To assess teachers’ comprehension of the visualization, statements were displayed one at a time below the visualization and the task was to decide whether the statement was true or false based on the information in the visualization (see for an example the following Figure 14). In order to reduce the workload of the participants, these statements were only displayed for group level visualisations.

Figure 14. Screenshot of one comprehension item

Boris Bann is better than Callum Campbell and Florian Fink.
After answering questions on the aspects usability and comprehension, participants were asked to indicate which of the visualisations they mostly prefer in terms of comprehensibility, usefulness, and amount of information. In an open comments box, participants additionally had the opportunity to provide any other kind of remarks and feedback.

Procedure

The first request to participate to this on-going questionnaire-study was sent out by email to a list of over 100 European schools at the beginning of July. Because most of the schools were on summer break, a second request was send out at the start of the new school year in September.

The online survey presented to participants consisted mainly of three parts: part 1) the background questionnaire, followed by part 2) a questionnaire for assessment of group level visualization, and part 3) questionnaire for assessment of individual level visualization.

The procedure was as follows:

a) After giving a short introduction to the goal of the user survey, at first, the background questionnaire had to be filled out.

b) Participants were then presented with the first visualisation to be evaluated accompanied with a short explanation of the purpose of the visualisation.

c) Participants were requested by having a closer look at the visualisation to subsequently answering questions related to the aspects usability and comprehension (only for part 2).

d) For the different visualisations to be evaluated, steps b) and c) were repeated for each visualisation. Subsequent to evaluate one visualisation, the next visualisation together with the questions was provided and answered by the participants, and so forth.

e) After providing all visualisations, i.e. after part 2 and part 3, participants were presented with a screenshot including all visualisation types of the respective part, with the request to indicate their preference in terms of comprehension, usefulness, and amount of information.

6.1.3 Results

The following section presents mainly quantitative results of six different types of visualisations based on two different information sources: group/students and competencies on an individual level. Visualisations were assessed by in total 21 (group level visualisations) respectively 20 teachers (individual level visualisations). For the scores calculated from the questionnaires the possible score range for each subscale is 1-5, with higher values indicating a better result (note: this also holds for the subscale ‘cognitive load’). Values above the middle of the scale are suggested as a good evaluation result (with higher values indicating a better result) and values in the lower half of the scale are seen as an indicator for a low quality of visualisation.

Group level visualisations

The aspect usability was assessed by the following two items: A: I find this figure suitable for getting an overview of the current status in the learning process and B: I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils. The detailed results are depicted in Figure 15 and Table 7.

When presenting participants the item ‘I find this figure suitable for getting an overview of the current status in the learning process’, mean scores between 1.67 and 3.10 could be identified. The best result was obtained for the Table Visualisation with $M=3.10$ $(SD=1.09)$, followed by $M=2.30$ $(SD=1.13)$ for the Histogram Visualization. The lowest score was reached by the Smiley Faces Visualisation with $M=1.67$ $(SD=1.07)$. 
Figure 15. Overview of results (mean scores) for the different group level visualisation types on item A) I find this figure suitable for getting an overview of the current status in the learning process and item B) I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

For the item ‘I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils’ rather low mean values could be identified ranging from 1.24 to 1.07. The best result was found for the Histogram Visualisation (M=1.70; SD=0.87), followed by the Table Visualisation (M=1.62; SD=0.87) and the Radar Plot Visualisation (M=1.43; SD=0.81). The lowest result was obtained for the Smiley Faces Visualisation with M=1.24; SD= 0.44.

<table>
<thead>
<tr>
<th>Visualisations</th>
<th>A</th>
<th>B</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Skill Meter</td>
<td>21</td>
<td>2.29 (1.35)</td>
</tr>
<tr>
<td>Table</td>
<td>21</td>
<td>3.10 (1.09)</td>
</tr>
<tr>
<td>Smiley Faces</td>
<td>21</td>
<td>1.67 (1.07)</td>
</tr>
<tr>
<td>Radar Plot</td>
<td>21</td>
<td>2.19 (1.29)</td>
</tr>
<tr>
<td>Histogram</td>
<td>20</td>
<td>2.30 (1.13)</td>
</tr>
</tbody>
</table>

Table 7. Results for the different group level visualisation types on item A) I find this figure suitable for getting an overview of the current status in the learning process and item B) I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Assessment of preferences

When explicitly asking teachers which of the visualisations presented to them they would prefer in terms of comprehensibility, the most frequently mentioned visualisation type is the Table Visualisation (12 out of 20 persons). The same result could be obtained for perceived usefulness where teachers also prefer the Table visualisation (7 out of 19 persons). In terms of amount of visualisation, no definite result could be found – 5 out of 20 persons do not know which type of visualisation they prefer, 5 other persons prefer the Skill Meter Visualisation, and other 5 persons the Radar Plot Visualisation. The detailed answer frequencies for each aspect are illustrated in Figure 16.
Teachers’ comprehension of the different visualisation types

All true-false statements were correctly answered by all teachers that indicates that all teachers participated in this study understand and comprehend the displayed visualisations.

![Preferences](image)

**Figure 16. Overview of the answers frequencies on comprehensibility, usefulness, and amount of information.**

Individual level visualisations

**Assessment of Usability**

For the first item ‘I find this figure suitable for getting an overview of the current status in the learning process’ medium results ranging from 1.90 to 3.25 could be identified for all visualisation types. For the Table Visualization the best result could be obtained with a mean score of 3.25 (SD=1.25). The lowest mean scores resulted for the Hasse Diagram Visualisations with M=1.90 (SD=1.55) and the Histogram Visualisation with M=2.00 (SD=1.03). An overview of all mean scores for all visualisation types is given in Figure 17 and Table 8.

For the second item ‘I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils’ referring to the usability aspect somewhat lower results could be found. The mean scores for this item range between 1.65 (SD=0.88) for the Hasse Diagram Visualisation and 3.10 (SD=1.33) for the Table Visualisation.
Figure 17. Overview of results (mean scores) for the different individual level visualisation types on item A) I find this figure suitable for getting an overview of the current status in the learning process and item B) I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

<table>
<thead>
<tr>
<th>Visualisations</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Skill Meter</td>
<td>20</td>
<td>3.15 (1.42)</td>
</tr>
<tr>
<td>Table</td>
<td>20</td>
<td>3.25 (1.25)</td>
</tr>
<tr>
<td>Smiley Faces</td>
<td>20</td>
<td>2.25 (1.16)</td>
</tr>
<tr>
<td>Radar Plot</td>
<td>20</td>
<td>3.10 (1.37)</td>
</tr>
<tr>
<td>Histogram</td>
<td>20</td>
<td>2.00 (1.03)</td>
</tr>
<tr>
<td>Hasse Diagram</td>
<td>20</td>
<td>1.90 (1.55)</td>
</tr>
</tbody>
</table>

Table 8. Results for the different individual level visualisation types on item A) I find this figure suitable for getting an overview of the current status in the learning process and item B) I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Assessment of preferences

At the end of this part of the questionnaire, teachers were asked to indicate their preferences in terms of comprehensibility, usefulness, and amount of information. A detailed overview of the results is given in Figure 18. With regard to the aspect Comprehensibility, 10 out of 20 teachers mentioned the Table Visualisation as the most useful visualisation for getting an overview of the current status in the learning process, the Radar Plot Visualisation as well as the Skill Meter Visualisation was stated by 3 out of 20 teachers each. 4 teachers gave no answer on this category. In terms of amount of information, 12 (out of 20) teachers prefer the Radar Plot Visualisation, as well.
6.1.4 Summary

Recent literature postulates that visualisations provided to the educational context bring benefits for both students and teachers [e.g., Kay, 1995; Zapata-Rivera, 2001; Bull, 1997; Mazza, 2007]. The current on-going questionnaire based study sought to answer the question of which kind of visualisation type teachers prefer to present simple open learner model information and how useful and appropriate they find different visualisation types. Thus, in sum 6 different visualisation types were presented to the teacher varied in two different ways: modelled for groups (group level visualisations) and modelled for individuals (individual level visualisation).

Looking at the results for group level visualisations, it became clear that the Table visualisation has been assessed as the most appropriate. Teachers find this visualisation type useful for getting an overview of the status in the learning process for the whole class. However, when looking at the open comments given by teachers, it became clear that they miss the support in a better understanding and identification of students’ needs, their strengths and weaknesses. Especially with regard to both providing better instruction and guidance and the evaluation of the available educational context they find the presented visualisations too simple. For controlling the overall progress of the class during the learning process, teachers find the group level visualisations appropriate.

Concerning individual level visualisations better results could be obtained which indicates that teachers find the different visualisation types presented to them (i.e. skill meter, table, smiley faces, radar plot, histogram, and hasse-diagram) more appropriate and useful for modelling individual students and their competencies. They most appreciate the Table Visualisation as well as the Radar Plot as they are easy to understand and contain an appropriate amount of information. A clear and easy understanding of the visualisation is quite important for teachers as one comment confirmed – one teacher pointed to the fact that even though the hasse diagram provides very useful information especially for individual guidance, it seems to be very technical and therefore too complicated.
In general, it seems that the different visualisation types used in this questionnaire-based study are useful and appropriate when using them for modelling individual students and their competencies. In further studies, one should investigate which visualisations are better suited to which specific purposes whilst taking into account visualisation’s level of complexity. Nevertheless, one have to consider, that in this section results of only 21 teachers were reported which makes a serious interpretation and discussion difficult.

6.2 Austria: Applying myClass in the Classroom – report of a Focus Group discussion

In order to evaluate the principles and features of the myClass tool, an initial application and testing of myClass has been carried out with about 20 teachers from the practical primary school of the University of Teacher Education Styria (Praxisvolksschule der Pädagogischen Hochschule Steiermark) in the scope of a training workshop in the spring of 2014. The workshop objectives were twofold: training teachers in applying myClass in the classroom and gathering first feedback on the interface and functionality of myClass itself. The main purpose, which is more of qualitative nature, is to serve the ideas of co-designing the look and feel of the tool and its implemented features. Gathering information that helps to further improve the tool and make it more attractive for teachers as well as the investigation of the initial benefits of the tool are of main interest.

First of all, myClass and its different features were demonstrated to the teachers, followed by a hands-on session where teachers had the opportunity to use myClass by themselves. After this session, participants were asked to express their experiences with and views about myClass in a moderated discussion. The outcomes of the discussion with teachers on experiences with myClass and its usage indicate a high satisfaction with both the tool and its particular functionalities and features. These results are not a surprise since there was a strong collaboration with teachers during the tool development process resulting in a tool that is more or less geared to the needs of them.

After this in depth training session on the myClass tool, teachers were asked to apply myClass during the school time in their real class setting within a period of about 8 weeks. After this time period, two focus groups with a small number of teachers (including the principal) were carried out. This focus group style discussion concentrated largely on collecting information about issues for further improvement based on teachers’ feedback, their opinions and feelings with regard to myClass.

The experiences with myClass resulted to be very good. Teachers’ general opinion on the tool is very positive: they are satisfied with both the tool in general and the particular functionalities that are offered to them such as design, interface, feedback and visualisation. Characteristics of tool such as its ease of use, its goal orientation as well as its stimulative nature were particularly emphasized. Overall, teachers assume myClass as being a good supplement to traditional teaching methods. It supports the formative assessment process by providing a precise protocol of students’ performances when correctly used. Especially the different types of visualisations of students’ individual results and performances given to the teacher are also judged as being comprehensible and helpful for the further (formative) assessment process. There is, however, certainly considerable room for further improvement of the tool. So, teachers offered a list of suggestions to make myClass even better than it already is. Some of their suggestions and wishes included for instance: reducing the amount of time it takes to scroll through a list of subjects and names looking for the students they wish to track activities from or making the activities record easier by including seating-plan style template of boxes.

Although teachers are aware having a powerful tool, however, they see some problems in implementing the tool in the real classroom not from a software perspective more from a hardware and technical perspective. They see a variety of hurdles especially concerning their technical resources and technical support. The pointed to the fact, that tablets and other hardware is either limited because they have to be shared with other teachers or they are of insufficient quality. Besides this limited number of (good working) computers, teachers highlighted that an insufficient simultaneous Internet access make the successful implementation of myClass into the classroom difficult.

To sum up – despite some technical challenges – teachers are aware of myClass’s quality and the benefit it can bring into the classroom by measuring and improving students’ skill and knowledge development, by sharing the information with students and parents, and – most importantly – giving teachers more time to focus on their students.
6.3 England: Inquiry in a broader range of contexts

D6.4 and D6.6 report three TISL studies with two teachers completed before May 2014. Since the release of these deliverables, UK studies have involved teachers engaging in inquiry in a broader range of contexts. These have included teachers engaging in inquiry on an individual basis, as well as in collaborative groups, and as part of distributed TISL study, a top-down inquiry involving the lead teachers’ colleagues. The studies are described below, though will be reported in additional detail in D5.9.

Two new studies with individual teachers have taken place. The first relates to an inquiry completed by a teacher of a BTEC qualification course in Art & Design in a Further Education College that focused on the ways in which Google Docs can facilitate the development of collaborative learning skills for students. The second was supported remotely by IOE, and was conducted by a teacher of Key Stage 2 aged learners at an international school in Italy. The teacher completed an inquiry on the ways in which a brainstorming map could affect story-planning skills in her lessons. Though different in terms of the contexts that the practitioners teach, the studies provided some valuable understandings of the changes in practice enacted as a result of the TISL inquiries.

IOE also collaborated with a faith school in London engaged in collaborative inquiry cycles. This provided an opportunity to explore the school’s collaborative inquiry processes, and to understand the need for a facilitator of such groups. Other studies have included distributed TISL plans. Two of these studies have been previously reported in D6.4 and D6.6 and were completed by the same teacher, though an additional participant also engaged in a third study. A key motivation for the lead teacher’s participation in the inquiry was to provide evidence for management, which justified the existence of student support sessions. This inquiry is still underway, and so there are currently only anticipated outcomes. As the teacher was required to provide feedback to senior management in meetings on this subject, it is anticipated that his findings will inform decisions surrounding whether to maintain the student support sessions within the school timetable. Due to teacher commitments external to the project, the outcomes for this school study will not be available until after the end of the project.

6.4 Germany: Supporting a School in becoming a community school

6.4.1 Introduction and Background

This section reports on a school that is closely supported on its way in becoming a community school by NEXT-TELL partners MTO and KMRC.

We are reporting here about the so far analogue documentation practices as well as the current feedback practices and procedures in the community classes. Furthermore, we will provide insight into how myClass and the OLM are adopted by the teachers in order to support these practices. The report is based on an interview that was taken with one of the teachers of the community classes in May on their current feedback practices and procedures within the new school form as well as on several informal talks that were held during school visits and participation of teachers on project plenary meetings in Vienna and Graz with the teachers and the school leader.

During the third project year, a school in Germany contacted NEXT-TELL partner MTO. MTO is known in the southwestern area of Germany for its expertise in school development. The schools intention was to ask for advice because they were on their way in becoming a community school, which is a new school form in Baden-Württemberg that is aiming at overcoming traditional restrictions of the schools, mostly by three changes:

- inclusion and internal differentiation regarding academic achievement, in contrast to external differentiation via “different schools for differently gifted people”;
- no grade retention at all, except through express wish of the parents.
competencies as elemental building part of the education, taught by teachers with diverse backgrounds.

The school (Gemeinschaftsschule in der Taus, Backnang) was among the first to join the change process from traditional Werkrealschule to Gemeinschaftsschule in 2012 and asked for assistance/consult for this change management process.

The school comprises the school years 1 to 10 (51 teachers, 24 classes, ca. 550 students) and the school board decided to enact in this shift of concept stepwise. Stepwise means that in the school year 2013/2014 the years 1, 2, and 5 became part of the community school, whereas the other classes remained in the “old” system of “Grund- und Werkrealschule” (elementary and secondary modern school with extension courses). From that year on, the community school concept will be extended to the respective next year so that students who started in 2013 in class 1, 2, or 5 in the community school would go on in class 2, 3, or respectively 6 with that approach.

After it became clear to the school board that with this switch of school concept, there would be a significantly higher amount of documentation requirements in order to keep track of the learning of each student which is also specifically defined by the educational ministries in Baden-Württemberg, and that the switch would also lead to new kinds of instructional methods like project work, they contacted NEXT-TELL partner MTO and asked for advice on how to proceed with their approach. After some considerations, MTO proposed and introduced the use of three NEXT-TELL tools (LIP, myClass, and OLM) that could potentially lower the workload of the documentation processes for the teachers and, furthermore, might also support the new instructional methods and help to develop a sense of ownership of learning in the students. As it turned out that these three tools very much support what the teachers of the community school already need to do, the school leader decided in the first part of the fourth project year that he would like to implement two of our tools and the third one maybe later on for the community school classes on the primary (myClass) and secondary (OLM) level. Up until now (end October) 22 teachers have been trained either in myClass or OLM. myClass has already been used full-flanked by the teachers on the primary level since May 2014 and furthermore been used for talks with parents at the end of school year (i.e. July 2014). Using myClass for documentation and for talks with parents has been reported as very helpful and timesaving. “I never had less to prepare for the talks with parents”, one teacher stated.

LIP was not taken up initially due to two factors in its design: Need of a constant Internet connection during the data input and an established collection of learning materials from the start on. The primary school’s classrooms are not equipped with a Wi-Fi network, and the school has not secured funding for this work up to day. Also, as the school was only at the start of the transition towards a new pedagogical system, no working/learning materials were available to use as a database for the LIP. This tool was shelved until the school’s infrastructure could provide a feasible basis for its deployment.

The OLM was so far only trained and used on a conceptual level (getting familiar with the concept of formative assessment and carefully think about competency goals and assessment criteria). These training sessions took either place in small groups (two/three teachers) or at a pedagogical day in early September to which MTO and KMRC were invited to introduce the OLM and the Assessment for Learning concept. We furthermore used this pedagogical day to show where and how the AFL principles have been implemented into the OLM. All trained “OLM teachers” will act as multiplicators for the remaining teachers of that school later on when the project has come to an end and the use of the tools cannot be directly supported by the project partners anymore.

It was planned to already use the OLM at the end of the school year 2013/2014 and to conduct a study to capture students’ reactions to the OLM in class 5 (students’ age around 10-11 years) but due to an expired SSL security certificate for the CAS service hosted by JRS in early July, we were unfortunately not able to conduct the classroom study as planned because we were not able to log into our tools for about a week. We postponed the study to end of July but at that date other severe technical issues appeared due to the rather out-dated software equipment at the school (i.e., Windows XP, old version of Internet Explorer that cached the webpages and did not reload so that it was not possible to properly work with the OLM - see Figure 19).
As described above, myClass is already used and will be further used in this school year. The OLM is now about to be used to formatively assess students’ project work from the beginning of the new school year 2014/2015 on.

According to the school leader myClass as well as OLM can be seen as school solutions for documenting students’ learning processes that will be used in all community school classes from now on.

The school leader describes the switch of concept as a 180-degree switch for the involved teachers. He had read before that it is not advisable to completely change the pedagogical practices from one day to the other but he decided to do so with only a few teachers and class levels and then expand the new approach to other teachers and classes with the already involved ones as multiplicators.

6.4.2 Method and Aim

One partner, MTO, worked on a weekly basis with and at the school. This was supported by academic and pedagogical input from KMRC. We were only able to collect small sets of data through one interview, flanked by extensive informal talks with the teachers and the school leaders but learnt a lot about the adoption of two of our tools that will be used as the school’s solutions for the documentation of students’ learning progression, their reflection, and the support of feedback talks between teachers, students, and parents.

An interview with one of the community class teachers (35 years, 10 years of teaching experience, teaching German, English, and project work for classes 5 and 6) was conducted by KMRC aiming at finding out about current feedback culture within the new school approach. The teacher reported on her and her colleagues (in total five teachers in the community school starting team) feedback procedures.

Furthermore, we were aiming at reporting the results of questionnaires about teacher characteristics, current use of ICT as well as feedback practices from both the community school teachers and those that are so far not working within that approach in order to compare them. Although we asked several times and our request was supported and brought to attention of the teachers by the school leader, only five teachers had filled in our questionnaires.
6.4.3 Results

Current feedback practices

According to the interviewed teacher, feedback practices generally depend on the subject in which the feedback is given due to specific regulations that come with the subject but all teachers share the same overall understanding in regard to an improved feedback culture within the community school approach.

This general understanding looks as follows (the interviewed teacher described it on the example of class level 5):

There are two fifth classes with each 25 students and five teachers in this class level for the different subjects. Each of the teachers engages for 10 students as a so-called learning facilitator. This means that he or she is responsible for these 10 students to have feedback and learning development talks every week. Basis for these talks is a portfolio that is recorded by the students and by the teachers during and after the regular lessons. The talks are used for individual planning of next steps and reflection. All teachers have access to these portfolios so they are in general informed about everything that is going on with the students.

Each student is obliged to record personal goals for the upcoming week and to note down what went well and what did not in the current week in regard to concrete contents but also in regard to social and work behaviour (e.g., if they forgot to bring their books or if they did not pay that much attention during class). The teacher responsible for a lesson or project work also fills in this portfolio, which is not necessarily the learning facilitator of a particular student. The portfolio is also used as communications instrument with the parents that need to be signed by the parents every once in a while. This way, teachers make sure that the parents are informed about the learning progression of the students during the school year.

There are four school hours reserved for this talks of which one is credited on the teaching load. The other three hours are a personal investment of each teacher but as those hours are seen as very worthwhile, this personal investment is not an issue for the teachers.

Self-assessment of students has become an important part within the subject lessons but also in the project works. When students have to sit exams, which are held at fixed dates, they can choose (based on their self-assessments) which difficulty level they would like to work on (high, medium, low). The interviewed teacher described that the calibration accuracy of these self-assessments differ in the different subject areas. According to her, students are quite accurate in English, in German this seems to be more difficult for her students. She experiences that students with migration background have more difficulties in assessing themselves accurately in German; they underestimate themselves most of the time.

Sometimes she needs to intervene when students are not sure or when their estimation is not accurate. She either uses written feedback underneath a sat exam or her learning facilitator position to do so. “In the beginning, we let the children self-assess because we were not able to do so [because the students just came to the school and schools do not get any information on students’ achievements anymore when they proceed from primary to secondary level - see also D6.3, p.26; note from author] and since then I realized that mainly the uncertain ones ask for advice, then I give them advice or if - there was e.g. an exam and one child overestimated itself whoppingly and I wrote underneath, I would suggest that you take the medium difficulty level next time.”

She was not able to provide insight into the self-assessment skills in Mathematics because this is not one of her subjects. She described that students tend to overestimate themselves within the project works when it comes to competencies like self-regulation, neatness and organisation of their work. “Well, in that area they overestimate themselves whoppingly, they think their folders are so beautiful and we have to assess that realistic then – and that is – yes, they often overestimate themselves there.”

When asked what she thinks might be optimized in their feedback procedure and culture, she stated that they definitely need support for their competency grids. With the switch to the community approach, the school became a model in the state of Baden-Württemberg for a school that does not give grades as assessment measures (this only applies for the community school classes, within the remaining classes in the system of elementary and secondary modern school, grades are still the instrument of choice). All assessment and feedback that is provided within the community classes is based on competency grids and portfolio work. Although the state’s ministry provide competency grids for the three most important subjects, German,
English, Mathematics, these are rarely used. This is partly because they were distributed rather late, and partly because they are too exhaustive for day-to-day use. As an example, the competency grid for the fifth and sixth grades of the subject German alone consists of about 700 competencies and sub-competencies.

When starting to work in a community school approach the teachers were confronted with new textbooks from school publishing houses. The school board decided to reconcile with the teachers to use textbooks that were already used and approved by other community schools. Unfortunately, these textbooks did not come with competency grids, which is why the teachers started engaging in developing, trying and revising competency grids for the documentation of students' achievements. They developed competency grids for the subject areas of English, Mathematics, German, and their project works that connect different subject areas (e.g., project work for the Neolithic Age which comprises History, Social Studies and basic craft with leather, stone and wood). Furthermore, they developed competency grids for interdisciplinary competencies like self-regulation skills and the like.

They are aware that they now need to further test and revise those grids as long as there is no solution by the educational ministries given they can apply.

The interviewed teacher described that she and her colleagues are now hoping that their paper load will drop with the implementation of myClass and OLM and that they have one place where all competencies are stored and represented in a well-arranged manner. Furthermore, they are expecting that the implementation will facilitate the feedback talks with both students and parents and the inter- and intra-class comparison of students. She herself is especially excited about the radar plot visualisation in OLM and hopes that the workload will be reduced a bit when they are able to provide their feedback digitally and via the Google spreadsheet API for multiple students at a time.

Adoption of myClass and OLM and intended use

In this section, we will have a deeper look into how the tools are adopted by the teachers.

myClass

Originally, only the OLM was presented during a two-day workshop with selected teachers from the school. MyClass, nevertheless, came into feasible use in the primary school section of the school supported.

The need to deploy myClass arose from the design of the OLM. The Open Learner Model has a fixed depreciation value for information put in over time. As these assessments are therefore no longer added simply arithmetically, the teachers in primary school, who were not happy with this feature, needed another solution to document the learner's progress in their classes. After comparison of the different tools offered, the teachers chose myClass.

What convinced them was the clear and simple design of the tool, which is based on a paper-and-pencil version of a class book. Another strong point was the foolproof way to enter data student per student.

They used it initially to document the insights into the learner's competency gained by written exams. Later on, they also changed the status of the learner's advance based on impressions gained during classroom presence and performance. Lastly, it was employed to visualise the learning track of children in talks between teacher(s) and parent(s).

During working together with first two and later four teachers from the primary school branch, many design suggestions and refinements for the features of the tool were garnered. It was understood that the tool had to be more neatly shaped to the processes going on in the school every day, of which documenting classroom performance in competencies was but a small part.

In the German school system, written or, more broadly speaking, formal exams are important, even in primary school. These exams yield a great amount of data for each individual member of the class, multiplied by the 20 to 25 children gathered in each class a teacher has to teach, mainly by herself. As an example to serve, for the data to document, might Mathematics be chosen: During the first school year, no less than 160 competencies, on three different hierarchical levels, were planned to be assessed.

This huge amount of data had to be put into the tool, processed and visualised in a way that was helpful for the teachers. The work together produced great results for the question of how teachers used and desired to use the tool.
The learning radar was, at the start, nigh useless, as can be seen from Figure 20.

![Lern-Radar](image)

**Figure 20. Initial state of the myClass radar plot visualisation for Mathematics in the first grade for a given student (live data at the end of the school year)**

Due to talks facilitated by the on-going consulting activity at the school, the teachers and the developer of the tool were able to find a useful solution. The solution was based on the fact that parents or children most of the time neither cared for nor understood the atomic structure of the competencies in Mathematics. What the teachers reported were the second-level characteristics of the children, so this visualisation was implemented, as can be seen in Figure 21.

![Lern-Radar](image)

**Figure 21. Re-worked version of the radar plot visualisation for Mathematics in the first grade for a given student, only second-level characteristics are shown (live data at the end of the school year)**
In Figure 21, strengths and weaknesses are easily observable. In addition, it facilitates the talks about more generally applicable learning goals as, e.g. LZ 83: “I can orientate myself in space”, which seems to be a strength of the student in comparison to LZ 154: “I learn to solve easy number riddles”. Both in talks with the student and his/her parents, these visualisations provided huge benefit for the teachers. It made their conclusions more understandable, more based on empirical insights and allowed easier discussion on equal terms about the future steps for the student.

**OLM**

The teachers decided in cooperation with MTO to only use one account per school year instead of individual teacher accounts (i.e., 2013/14, 2014/15, etc.). This is due to the fact that the NEXT-TELL account setting does not include (due to privacy reasons) that teachers are able to view the learning progression of their students in other subjects that are taught by another teacher. As the teachers are working very closely together and due to their obligations as learning facilitators, they have the need to be able to see what another teacher assesses in his/her subjects. Furthermore, with this approach, teachers only need to configure one set of competencies and can easily compare the development of interdisciplinary competencies above subjects and teachers.

In order to be able to filter their own sets of assessments, they agreed to use their teacher codes as tags every time they conduct an assessment. The assignment to the different classes is taking place through the grouping function in the configuration tool.

Every student of one year’s class level gets a personal account. At the moment it is not intended by the teachers that students use the OLM on their own. They would like to fill the OLM with assessment data and use the visualisations for development talks with students on a weekly basis in order to negotiate next week’s learning plans and goals and with parents on parent-teacher meetings. When the teachers are feeling more competent in using the OLM, they would like to introduce it to their students so that they can engage in self- and peer-assessment and use the visualisations on their own in order to keep track of their development and reflect upon it.

The competencies that the teachers identified for the development of the competency grids were brought into the OLM (see Figure 22 as an example).

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1. *Lernziel*, learning goal
2. e.g. “FD” for a teacher with a last name starting with a F and a first name starting with a D
As they use four stages to describe the level of attainment of a competence, they set the number of points on the OLM assessment scale from zero to three in order to make their grid values assignable to the OLM (Figure 23).

![Figure 22. Example of competencies in OLM](image)

![Figure 23. Assessment point specification that applies to values in competency grids](image)
6.4.4 Discussion and Outlook

Although we were not able to gather much data through semi-structured interviews or questionnaires, we gained valuable insights for the adoption of myClass in OLM in a community school setting through a lot of informal talks and training sessions. Furthermore, these insights can be used by NEXT-TELL’s follow-up project Lea’s Box in which partners TUG and BHAM are involved. As we worked closely with both partners while implementing the tools in these schools, they are already aware of the obstacles we encountered and some of them were already addressed.

The implementation of both tools once more showed that it seems to be easier to adopt the tools if there is already an existing pedagogical approach that is in line with the one that the tools aim to support. Teachers in that case already have a clear concept what the tools can be used for and a transformative use of the tools becomes more likely but still takes time to translate into a continuous usage. The experiences we made with this school furthermore emphasize and support our reporting in D6.5 [Cierniak, 2013] that competence-based formative (e-)assessment in teaching-learning-situations is not done from one day to the other but is a very intense and complex endeavour.

6.5 Germany: Using Repertory Grid for getting insights into students’ understanding of technical terms in Economy

6.5.1 Introduction

During the fourth project year, a teacher in Baden-Württemberg conducted a teacher-led study with Repertory Grid for Formative Assessment (RGFA). This study was closely assisted by MTO, with great technical support by the Copenhagen Business School (CBS). The results are planned to be presented at the CSCL in 2015.

As a starting point to this study the teacher (upper secondary school, aged 32, 6 years of practice, teaching this class for one year in the subject Economy, has been teaching subjects Biology, Economy, Political Studies and History) was trained in RGFA by using examples from one of his subjects (Biology), which illustrated functions and limitations of the Repertory Grid technique tool. He then designed one grid by himself, which was scrutinised during a team session with a representative from MTO. Using this further practice to refine his knowledge about the tool and method, the teacher constructed three different grids for his students in Economy.

6.5.2 Method and Aims

The participants were a course of 22 students in the subject of Economy, ranging in age from 16 to 17 years. They were in their pre-final year of the 12-year school period that concludes with the Abitur (university entrance requirement). The course was chosen by the students at the begin of that year as one of their two focus subjects besides German, English and Math, which are obligatory. The course comprises topics of business administration, national economy and social studies.

The main question for the teacher was how to better comprehend the ability of his course to correctly use already known technical terms of Economy at the end of a learning unit. The terms would be part of their final exams in the next year. The hypothesis was that there would be certain deviations from the expected usage of the concepts and that some differentiations between the terms would be blurry. For example, one of the triads that were created consisted of the terms “free trade”, “Smith-Ricardo theory of comparative advantage” and “world risk society”. The expectations were that students would group “free trade” and “Smith-Ricardo theory of comparative advantage”, as they both explain globalisation with regards to the profit gained from trade and comparative production advantages.

The teacher split the terms for the grids in three different exercises after understanding the concept of repertory grid better, so that 20-19-19 students completed the different grids. Two were absent at that day, one did not complete more than one grid due to reasons outside of the study.
6.5.3 Results

According to the teacher, none of his students understood the terms the way he intended them to. The distance between what he had expected and what the grid revealed was so huge that he was puzzled on what to do with this result and how to use it in a pedagogically sensible way.

Additionally, he struggled with some technical issues because he could not download some of the data analytics the tool should provide (dashboard analytics, the general overview of the students’ answers) which prohibited an accumulated view on the results.

Although he engaged with his students in an open discussion about what they were missing that would enable them to better use the technical terms, little practical result was obtained from the available analytics. The teacher nonetheless stressed the point that for him, the study made possible to gain insight into how broad the spectrum of understanding in his classroom was, something he was not aware of in such detail beforehand.

Apart from that, he missed more practical use how to integrate the results into his pedagogical approach because (as mentioned above) some of the analytics were not available to him. Also, the available analytics, like time metric, came with no clear message to him on how to use them for his classroom practice or the guidance for his students. This led the teacher to the question of the additional value of the tool in relation to the time it takes to prepare the grids.

He also reflected, after being invited to, in written form on the problem that diagnostics, in which way he understood the RGFA, have no clear connection to classroom practice. The connection between both the non-intended use and lacking understanding of the technical terms of his students on the one side and how to ameliorate that state in the classroom on the other side, was missing for him.

6.5.4 Conclusions

Apart from the question of what NEXT-TELL is about, when deciding between a development project that provides proof-of-concept solutions and a project that establishes pedagogical concepts with the facilitation of 21st century tools, the experience this teacher made clearly points to the problem of how the tools are used in a day-to-day school usage and if it is possible to use them on a daily basis: On the one hand, taking TPACK and RAT into account, there is the challenge of integration knowledge that teachers need to use tools in a way that it at least amplify the instructional process. On the other hand, we once more had the problem of a tool pilot that potentially could help with gaining insights into students learning and really transform the tasks a teacher has to do but due to technical issues was not able to provide them. Of course, if tools were to be used on a daily basis, these tools would function but until we have pilots that provide the functionalities that should be tested, we do not have any evidence if a daily basis will be advisable or even worthwhile.

It is furthermore assumable that the problem is not so much with the analytics provided, but with the range of pedagogical solutions the teachers have in their arsenal and which of these they can really apply in a setting that usually limits the whole study of economic ramifications of the globalisation process to 16 to 24 lessons of 45 minutes.

6.6 Netherlands: Teacher-led studies into the nextTALK method - Peer-facilitated participatory decision making

The project has been working via Peter Reimann during the fourth project year with three ESL (English as Second Language) teachers from three secondary schools in Bergen and Herhugowaard, North-Holland. These teachers are each conducting research in one of their regularly taught classes on how the nextTALK approach affects and influences meeting activities in the classroom.

6.6.1 The nextTALK approach

The general approach

In professional life meetings are pivotal means of deliberation, planning, decision-making, capacity development, and community building. However, meetings are often badly prepared and conducted. This is
even more the case for online meetings (e.g. via Skype or other web-conferencing tools), which require special skills and careful preparation. And while students increasingly spend time in groups in many subject areas, rarely is that kind of work used to foster facilitation skills systematically. This package allows students to learn about and experience facilitation first-hand, thereby developing a set of competencies that are useful for the life in school and beyond. This scenario applies to many subject areas where meetings are required to discuss problems and prepare decisions. The nextTALK software supports peer-facilitated teamwork (PFT) for:

- Project-based learning across the curriculum, with teams of students meeting regularly over multiple weeks to drive a complex project forwards. This allows them to not only learn about the subject matter, but also how to work in teams, manage time and other resources, and develop their leadership skills.
- Second language learning, in particular task-based language learning. Group work increases opportunities for practicing languages significantly, and facilitated group work adds yet another level of efficiency. For second language education, even short-term teamwork around typical tasks such as discussions can be accommodated.

The adaption to the Dutch ESL classroom

For the study with the three teachers, the nextTALK approach was modified, and considerably simplified, in order to meet the demands of more conventional classroom work other than project-based learning. For the ‘normal’ ESL lesson and classroom, the method needs to work (a) within 40-45 minutes and (b) without individual (or close to individual) student computers. The normal ESL classroom is technology-lean. These general requirements/constraints led to the following, largely teacher-driven design decisions:

- The meeting activities are paper-based. Documents are uploaded to GDoc after the meeting.
- The meeting design and activities are tailored to a prototypical ESL collaborative learning form: Ethical decisions.
- The need for meeting planning is reduced by providing the facilitating student with a “decision deck”. The facilitating student needs to decide only on the details of the decision steps, not on their nature and sequence.

These considerations let to the development of a “decision deck”, a template for the process of coming to a group decision on an ethical dilemma, such as “Who is to get the heart when only one donor heart is available” for five patients. The decision deck can be used on Google Docs (as a set of “slides”), and/or in printout form. Its final format was co-designed with one of the teachers.

Here two screenshots from different phases of the decision-making process:

4. Criteria for comparing the options

How will your group compare the different options? Write the name of each group member under one of the boxes. Each group member should write the criteria that he thinks is important as a basis for making the decision on a sticky note and place it in the box above his name. After this, discuss the criteria.

Figure 24. Phase 4 of the decision-making process
In consequence, the focus of how the nextTALK method works out in the ESL context is on oral communication: How does the facilitating student guide peers through the decision steps, and how does that affect the quantity and quality of spoken English in the group? To answer these (and primarily the second) questions, the participating teachers engaged in a teacher-led research project, which is also part of the Masters course at a Dutch Teachers College they are enrolled in.

6.6.2 Study Design and Methodology

Research questions:

1) What is the effect of teaching group facilitation skills on the amount of students’ exploratory talk?

2) What is the effect of teaching group facilitation skills on students’ anxiety in spoken English?

The study design is for each of the three classes as repeated measurements design. It allows also for the comparison between classes, which vary on a range of dimensions.
The effort for both teachers and students is considerable as the practice phase extends over four weeks, with group activities at least once a week.

**Figure 26. Study Design**

**Figure 27. Instrumentation**

Instrument 1:
Searching for key words in context as evidence of exploratory talk:
If, because, if… then, I think, Actually, but, Maybe, agree, Why

Instrument 2:
Foreign Language Classroom Anxiety Scale
(Horwitz, Horwitz & Cope, 1986)
6.6.3 Analysis and Findings

The analysis is not completed as of yet, but will be in its main parts by November 2014. The analysis requires identifying all turns in the students’ communication, as recorded on audio files, and then performing a content analysis of the text to identify a number of keywords deemed significant indicators of language development. This analysis is hence very time-consuming.

Initial observations from the teachers show a visible increase of the quantity and quality of exploratory talk during the decision-making lessons. The exact numbers will only be available after transcription and content analysis. As far as the foreign language anxiety is concerned, first results show an uneven picture, which is not astonishing, given the differences between the classes and schools. For instance, one school is international, with most students being bilingual and all speaking in a foreign language almost constantly.

![FLCAS questionnaire preliminary results](image)

Figure 28. FLCAS questionnaire preliminary results

6.7 Norway: Teachers (almost) on their own when using the Open Learner Model

6.7.1 Introduction

This section reports on a teacher-led study conducted in late spring/early summer 2014. It builds on the study reported in D6.6 and was led by one of the two STEM teachers in an Upper secondary school. A second teacher, who previously participated in our studies, followed what was happening in the participating class, but did not manage to participate in the study herself.

In the school year 2013/2014 the teachers were able to use NEXT-TELL tools basically on their own. The report on the trial from autumn 2013 and early spring 2014, available in D6.6, describes how students were introduced to OLMlets [Bull, 2010] and the OLM, how students used OLMlets, the tasks on exploring the OLM that the students received and also describes how the teacher organised the work with the tools.

The study reported in this section focuses on the use of the OLM in the classroom. The aim of the study was to:

1) Investigate if teachers were able to use OLM independently, as part of a classroom activity
2) Investigate how teachers were able to use OLM as part of their overall pedagogy and teaching activity
6.7.2 Background

In June, following students' use of the OLMlets tool and a comprehensive test/assignment in the unit on Nutrition and Health, the teachers planned for the students to carry out a self-assessment activity in OLM within the unit on Energy for the Future. Although the school year was coming to an end, with only the exams remaining, the teachers wanted to try the OLM for self-assessment, as there had not been much time for this previously (D6.6 reports mostly on the use of OLMlets). At this point the students had only logged on to OLM and explored how their results from OLMlets were visualized in the OLM (D6.6).

First, the teachers had to identify which competence goals the self-assessment activity would address. Next they had to define the competence goals in the configuration tool, create activities in the OLM, and then tie the two together in the OLM. To be able to do this, the teachers had to:

1) log into the OLM
2) access the configuration tool

In the later stages of the NEXT-TELL project the definition of competence goals was removed from the OLM and a separate configuration tool was developed for this purpose. This was not easy for the teachers to understand (reported in D6.6) because of how the tool interfaces with the OLM; the teacher enters the configuration tool from the OLM tool via "a click". When one of the teachers in the teachers-led-study was preparing the self-assessment activity, she ran into problems and sent a mail to the researcher for help:

I have (...) a question about what happened to the OLM. There has been an update. However, I cannot find the functions in order to configure. Where have they hidden this? I planned that students should get the opportunity to take a self-assessment in this system. Must we make an OLMlets or is it a separate function where they also could write their self-assessment? Could they, in the OLMlets also post text, without connecting this to misunderstandings? I did not figure this out, and need help. (Our translation from: Mail (26/05/2014) from Excerpt 1).

The researcher discovered that the update made in OLM was the separation of the definition of competencies and activities for the visualisation in OLM to a new configuration tool, but the teacher could not find it. Through correspondence with the developer, the researcher receives a direct web-address to the configuration tool, and sends this to the teacher. Along with the address, we wrote a step-by-step instruction guide:

**Step-by step instruction guide for creating a self-assessment activity**
(The procedure also applies to peer-assessment)

You find the configuration tool here:
http://eeevle.bham.ac.uk/nexttell-config

**As a teacher:**

Log in to the configuration tool. You must add the activity peer assessment, under the subject theme you want to assess and tick the "self-assessment" box at the bottom of the page – you do not need to synchronize with OLMlets.

**As a student:**

Enter the self-assessment link, you find this to the left on the page. Enter groups (also on the left side). Enter activity (also on the left side). Enter "Self-assessment". There are some small long blue boxes in the window named - Associated with an activity - and click this. You will find the competencies that teachers want you to assess. In the boxes, write down strengths and challenges / difficulties. In the top left corner there is a button to set preferences sharing information. It is important that you tick the box related to the teacher.

You can also add self-assessment Not associated with an activity (blue box). If you do this you will be shown all competences the teacher has identified for self-assessment.
Note to teachers:
You can also create a test-student and add this to your class in order for you to test this from the perspective of a student. You could also ask to borrow a student account. If you wonder about anything, just ask. Could you show this to your colleague, if she needs help?
Good luck!

The teacher replies that she will use the guide, and believes that this will help her solve the problem.

Being able to define competences and activities is essential for the teacher to develop the self-assessment test. It is also essential for the students to tie competences to the visualisation of their competences. Without the configuration tool, the teacher is not able to prepare the self-assessment activity. The teacher argues later in an email why she believes the self-assessment activity could work as a nice activity. At the end of the year, when the students were preparing for oral examination it would "suit well if we could use this as a summary for the Energy for the future" (Our translation from: Mail (30/05/2014) from Excerpt 1).

6.7.3 In school

Returning to the questions about teacher-driven studies on the use of OLM in the classroom, we provide an account of how the running of this particular scenario played out. Due to lack of time, only one of the teachers was able to go through with the plan for the self-assessment activity. On the day of the self-assessment activity, the teacher informed us that she experienced problems in authoring the self-assessment activity. First, she reported on problems with adding the questions in the forms, as there was no "student view" in her teacher account. She was thus unable to see how the questions appeared to the students. To be able to see that, she would have to make herself a student account or borrow an account from one of her students - which she did not have time to do.

She authors the activity the following way:
1) Logs on to the configuration tool (Figure 29)
2) Adds an activity (Figure 30)
3) Adds the competence goals in the activity (Figure 31)
4) Adds students (Figure 31)
5) Enables self-assessment in the activity (Figure 31)
Figure 29. Start page of the Configuration Tool

Figure 30. Add Activity Self-Assessment, Energy for the Future
The four different steps were unproblematic for the teacher.

To be able to see how this works for the students, the teacher logs into an account belonging to one of her students. She reported to the researcher that she should have made a dummy student account. Having to log in and out from the teacher-account to the student-account in order to be able to author/see activities for students was perceived as cumbersome. In addition, a test-student account can contribute to contaminated data, when analysing the group models.

The teacher, then logged in as a student, clicks on the Add Evidence, to access the assessment form (Figure 32).
In order to access the correct form the student will have to 1) click the group button, and 2) click the activity button (Figure 33) and find the self-assessment form. Being logged in as a student, this is where the teacher experienced problems. She tries to enter the *group* and *activity* (see red arrows), but in this instance the navigation does not work. The mouse pointer appears as if it is possible to do this, but there is no response from the system. The teacher explains that she must take a chance that this works for the students, though not for her. At this point she is late for class and runs to the classroom.

In the classroom the teacher explains to the students how they perform the self-assessment that she has made available. She also adds that she herself had difficulties getting it to work, and that she hopes that the system will work when the students log in. She is therefore not able to present the OLM, but explains for them what to do. The students do not experience the same problems as her, and are able to enter the self-assessment form that she has made for them.

The teacher, however, does not manage to present how they should answer the form using her account (with her computer connected to a projector). A student offers her to use his computer in order for her to present it, and the teacher shows what the form looks like and how she would like them to answer (Figure 34).
Figure 34 shows the self-assessment form. Here it is possible for the students to rate their level of achievement for the competence goals – labelled with green squares (in this form of 0-10) – and enter a text describing their strengths and challenges/difficulties. The teacher defined the scale to be 0-6 for this activity. The students self-assessed in relation to the following competences:

1) Carrying out experiments with solar cells, solar traps and heat pumps, explain the main features of behaviour, and make simple calculations of effect. (Science)

2) Describing the behaviour and application of some common batteries and fuel cells (Natural Science)

3) Explaining what redox reactions are, doing experiments on combustion, galvanic element and electrolysis and explain the results (Natural Science)

4) Explaining different use of biomass as an energy source (Natural Science)

5) Explaining the difference between energy sources and energy carriers and a potential energy carrier for the future (Natural Science)

The teacher attempts to present to the students how the self-assessment results influence their learner model, however, the student whose account she uses has not carried out any other activities, thus the student model is not updated with the entered data. The teacher asks another student if she can use her account to demonstrate the learner model. The student logs on and the results from the automatic data from OLMlets are shown. The teacher was then able to present the idea of the model and how students can investigate their own level of achievement, related to the different competences relevant to the subject.
The teacher proceeded to present how the different colours in the model inform the kind of assessment activity visualized in the model:

1) Teacher: purple
2) Automated sources: orange
3) Self-assessment: red
4) Peer-assessment: green

In Figure 35, we see how automated sources (OLMlets) cover more competences than the teacher has entered manually. In addition to this, we see that self-assessment is not applicable to all competency goals, as students in this group did not carry out peer-assessment in these subjects.

The students were then asked to use the remaining time to explore their own models. The students reported that there was not much information in the models. The students had, prior to the self-assessment, only data from the OLMlets activity. The rest of the lesson is still influenced by tool problems, especially loading of pages. With just a few days left before the summer holiday, it is likely they were easily de-motivated when the OLM-tool did not work as expected. The students turned to the students next to them to chat instead, while waiting for their student models to load. When the session ended, only a few of the students had been able to investigate their models.

6.7.4 After the classroom activities

Following the scenario, the teacher communicated that she would like to add the results of a test the students have taken earlier in the semester. When doing this she understands that this will result in the models being more comprehensive and interesting both for her and for her students to use. In order for her to do this, she has to enter the test results manually. A few days later the teacher sends the following mail: "As an end to the project, I tried to put in the results, but it is just problems, just like when you were at the school. I have tried two different browsers, and to put the results into Google spreadsheet. But all this, without any luck." (Our translation from: Mail (17/06/2014) from Excerpt 1). She made some further attempts during the summer, but was unable to complete updating OLM with the data.

Figure 35. Teacher account: OLM of all competence goals in Natural science from Energy for the Future and Nutrition and Health
In a follow-up meeting between the researcher and the teacher, she reported to be very interested in OLM as a concept (reported in D6.6). She found that the tool has features that are very useful, missing in other tools the school uses, such as the overview of competence goals related to groups and individual students. Despite this, she found the interaction with OLM difficult somewhat cumbersome, for example that it demands a lot of navigation. The idea of dividing the OLM and the configuration tool into two separate tools proved difficult to understand (reported in D6.6) as well. Still, the teacher communicated that she was interested in the concept, as did the other teacher that participated in the spring (reported in D6.6). As potential benefits with OLM, teachers for example theorised that the students would become more self-regulated if they were able to use it, and use it regularly. In support of this observation, the teachers explain that the use of OLM must be continuous, on a regular basis, and not in between and from time to time. In the long run this would also require an easy or automated way of getting assessment data into OLM. Without this function, it involves a lot of manual work to use, drawing on limited teacher time. Developmental steps has been taken to support this, represented by the Google Docs feature, but the teacher found it not to be working at the time of this study. The teachers do have access to data from the school LMS for example (also used by all other Norwegian upper secondary schools), as the results from student tests are saved in Google Doc. The teachers were willing to punch data from assessment results by hand, but were unable to do so because of the above reported tool problems. Still, having to punch data manually takes a lot of time when you have 30 students (that is only for the one class). The only automated option available to the teachers was by using OLMlets.

6.7.5 Results

In early spring, as reported in 6.6, the teachers were leading their own OLM-based study. In this teacher-led study they planned to use the OLMlets and self-assessment in OLM as a part of the pedagogical approach to their teaching. Their plan was to use OLM for planning and teaching. The teachers demonstrated a well-developed understanding of the capabilities and learning potential associated with OLM, and how to put this to sound pedagogical use in their teaching. Their previous participation in and engagement with classroom scenarios involving OLM, likely contributed to the development of this understanding. In this particular study, the teacher who carried out the plan experienced some user problems with the running of OLM, and also some confusion arising from changes to the user interface and structure of OLM at critical points in the scenario. In the follow-up interview session, they articulated perceived educational benefits with the tool, and suggested improvements for how it might support better integration with school practices such as improved support for data import to the model.

6.7.6 Summary and conclusion

Returning to the original goals for the study, which was to investigate whether teachers are able to work independently with OLM, and how they were able to use OLM in support of their overall teaching activity and pedagogy, we found that the participating teacher created a plan for the tool use that was in line with intentions with the tool (i.e. using it to support what was intended with the OLM), but in this instance experienced some technical problems with use at critical points in the teaching. The teacher demonstrated knowledge and insights into how OLM could be used to support her teaching mainly represented by using it for students to reflect and self-assess based on previous activity, and that visualising their competencies might lead to learning gains by the students in her class.

This one teacher, participating in late spring 2014, was very motivated to conduct and finish the project. The teacher found many useful features for both teachers and students when it comes to the concept of OLM. As to the aims of the study, we believe the teachers would be able to use OLM on their own as part of classroom activity after instruction. The problems that arose where due to technical issues and we believe that if the tool had been working without problems, the teachers would have used it more actively. One of the biggest challenges with using OLM, but also one of the promising potentials, is the possibility to get data into OLM in an automated or more efficient way. In relation to how teachers are able use OLM as part of their teaching activity, the observations made in this trial seems to support that there is a mature understanding of the pedagogy involved, and perceived benefits for the students. However, the teacher was not able to enter the data she needed into OLM (she tried repeatedly, even when on holiday), to start working with OLM as a pedagogical tool. It is also forewarned that the technical problems with using the tool may have affected the data, and made it difficult to see it in use in a proper teaching/classroom situation.
7 Schools’ Engagement in NEXT-TELL from 2010 to 2014

This chapter aims at giving insights into teachers’ and schools’ engagement within NEXT-TELL over the past four years. We will provide some tables that summarize the overall participation of principals, teachers, students, and classes over the project duration and compare those with our declared performance indicators (see also section 3.2). In the next chapter we will then review all studies that have been conducted throughout the projects life and that have been reported in former deliverables of WPs 2, 5, and 6.

According to NEXT-TELLs initial aims (as described in the DoW), we wanted to involve 60-80 teachers in 30 schools in at least four different countries with a participation duration of each school/teacher for at least one year.

In the following, we will report on our participants. Table 9 provides an overview of overall participation of schools within NEXT-TELL that were involved for at least one year. That means these numbers do not include teachers or students that filled in our sent out questionnaires (e.g., Baseline Study in Germany as reported in D6.2) or the participants of our huge research and dissemination workshops that were also used to discuss our developments and gain insight into current practices (e.g., Workshops in Bad Waltersdorf, Gabelhofen and Hamburg as reported in D6.5).

We outreached our initial aim of number of teachers, schools, and involved countries, although we have to mention that we mainly worked with teachers in four countries (Austria, England, Germany, and Norway).

<table>
<thead>
<tr>
<th>Country</th>
<th>Schools</th>
<th>Principals</th>
<th>Teachers</th>
<th>Students</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>13</td>
<td>1</td>
<td>9</td>
<td>307</td>
<td>15</td>
</tr>
<tr>
<td>Denmark</td>
<td>2</td>
<td>0</td>
<td>11</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>England</td>
<td>14</td>
<td>7</td>
<td>168</td>
<td>300</td>
<td>51</td>
</tr>
<tr>
<td>Germany</td>
<td>8</td>
<td>5</td>
<td>24</td>
<td>78</td>
<td>4</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td>125</td>
<td>8</td>
</tr>
<tr>
<td>Norway</td>
<td>2</td>
<td>2</td>
<td>31</td>
<td>149</td>
<td>6</td>
</tr>
<tr>
<td>Singapore</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>64</td>
<td>2</td>
</tr>
<tr>
<td>overall</td>
<td>45</td>
<td>14</td>
<td>252</td>
<td>1058</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 9. Overall participation in NEXT-TELL over four years

In Table 10, we have a closer look on the involved classes over years and furthermore provide in this table how many classes each year were expected. Although expected numbers on new classes each year deviate from actually reached classes per year, we were able to reach our initial aim of 60-80 classrooms because of a huge increase in year 2.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected classes</td>
<td>10-15</td>
<td>20-30</td>
<td>50-60</td>
<td>60-80</td>
</tr>
<tr>
<td>Expected new classes</td>
<td>10-15</td>
<td>10-15</td>
<td>20-30</td>
<td>10-20</td>
</tr>
<tr>
<td>Involved classes</td>
<td>9</td>
<td>71</td>
<td>88</td>
<td>91</td>
</tr>
<tr>
<td>Involved new classes</td>
<td>9</td>
<td>62</td>
<td>17</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 10. Number of expected and involved classes over years
In Table 11, we list our expected number of trials and oppose those with our number of conducted trials. It indicates that we did not fully reach our aim of at least 60 trials within the projects lifetime.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected trials (incl. Baseline Studies) – incremental</td>
<td>12</td>
<td>25</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Conducted trials (incl. Baseline Studies) – incremental</td>
<td>10</td>
<td>26</td>
<td>34</td>
<td>44</td>
</tr>
</tbody>
</table>

Table 11. Number of expected and conducted trials

This slight deviation has several reasons:

1) Almost all of our trials took longer in terms of preparation and execution than initially expected. Here we would like to mention one trial as an example and a general experience we made. The collaborative study between Austria and Norway in year 2 in which four classes met in OpenSim. The preparation of this trial (including the development of the Chatterdale scenario) took about 6 months until it was ready for implementation in the two schools (see D6.3).

2) Several of the schools we approached have not been in any contact with us before, therefore it took quite some time before we had explained our aims to the specific teachers and earned their trust (which is hard to earn and easy to lose) to further cooperate with them because we usually had no direct incentives to offer.

3) It almost always took at least three months after gaining this trust to further work with each other until we were able to get dates for school visits and study implementations, which were also sometimes cancelled on a very short term because other school important issues arose unforeseen.

4) We count several studies that had the same aims as one trial. For example: in year 2 IOE conducted several TISL studies in two schools with 50 teachers in 50 classrooms but we count these studies as only one trial because they all had the same goal to further develop the TISL method and tool (see D5.3 and D6.4 for details) and therefore contributed to a valid basis for the methods development.

5) We often needed to go into more detail in relation to Assessment for Learning than expected because many of the teachers we have been working with were not familiar with it (this applies especially for Austrian and German teachers). Instead of “just” training our tools, we needed to also train the underlying pedagogical concept which took more time but also let to a lessons learnt (see section 9.2).
8 Review of Pilot Studies (2010-2014)

This section will provide the reader with short reviews of all former studies that contributed to NEXT-TELLs developments. We do so, in order to facilitate the reading of our concluding chapter on contributions and key findings within NEXT-TELL (chapter 9).

Apart from the Baseline Studies and Requirement Analysis of year 1 which will be summarized above countries comprehensively, we will shortly review our studies and highlight findings to exemplify how our studies contributed to NEXT-TELLs aims and objectives as it already has been done with some of our studies in chapter 5.

Baseline Studies (BS) and Requirement Analysis (RA) drove year 1, which are reported in detail in D6.2 [Cierniak, 2011]. We will not summarize each BS and RA result in detail but highlight our key findings from year 1 which helped with the development of the first version of our tools and further specified the procedure we took in order to approach new schools within the project.

BS and RA occurred several times during the runtime of NEXT-TELL because of our DBR approach. We contacted several new schools and were always interested to document the current state of practices of teachers and schools before implementing our tools and methods in order to get informed about changes in teachers’ practices.

The first BS and RA round was completely driven by the aim to find out what schools in participating countries do in terms of instruction, teachers’ professional development and strategic school development (with and without ICT), the later BS and RA were more specific and related to our developed tools which can in fact be traced back to the first BS and RA run in which we found out that schools experienced the whole NEXT-TELL package with all different layers as too demanding for implementation. As a conclusion to this, we later on tried to first engage in informal talks with schools to find out about specific needs and then offer the most suitable NEXT-TELL solution for their challenges. With this approach and the more and more maturing tools, it became easier to approach new schools but as mentioned above it also led to more specific BS and RA that not necessarily covered all initial layers of NEXT-TELL.

After the short review of the BS and RA from year 1, we provide a review about researcher-led workshops that not only fitted the purpose to gather further feedback on our developments but also had a dissemination character in order to acquire new participants (i.e., Workshops in Bad Walterdorf, Gabelhofen, and Hamburg). As a third part of this review of studies, we will present researcher- and teacher-led studies that were out taken in schools in the years 2 to 4. We would like to clarify that some of these were also out taken in a workshop like way (e.g., ECAAD and OLM Workshop in Germany in year 2) but as those had the main focus to gather data and train already participating teachers, we do not count those to the section of researcher-led workshops.

In order to facilitate the reading, we will provide a table overview of all studies that we are reviewing here, similar to the table 2 in chapter 5.

<table>
<thead>
<tr>
<th>Study name</th>
<th>NT tool/method used</th>
<th>Initially reported in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Studies and Requirement Analysis</td>
<td>n/a</td>
<td>D6.2</td>
</tr>
<tr>
<td>ECAAD-Baseline and Requirements Analysis: A Hands-on and Research Workshop</td>
<td>ProNIFA</td>
<td>D6.3</td>
</tr>
<tr>
<td>Extended Workshops on “Virtual Worlds in the Classroom”</td>
<td>OpenSIM, ProNIFA</td>
<td>D6.5</td>
</tr>
<tr>
<td>Conference Workshop at an EduCamp</td>
<td>OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>Team Building Show and Project Work</td>
<td>OpenSIM, Moodle</td>
<td>D6.3</td>
</tr>
<tr>
<td>Chatterdale Mystery: Assessing Second Language Learning in OpenSIM</td>
<td>OpenSIM, ProNIFA</td>
<td>D6.3</td>
</tr>
</tbody>
</table>
### Table 12. Overview on reviewed studies

<table>
<thead>
<tr>
<th>Study name</th>
<th>NT tool/method used</th>
<th>Initially reported in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the Division Practice Tool Sonic Divider in the Mathematics Classroom</td>
<td>Sonic Divider</td>
<td>D6.4</td>
</tr>
<tr>
<td>Technological Support of Individualized Teaching &amp; Learning Practices in Different Learning Contexts</td>
<td>1x1 Ninja</td>
<td>D6.5</td>
</tr>
<tr>
<td>The Usage of New Technologies in the 21st Century Classroom: A question of Teachers’ Personality</td>
<td>n/a</td>
<td>D6.5</td>
</tr>
<tr>
<td>LIP for raising students’ motivation in learning</td>
<td>LIP</td>
<td>D6.6</td>
</tr>
<tr>
<td>An evaluation of a gamified feedback tool</td>
<td>Sonic Divider</td>
<td>D6.6</td>
</tr>
<tr>
<td>ICT use as Basis for Communication and Negotiation Behaviour</td>
<td>n/a</td>
<td>D6.3</td>
</tr>
<tr>
<td>RGFSA, Communication &amp; Negotiation</td>
<td>RGFSA, CoNeTo</td>
<td>D4.3, D6.3</td>
</tr>
<tr>
<td>Using iPod to explore whether Java Programming students perform better in online, multiple-choice tests</td>
<td>TISL method</td>
<td>D6.4</td>
</tr>
<tr>
<td>Cross-curricular problem-based learning</td>
<td>TISL method</td>
<td>D5.5, D6.4</td>
</tr>
<tr>
<td>The use of Google Docs in cross-curricular problem-based learning</td>
<td>TISL method</td>
<td>D5.6, D6.5</td>
</tr>
<tr>
<td>Project Presentation and Design-Based Research</td>
<td>ECAAD</td>
<td>D6.3</td>
</tr>
<tr>
<td>ECAAD and OLM Research Workshop</td>
<td>ECAAD, OLM</td>
<td>D6.3</td>
</tr>
<tr>
<td>OLM as Digital Grade Book and Tool to Leverage Self-Reflection</td>
<td>OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>OLM as Tool to Leverage Peer-Feedback</td>
<td>OLM</td>
<td>D6.5</td>
</tr>
<tr>
<td>A Teacher-led approach to leverage students’ final exam preparation</td>
<td>OLM, TISL</td>
<td>D6.6</td>
</tr>
<tr>
<td>The loop of classroom planning, teaching and assessing</td>
<td>ECAAD method, OLM</td>
<td>D2.8</td>
</tr>
<tr>
<td>OLM Workshop</td>
<td>OLM</td>
<td>D6.3</td>
</tr>
<tr>
<td>SPICE</td>
<td>n/a</td>
<td>D6.3</td>
</tr>
<tr>
<td>Using OLM in everyday teaching</td>
<td>OLM</td>
<td>D6.6</td>
</tr>
<tr>
<td>Supporting students in the art of questioning</td>
<td>OLM</td>
<td>D6.6</td>
</tr>
</tbody>
</table>

### 8.1 Baseline Studies and Requirement Analysis

#### 8.1.1 Above countries Baseline Studies and Requirement Analysis results from year 1 (see D6.2)

Background/NT tools and methods used:

- Baseline Studies and Requirement Analysis
Aims:

Baseline Studies:

- getting insight into current practices with and without ICT concerning teaching and assessment methods (ECAAD), investigating teaching (TISL), and leading schools (SPICE)

Requirement Analysis:

- finding out what is needed to implement specific NEXT-TELL components in the classroom
- within the RA each conducting partner focussed on a specific task within their work packages that led to a specific development
  - Denmark (CBS): Repertory Grid
  - England (IOE): TISL method
  - Norway/Austria (UniRes and TALK): TESL assessment methods
  - Germany (KMRC and MTO): research approach and training requirements (in year 1 WP7 was a responsibility of MTO before this was shifted to UniRes)

Methods/data:

- semi-structured interviews (Austria, Denmark, Germany, Norway)
- informal discussions at workshops (England)
- questionnaires (Germany)
- 14 schools (grammar, secondary, independent schools), 4 principals, 34 teachers (interviews, discussions)
- six principals, 28 teachers, 90 students (questionnaires, no information how many different schools)

Results/ main findings:

general results

- NEXT-TELLs DBR approach was considered as important by all teachers in order to develop tools for teachers and schools
- the project was considered as interesting and important but too complicated and complex as a whole to implement in one school

ICT usage/equipment

- participating teachers in Denmark, England, and Norway are more familiar with ICT usage in schools than participating teachers in Germany and Austria
- participating schools in Denmark, England, and Norway are better equipped with ICT than participating schools in Austria and Germany, although there are several initiatives in the latter ones to better equip schools. The former countries are demanded by the Ministries of Education to use ICT in schools.
- all interviewed teachers fear that ICT usage (and especially new tools and software solution) might increase their already high workload
- interviewed English and Norwegian teachers use more communication and collaboration tools than interviewed German and Austrian teachers who use more “classical” computer programmes like MS word or excel

formative assessment/Assessment for Learning

- participating teachers in Denmark, England, and Norway are more familiar with formative assessment than participating teachers in Germany and Austria
• participating Austrian teachers are more interested in the concepts of formative assessment than participating German teachers
• Assessment for Learning is supported by national initiatives in Norway and England

**ECAAD level**

• planning procedures are very different between but also within participating countries interviewed schools/teachers
• no specific planning software is used but ICT is used to document lesson plans
• there is no given “planning approach” by the different Ministries of Education, therefore every teacher enacts more or less in his/her own best practice
  - best practice approaches differ very much - some teachers only plan with three keywords, others plan very extensively not only which contents will be covered and which media will be used but also how much time each activity might take
• the interviewed Norwegian and English teachers do not only plan the lessons (as the interviewed German and Austrian teachers do) but also integrate the assessment into their plans (which is an essential part in an Assessment for Learning)

**TISL level**

• Norwegian and English teachers are familiar with teacher research and its practice for teachers professional development
• teachers professional development is organised top-down in Austria and Germany

**SPICE level**

• usually a group of teachers is involved in strategic school decisions
• each topic (e.g., ICT in a school) is addressed by a different group of teachers

### 8.2 Research and Dissemination Workshops

**8.2.1 ECAAD-Baseline and Requirements Analysis: A Hands-on and Research Workshop (see D6.3)**

**Background/NT tools and methods used:**

• 1 researcher-led hands-on workshop in Austria named “Designing for Assessment” where first NEXT-TELL tools were presented to teachers (with a special focus on ProNIFA)
• Baseline research

**Aims:**

• disseminating the project and its fundamental ideas, in particular formative assessment
• conducting teacher training and introducing a number of NEXT-TELL-tools
• involving teachers and their experiences in the Next-Tell research process (baseline and requirements analysis)

**Methods/data:**

• 22 Austrian teachers
• research methodology was based on questionnaires, discussions, and observation of using the tools
  - collecting data and gathering feedback on the following aspects: planning and teaching activities and ICT use; used assessment methods and assessment tools; feedback and communication with students; ICTs’ integration challenges; Next-Tell integration aspects
Results/main findings:

- requirements concerning tools
  - providing easy to use and easy to learn planning and assessment tools
  - providing tools that have an added value for individualized teaching
- requirements concerning infrastructure
  - Providing an appropriate infrastructure to use ICT on a broad level
  - Allowing and helping to provide, access and manage teaching and learning resources in an easy and effective way
  - Providing an efficient, effective and overall system with the opportunity to share and make transparent all gathered information about the student with himself and his parents
  - Providing a comprehensible visualisation of the students’ learning progress

8.2.2 Extended Workshops on “Virtual Worlds in the Classroom” (see D6.5)

Background/NT tools and methods used:

- 2 researcher-led hands-on workshops in Austria on virtual worlds for teaching
- presenting OpenSim/Chatterdale and the Teacher Control Center

Aims

- recruit teachers and schools for further NEXT-TELL trials
- disseminate NEXT-TELLs tools to the teacher community
- get feedback from teachers to help with further developments within NEXT-TELL
- give the teachers the chance to “put on their student’s shoes” and explore what a quest in a virtual world is about
- research aims:
  - gathering general information on teachers’ attitudes towards the use of ICT
  - with respect to ProNIFA: general feedback on usability aspects from users that is only based on their impression of the tool without direct interaction and handling it
  - with respect to SecondLife/OpenSim: in-depth feedback on user acceptance aspects based on their experiences with the virtual environment
  - gathering information on teachers’ personality.

Methods/data:

- 50 teachers from different school forms in Austria; the workshops lasted about one and a half day
- feedback via informal talks and questionnaires (data of 32 teachers)
  - 17 persons filled in the questionnaire of the first workshop
  - 15 persons filled in the questionnaire of the second workshop

Results/main findings:

- there was a lot of interest by Austrian teachers - in both offered workshops only 25 teachers were accepted, but many more had applied
- teachers found it very interesting but were still sceptical about usability for daily class
- there were several follow-up meetings with interested teachers but none of them led to a classroom study
- results from a research perspective:
appropriate experience and knowledge level regarding the use of ICT
medium to high level of ICT use
perceive ICT to offer advantages
user acceptance of Second Life/Open Sim good concerning the aspects perceived ease of use, perceived usefulness, behavioural intention
ProNIFA’s perceived usability is rather low: teachers need support on how to use the tool.
visualisations provided by ProNIFA are of medium to good usability
Answering the question whether there is any relationship between teachers’ personality, their educational beliefs (i.e., attitude towards the use of ICT) and their acceptance and use of educational technologies, only for agreeableness moderated correlations could be identified. Teachers with high values in agreeableness intend to use a system more likely and find it easier to use than others.

8.2.3 Conference Workshop at an EduCamp (see D6.5)

Background/NT tools and methods used:
- Researcher-led workshop dissemination workshop
- OLM

Aims:
- disseminate OLM to the teacher community
- get feedback from teachers, teacher educators and media pedagogues on the OLM
- reach teachers that are already using ICT in their teaching and suggest the OLM as a solution they might use to facilitate their students self-reflection

Methods/data:
- 18 participants (teachers, teacher educators, media pedagogues)
- informal discussion at the workshop

Results/main findings:
- Configuration tool (in order to use the OLM) inspired a discussion about competencies
  - concept of competencies is not well elaborated in the German teacher community and it remains unclear how to deal with competencies
    - there is no common definition given by educational authorities
    - no general accepted measurement instrument of competencies given by educational authorities
  - option to provide feedback in OLM led to discussion about quantitative and qualitative feedback
    - participants remained sceptical about the option to quantify competency development and saw missing step between providing steps and guidance (pedagogical step to find out what students struggle with)
    - participants did not see how OLM might support this pedagogical step in order to provide guidance
  - the configuration structure (teacher feeds in which competencies are important) was questioned if NEXT-TELL claims that the OLM supports self-regulation of learning
8.3 Pilot Studies year 2 to year 4

8.3.1 Team Building Show and Project Work (see D6.3)

Background/NT tools and methods used:

- RDS in Austria and Italy
- OpenSim with “mating-show” stage
- Moodle as forum - asynchronous communication
- cooperation between Italy and Austria
- running over several months (preparatory activities, team building activities) with the mating-show in OpenSim being the final highlight
- language tandem model

Aims:

- explore OpenSim as an environment for cooperation
- explore a TV-show in an immersive environment as method for increasing student’s motivation
- explore a TV-show in an immersive environment as method to train language skills
- explore a TV-show in an immersive environment as method to reveal and track language skills
- explore usability of OpenSim-activities in real classroom- and school situations
- gather and evaluate teacher’s and student’s feedback

Methods/data:

- participants: 2 classes of 15/16-year old students (total of 21 students): 1 class from Austria, 1 from Italy
- language tandem: each students should speak the language, of which s/he is a learner - the native speakers of this language are doing correction work (e.g. in Moodle forum)
- use the well-known paradigm of TV mating-shows to engage students
- observe communication behaviour (in Moodle as well as in OpenSim) and analyse (data in Moodle, informal talks, etc.)

Results/main findings:

- The activity was received as well-chosen for this age-group
- high level of participation and motivation
- inter-school organisation is a challenge, but is worth the effort, as it makes the whole experience much more “natural” (it’s not very natural to meet somebody in a virtual environment who is sitting next to you in the computer lab);
- virtual environments are in principle very valuable tools for language training, however technologicals barriers are still high

8.3.2 Chatterdale Mystery: Assessing Second Language Learning in OpenSIM (see D6.3)

Background/NT tools and methods used:

- Researcher-led study in Austria and Norway
- OpenSim with Chatterdale story
- ProNIFA/teacher control center (former “Logfile Analyzer”)
- cooperation between Norway and Austria
- running over several months (preparatory activities, team building activities) with the mystery quest in OpenSim being the final highlight

Aims:
- explore OpenSim as an environment for cooperation
- explore quests as method for increasing student’s motivation
- explore quests as method to observe student’s cooperation
- explore quests as method to train language skills
- explore quests as method to reveal and track language skills
- explore OpenSim as environment to track language skills
- explore usability of OpenSim-quests in real classroom- and school situations
- gather and evaluate teacher’s and student’s feedback

Methods/data:
- participants: 4 classes of 13-year old students (total of about 90 students); 2 classes from Austria, 2 from Norway; teams of 4 students (2 Austrians and 2 Norwegians in each team), several visiting teachers from the Austrian “IT-at-schools”-community
- define learning goals based on curriculum (CEFR A2, B1)
- find ways to observe those goals in virtual environment and design the quest accordingly
- set up quest, activity tracking and link to teacher control center
- run quest and collect data via logging; analyse data via teacher control center

Results/main findings:
- virtual environments and quests are so different from what students usually do at school.
- high level of participation and motivation - teacher reported that also students that are usually not that much interested in school are more motivated
- minor problems in intercultural cooperation (too little teambuilding activities beforehand)
- teacher’s feedback: drilling deep in few competencies does not give too much insight into student’s overall skills - thus is not so valuable for the teachers
- technology is a challenge
- inter-school organisation is a challenge as well, but is worth the effort, as it makes the whole experience much more “natural” (it’s not very natural to meet somebody in a virtual environment who is sitting next to you in the computer lab)

8.3.3 Using the Division Practice Tool Sonic Divider in the Mathematics Classroom (see D6.4)

Background/NT tools and methods used:
- researcher-led study in Austria
- division practice tool Sonic Divider

Aims:
- Supporting pupils in their learning as well as in increasing their depth of knowledge by using a specific tool (i.e. the division practice tool Sonic Divider)
- Support teachers in their teaching and assessing of a concrete teaching activity in the classroom by using a specific tool (i.e. the division practice tool Sonic Divider)
Methods/data:
- Classroom study based on questionnaires and observation involving 20 children

Results/main findings:
- very good experiences with the tool
- teachers find the tool (as well as its visualisations) easy to use, emphasize its goal orientation and stimulative nature
- teacher find the tool as being a good supplement of traditional teaching methods
- students also find the tool easy to use, easily comprehensible and helpful

8.3.4 Technological Support of Individualized Teaching & Learning Practices in Different Learning Contexts (see D6.5)

Background/NT tools and methods used:
- RDS in Austria
- 1x1 Ninja tool

Aims:
- to investigate whether children actually learn something from playing 1x1 Ninja in general;
- to investigate the effect of different feedback methods provided by the 1x1 Ninja on learning.

Methods/data:
- data of 58 pupils form a primary school
- Pupils were asked to accomplish a total of five five-minute sessions of multiplication tasks during school time within a period of two weeks. Pupils’ interaction with the tool were automatically logged by the tool
- using a mixed-design
  o Firstly, the type of feedback provided to pupils is varied (between-subjects variable).
  o Secondly, the experiment was conducted in two different classes (between-subjects variable).
  o Thirdly, there are five measuring points (within-subjects variable)

Results/main findings:
- children can benefit from using and playing with the Ninja-Tool
  o improvement of learning performance
- students benefit more from receiving elaborate CbKST-based formative feedback relative to standard or regular feedback

8.3.5 The Usage of New Technologies in the 21st Century Classroom: A question of Teachers’ Personality? (see D6.5)

Background/NT tools and methods used:
- questionnaire-based study in Austria investigating the impact of and relationship between teacher personality traits, their educational beliefs and their acceptance and use of educational technologies

Aims:
- investigating the impact of and relationship between teacher personality traits, their educational beliefs and their acceptance and use of educational technologies
Methods/data:

- An online survey was created and implemented covering the following aspects: i) attitudes towards the usage of ICT, ii) user acceptance, and iii) personality traits. These aspects were preceded by a set of questions on demography.
- 110 persons (79 female, 31 male) have completed the questionnaire

Results/main findings:

- Widespread awareness that ICT can be an effective tool in supporting teaching and learning
  - Teachers often do not see the added value and benefit, ICT can bring to them
    - Solution Approach: Providing in-depth training in a wide range of computer technology skills to make full use of ICT in the teaching process
    - User acceptance towards e-learning systems quite good
- Teachers Personality:
  - high extrovert, agreeable, conscientiousness, open characteristics and low neurotic
  - Not playing such an important role for using computer technology

8.3.6 LIP for raising students' motivation in learning (see D6.6)

Background/NT tools and methods used:

- Teacher-led study supported by researchers in Austria
- LIP

Aims:

- field-test a tablet-based documentation system in regards of usability in every day classroom situations
- develop link to competencies without the need for explicit assessments - just based on observations and background knowledge about used teaching material and activities
- develop teacher-tailored analysis features
- explore how such a tool changes practices, and if it helps levering student’s motivation

Methods/data:

- LIP has been used in 4 different schools. In one of them it was used in 2 mixed-age classes (age 6-10) for 2 full years (3rd year starting now). In the other classes it was used for one year (2nd year starting now).
- logfile data (average of 1-3 daily entries per student)

Results/main findings:

- LIP proved to be very useful in daily class routines. It successfully changed practices in regards to documentation, planning, assessment and communication with parents
- teacher experienced LIP to positively affect students’ motivation by visualising their learning progress and providing base data for reflection (alone as well as with teachers)

8.3.7 An evaluation of a gamified feedback tool (Sonic Divider) (see D6.6)

Background/NT tools and methods used:

- RDS in Austria
Sonic Divider

Aims:
- purpose of the evaluation was not the tool itself but rather to investigate the effects of gamification as well as CbKST-based intelligent feedback mechanisms in education setting

Methods/data:
- Second classroom study on the Sonic Divider - experimental study involving 40 students
- 2x2 mixed design to investigate the effect of feedback on learning performance
  - two experimental conditions depended on the type of feedback
  - two measurement times for each condition

Results/main findings:
- children much appreciated using the tool for practicing divisions
  - more attractive and motivating than regular work on paper
- tendency that smart feedback results in slightly superior results

8.3.8 ICT Use as Basis for Communication and Negotiation Behaviour (see D6.3)

Background/NT tools and methods used:
- Researcher-led activity to gather requirements for the CoNeTo in Denmark

Aims:
- finding out about students ICT use
- finding out about students’ parents ICT use
- intensifying collaboration with teachers

Methods/data:
- informal talk with six students in a focus group about ICT available in classroom/at home and how they picture their classroom and their learning in the future
- questionnaire data from two students’ parents to the same questions that were raised to the students

Results/main findings:
- students would like to have ICT that makes school more fun
- students would like to use technology instead of books
- the two parents were content with the way it is right now and do not see the need to engage in new developments

8.3.9 RGFA, Communication & Negotiation (see D4.3; D6.3)

Background/NT tools and methods used:
- Participatory design workshop

Aims:
- gathering requirements for the design of Repertory Grid and CoNeTo Tool
Methods/data:
- 14 participants (teachers from primary and secondary schools, teacher educators, agents from organizational learning departments)
- design artifacts
  - power point presentations
  - flipchart
- facilitator notes

Results/main findings:
- three key themes emerged that should be addressed when designing tools:
  - gamification of teaching and learning
  - control
  - “cultural fit”

8.3.10 Using iPod to explore whether Java Programming students perform better in online, multiple-choice tests (see D6.4):

Background/NT tools and methods used:
- Use of five-stage TISL planning method
- Collaboration between teacher and researcher

Aims:
- To evaluate how teachers get along with the TISL method, and based on this to make improvements to the method and software design of the TISL planner.

Methods/data:
- This study included one teacher participant.
- The data collected from this enquiry comprised of:
  - Audio recordings of the TISL training and follow up sessions
  - TISL plans created by the teachers, as recorded on the TISL Planner Google Form.
  - A written report from the participant who carried out her TISL plan

Results/main findings:
- Changes to language in TISL method description

Evaluation of TISL method:
- Formulating a narrow enough question that could form the basis of an inquiry process.
- Identifying an appropriate set of data to answer the question
- Apply appropriate analysis to the data to answer the question

Factors which support facilitation:
- Commitment of teacher
- Culture of learning amongst teachers
- Technology
Factors which hinder collaboration:
- Clarity of goals
- Technology
- Value of collaborative data collection and analysis
- Triggers new ideas

Structured collaborative evaluation of cross-curricular teaching practice:
- Sharing between schools
- Positive experience for teachers
- Prompt discussion on method for inquiry into students’ learning

8.3.11 Cross-curricular problem-based learning (see D5.5; D6.4)

Background/NT tools and methods used:
- Use of five-stage TISL method
- Collaboration between teacher and researcher

Aims:
- To evaluate how teachers get along with the TISL method, and based on this to make improvements to the method and software design of the TISL planner.
- To evaluate collaboration between teachers using the TISL method, and based on this to make improvements in the process of application of the TISL method to support teachers work with each other (leading to less support from NT researchers).

Methods/data:
The data collected from TDA is comprised of:
- Audio recordings of the TISL training and follow up sessions
- TISL plans created by the teachers as recorded on the TISL Planner Google Form
- Data collected by teachers annotating audio recordings of their students’ retrospective discussions regarding a project-based learning activity
- This study involved one lead teacher participant, as well as over 50 teachers engaged in the cross-curricular project.

Results/main findings:
- Changes to language in TISL method description

Evaluation of TISL method:
- Formulating a narrow enough question that could form the basis of an inquiry process.
- Identifying an appropriate set of data to answer the question
- Apply appropriate analysis to the data to answer the question

Factors which support facilitation:
- Commitment of teacher
- Culture of learning amongst teachers
- Technology
Factors which hinder collaboration

- Clarity of goals
- Technology
- Value of collaborative data collection and analysis
- Triggers new ideas

Structured collaborative evaluation of cross-curricular teaching practice

- Sharing between schools
- Positive experience for teachers
- Prompt discussion on method for inquiry into students’ learning

8.3.12 The use of Google Docs in cross-curricular problem-based learning (see D5.6; D6.5)

Background/NT tools and methods used:

- Use of TISL planning method
- Teacher/research collaboration
- Follow up study from initial study (Cross-curricular problem-based learning, see D5.5)

Aims:

- To evaluate how teachers get along with the TISL method, and based on this to make improvements to the method and software design of the TISL planner.
- To evaluate collaboration between teachers using the TISL method, and based on this to make improvements in the process of application of the TISL method to support teachers work with each other (leading to less support from NT researchers).

Methods/data:

- Analysis of interviews with teachers whose learning design was affected by the inquiry, as well as interviews with lead teacher.
- This study involved one lead teacher participant, as well as 57 teachers engaged in the cross-curricular project. Interviews took place with 13 teachers

Results/main findings:

- Development of model to support distributed teacher inquiry in school-based contexts.
- importance of monitoring
- use of communication support tools
- communication management- public/private
- choice of data collection methods in TISL

8.3.13 Project Presentation and Design-Based Research (see D6.3)

Background/NT tools and methods used:

- Workshop to clarify NEXT-TELL and Design-Based Research for teachers (3 already participating, 2 new ones) in Germany
- Baseline Study and Requirement Analysis for new teachers
- ECAAD used by researchers for preparation
Aims:

- introducing new teachers and updating already participating ones
- explanation of DBR and NEXT-TELLs general approach
- presenting current state of NEXT-TELL from BS and RA (year 1)
- gathering BS/RA data from new teachers
- using ECAAD in a “drink your own champagne manner” to clarify the purpose and practical use to teachers in order to chain it to the assessment for learning approach

Methods/data:

- 5 teachers in 2 schools (grammar and secondary school)
- informal workshop talks
- artefacts from group zap application

Results/main findings:

- teachers perceive their workload as too high
- there is no fear among the participating teachers that ICT could make them dispensable
- teachers aims when using NT:
  - learn new ICT as well as chances and limitations of ICT/web 2.0
  - collaborate with teachers from other countries
  - improve own competencies
  - offer international experience to students and provide them with the chance to learn (new) ICT

8.3.14 ECAAD and OLM Research Workshop (see D6.3)

Background/NT tools and methods used:

- Researcher-led Workshop in Germany
- ECAAD and OLM (methods and tools)
- ECAAD used by researchers for preparation
- teachers were asked to prepare workshop by transferring one of their lesson plans into a prearranged google spreadsheet which columns meet different instances in ECAAD method/planner

Aims:

- introduce teachers to first version of tools (ECAAD and OLM)
- introduce teachers to ECAAD method
- explore how teachers perceive ECAAD method as well as planning tool v1.0
- explore what teachers opinion about OLM v1.0 is
- using ECAAD in a “drink your own champagne manner” to clarify the purpose and practical use to teachers in order to chain it to the assessment for learning approach
- get insight into teachers’ practice on individualized teaching

Methods/data:

- 5 teachers (4 in-service, 1 pre-service), 3 guest: 2 cooperation partners of the school from the pedagogical university, 1 cooperation partner with background of electronic programming in the private industry in 1 secondary school
• informal workshop talks
• lesson plan data in google spreadsheet (from preparation of teachers)
• lesson plan data in ECAAD v1.0 (modelled by researchers based on spreadsheet data)
• videotaped workshop

Results/main findings:
• ECAAD method (in spreadsheet) is perceived as difficult because current lesson planning practice does not involve the planning of assessment
• teachers were critical to ECAAD approach because in their opinion the detailed planning of lessons including assessments and the sharing of lesson plans with colleagues is not realistic because it is too time consuming (teachers described their lesson plans as consisting of three notes)
• sharing of plans is perceived as potentially useful for getting new impressions and other approaches on a topic but not for adoption to one’s own lessons
• sharing does not need to be digitally; a talk in the faculty room is perceived as enough sharing
• teachers stated that individualized teaching needs more preparation time because several different materials for each learning status is needed
• in opinion of teachers, individualized learning is closely connected to self-directed learning (important skill for student needed: self-assessment)
• self-assessment is perceived as something very difficult for students (tendency to overestimate themselves)
• it is perceived as necessary to attract students to their own learning (their own data) because students usually live from test to test and do not reflect what went wrong or well

8.3.15 OLM as Digital Grade Book and Tool to Leverage Self-Reflection (see D6.5)

Background/NT tools and methods used:
• Teacher-led design study supported by researchers in Germany
• OLM with all functionalities but no detailed instruction for usage in class (basic training was given beforehand)
• implementation of OLM was designed and planned by teacher; approach was discussed and elaborated if necessary with researchers
• OLM used by teacher and students (more than once)
• introduction to OLM for students given by teacher

Aims:
• researchers perspective:
  o find out how the OLM is adopted for real classroom practices
  o provide recommendations for developers how the OLM needs to be adapted
• teachers perspective:
  o leverage students in self-assessment and raise students’ reflection skills
  o find out how to support students in becoming self-regulated
  o improve own feedback practices
  o find out how to explain expected competencies
  o use OLM to leverage current assessment practices
Methods/data:

- 1 teacher in grammar school (Geography, History), 37 students (only 26 registered in OLM), 2 classes
- interviews, classroom observations, pictures, email exchange
- logfile data
- elaborated competency lists in OLM

Results/main findings:

- OLM was perceived as useful by the teacher due to several reasons:
  - it triggers to carefully rethink expected competencies and how to formulate them
  - it fosters transparency of success criteria
- it was also found time consuming when all functionalities are used (e.g., giving verbal feedback to each student → teacher suggested to implement a repository for this from which it is possible to choose appropriate feedbacks and which is “learning” new entries)
- students found it rather difficult to self-assess (teacher report)
- 10-star rating system (OLM v2.0) was difficult to “translate” for students who are used to 15 points scale (teacher report)
- students did not see the potential usefulness of OLM because it is not directly related to any subject (teacher report)
- some parents were very critical about the OLM because it is an online tool and it does not have anything to do with the content their children need for the final examination (teacher report)
- teacher developed TISL question out of first OLM usage
- teacher has learned that future OLM use needs to be adapted in regard to the introduction process for students to make them fully aware what the purpose is and why it might support their learning
- teacher has learned that the OLM is not ideal for grading his students

8.3.16 OLM as Tool to Leverage Peer-Feedback (see D6.5)

Background/NT tools and methods used:

- Teacher-led design study supported by researchers in Germany
- OLM with all functionalities but no detailed instruction for usage in class (basic training was given beforehand)
- implementation of OLM was designed and planned by teacher; approach was discussed and elaborated if necessary with researchers
- OLM used by teacher (more than once) and students (one time only)
- introduction to OLM for students given by teacher

Aims:

- researchers perspective:
  - find out how the OLM is adopted for real classroom practices
  - provide recommendations for developers how the OLM needs to be adapted
- teachers perspective:
  - find out how to make students think and help each other
  - leverage peer-feedback and provide students with a platform to peer-review
  - improve own feedback practices
Methods/data:
- 1 teacher in grammar school (Economics, Politics, History, Biology), 28 students, 2 classes
- interviews, classroom observations, pictures, questionnaire data by students
- logfile data
- competency lists in OLM

Results/main findings:
- providing verbal feedback in the OLM is the most effortful process (which is not caused by the OLM itself but more by the fact that thinking about potential next steps and pedagogical advice is effortful)
- based on the questionnaires that were filled in by students we could find that students like the idea of getting feedback on their competency level in OLM (in comparison to “only verbally” and “written on paper”)
- the skill meter visualization was found most useful by students, followed by table and smiley visualization, the word cloud and tree map were found least helpful (in OLM v2.0 these were all available visualization types), although about 70% of the students provided no information on the helpfulness of the last two visualizations
- students were furthermore interested to receive information via OLM on how good they perform compared to their peers
- students perceive using OLM as not self-explaining and rather difficult (about 55% of students)
- about 30% of the students were triggered to think and reflect about their strengths and weaknesses while using OLM with the intention to enhance their learning outcomes, about 45% did not feel triggered, the rest did not provide an answer
- teacher developed TISL question on the effects of obligatory and voluntary peer-feedback (which was unfortunately not addressed further by the teacher)

8.3.17 A Teacher-led approach to leverage students’ final exam preparation (see D6.6)

Background/NT tools and methods used:
- this study is based on previous work with a teacher in Hamburg (section 8.3.15)
- Teacher-led design study slightly supported by researchers in Germany
- OLM with all functionalities (teacher and students had already used the tool, so no additional training was given)
- implementation of OLM was designed and planned by teacher; approach was discussed and elaborated if necessary with researcher
- OLM used by teacher and students (more than once)

Aims:
- teachers perspective:
  - take away some grading pressure from students when using OLM
  - introduce students casually to self-assessment
  - help students gaining insight into their competency level related to the final exams

Methods/data:
- 1 teacher in grammar school (Geography, History), 15 students, 1 class
- interviews, email exchange
- log file data
refined competency lists in OLM

Results/main findings:

- second attempt was described as more successful than first attempt
- students were perceived as more open to the OLM usage and the teacher assumes this might have something to do with the context in which he used the OLM this time and the fact that it is not used for grading anymore which might have helped to release some performance pressure
- teacher perceived OLM usage due to his already familiarity with it as less time consuming than before
- OLM is perceived as a tool that might be used for detecting students that are falling behind and for further lesson planning due to the visualizations

8.3.18 The loop of classroom planning, teaching and assessing (see D2.8)

Background/NT tools and methods used:

- Ethnographic study of 3 STEM teachers and their planning, teaching and assessment of a teaching unit on Energy for the Future in Norway
- Teacher-led

Aims:

- Obtain a better understanding of planning, teaching and assessment connected to a teaching unit, over a period of time.
- Inquire what kind of student data that is collected
- Investigate how collected data is assessed.
- Investigate how collected data can be assessed and integrated as competence levels into the OLM.
- Investigate how visualisation of the competence levels in OLM can produce information for feedback and feed forward negotiation between a student and their teacher, from a teacher perspective.

Methods/data:

- 3 STEM teachers in one Upper Secondary school
- Observations, fields notes, recorded interviews

Results/main findings:

- The teachers planned in teams
- The teachers introduced the topic by investigated students level of competence through asking questions and drawing on the whiteboard.
  - The RGFA tool could be appropriate for this activity resulting in a new study for Y3 (D6.5).
- Assessing students competence gives teacher some knowledge about students’ competence level.
- Teachers have difficulties connecting feedback to the aspect of bringing student further
  - Confirms previous findings in the baseline studies (D6.2) about direct feedback to the students is given in different ways, such as comments on a test or in a discussion directly with the student, being relevant for the OLM tool (see also D4.4) that could help teachers maintain a better overview of the student competence and give evidence for concrete discussions with the students.
8.3.19 OLM Workshop (see D6.3)

Background/NT tools and methods used:
- Researcher-led Workshop in Norway
- Introducing OLM
- Presenting theory
- Demonstrating tool
- Hands-on training with OLM

Aims:
- Introducing OLM for implementing OLM usage in the school

Methods/data:
- 12 teachers, 1 school leader
- Debriefing session
- Questionnaire, after 2 weeks. Only 6 of 12 teachers answered

Results/main findings:
The results of the questionnaire showed that:
- In most of the questions all teachers answered natural in relation to different usage of OLM.
- Only two teachers highly agreed on the issue to encourage students to view their individual OLM, while two teachers were natural and two did not answer.
- Use of OLM to review individual students’ understanding, compare students’ understanding, form student groups for general discussion, form student groups for peer help, help and student groups - only one teachers agreed, four answered they were neutral, while two did not reply to this.
- Use of OLM to form student groups for specific activities, or help individuals, help the whole class - three teachers were positive and agreed to these issues, while three where neutrals.
- In relation to getting information in OLM about students learning processes (epistemic information) - four of the teachers agreed, while two were neutrals.

8.3.20 SPICE (see D6.3)

Background/NT tools and methods used:
- Baseline study with one school leader in Norway
- The school uses the theories of learning organisations [Senge, 1994]

Aims:
- Gather BS/RA data from new teachers
- Understand the connection between formative assessment and strategic planning
- Understand the connection between technology usage and strategic planning
- Connecting school leaders to NEXT-TELLs general approach

Methods/data:
- Interview with one school leader in one Upper Secondary School.
Results/main findings:

- The school is a paper-less school and focuses on the pedagogical aspects in technology, in all organisational levels of the school.
- Through the use of assessment reforms on a national level in Norway, the school is obligated to focus on formative assessment, and is working on an organizational level to commit to this.
- The school has a focus on professional development and professional experience.
- The school defines openness, willingness to change, distribution and change, as the life circle of the school, working to be a learning organisation through the following steps:
  - Letting research projects in school
  - Supporting further education
  - Enabling competence development
  - Facilitating new knowledge
  - Facilitating administrative structure
  - Encouraging teachers to collaborate with each other
  - Sharing workspace
  - Letting teachers working with related topics sit together
  - Homeroom teachers share offices
  - Internal courses running three to four times throughout the week, in order for teachers to choose when to attend
  - Letting subject groups go on external courses

8.3.21 Using OLM in everyday teaching? (see D6.6)

Background/NT tools and methods used:
- Teacher-led study in Norway
- OLMlets (not a NEXT-TELL tool)
- Open Learner Model (OLM)

Aims:
- use of NEXT-TELL e-Assessment technology within the unit of Nutrition and Health (STEM)
- to investigate if the participating teachers were able to use the NEXT-TELL tools in their everyday teaching
- to determine if the OLM could support formative assessment in relation to teacher inquiry into student learning (TISL)
- As our research aims were exploratory, a case study methodology was used in order to investigate if the teachers were able to use the NEXT-TELL tools in their everyday teaching. A number of data generation methods were used during the initial planning meeting through the teaching of the unit, to discussions after the unit was complete

Methods/data:
- Two STEM teachers conducted the trial with approximately 60 students from two different classes
- Observations, field notes, Interviews (notes and recorded), email, photos, assessment results, video, a questionnaire
Results/main findings:

- As the tool functions now, it is hard for the teachers to make OLM become an integrated feature of their everyday teacher.
  - It is overwhelming
  - It is difficult to navigate
  - It is hard to understand the connection between the Configuration Tool and OLM
- The teachers need time to understand the conceptual ideas of the tool
- Interface design and some technical issues limited the teachers in being able to carry out the TLS on their own
- The tools demands time and needs to be prioritized if going to be an integrated part of teachers practice

8.3.22 Supporting students in the art of questioning (see D6.6)

Background/NT tools and methods used:

- this is a follow-up TLD study based on previous work of teachers in Singapore (D6.5)
- OLM is used by teachers and students
- method of six thinking hats by de Bono [de Bono, 1985]
- the study was supported by a member of the Ministry of Education in Singapore

Aims:

- teachers perspective:
  - develop global, independent lifelong learners by enhancing research culture among students and teachers
  - improvement and evaluation of project ideas through the use of questioning structure
  - facilitate students’ reflection, planning and monitoring

Methods/data:

- 3 teachers in 2 schools, 64 students, 2 classes
- email conversations, questionnaire data, OLM log files, teacher presentation at conference

Main results/findings:

- teachers generally described the OLM as helpful in presenting the process of students’ progress in various competencies
- visualisations were found helpful to provide better formative feedback to the students
- teachers expressed they gained more insight in how students collaborate and communicate with each other
- teachers experienced that some students tend to overestimate themselves when self-assessing what could be used to get in close contact to students
9 Conclusions from Pilot Studies

This chapter serves the purpose to highlight the contributions and key findings of four years of NEXT-TELL in terms of assessment methods developed as well as the pilot studies. As we have mainly conducted case studies in which most of our tools were not used on a day-to-day basis, we are limited in the generalizability of our results and do not claim completeness or representativeness with them.

In a second step, we draw some lessons learnt out of our experiences and provide recommendations for further training and disseminating our methodologies. In completion of these two steps, we draw on the resources available in the RAT and TPACK frameworks described in chapter 3, as each framework provides different and mutually informative insights into matters of technology, practice, development and change with ICT in the sphere of education.

9.1 Contributions and key findings of NEXT-TELL

When reviewing the conducted studies that were undertaken during the past four years, it becomes clear that we have a wide variety in our studies in relation to different approaches, methods, and tools used. As this is a section of contributions and key findings, we will highlight the most considerable ones and try to connect them to the initially introduced frameworks of TPACK and RAT (chapter 3).

On a general scheme, we got the insight from year 1 on that there seems to be cultural differences across the participating countries when it comes to teachers' pedagogical knowledge with respect to state of the art assessment methods, teachers' professional development, teachers' readiness to use different ICT in their teachings, and also the ICT equipment in schools. Apart from the cultural differences nearly all teachers feared that new ICTs would increase their already high workload instead of reducing it.

Furthermore, we can say that nearly all teachers that we have approached during the last four years were keen on and interested in the objectives and ideas NEXT-TELL had. An important discovery was made in year 1 that teachers and school leaders felt challenged with the complexity of NEXT-TELL (i.e. the several different layers) because we wanted to develop solutions that transform existing practices. The TPACK framework helps analysing this observation in the sense that teaching situations in themselves are regarded as very complex and become even more complex as soon as new technology is introduced (or in NEXT-TELLs case incrementally developed), as introduction of new technology entails not only to learn that technology, but also reinterpretation of existing pedagogical and content knowledge. As NEXT-TELL was aiming at providing computational support for all different school layers this was at first rejected by schools because integrating technology into one single layer alone (e.g., the instructional layer) would already lead to a reinterpretation of existing knowledge and practices, meaning that an instructional solution could lead to a new problem on a different layer. Therefore, with the beginning of the second project year, it was one of our main focuses to reduce this complexity. We did not offer all possibilities to one school anymore but talked to teachers before introducing NEXT-TELL as a whole to find out in which areas they might be interested in the most. After that, we suggested a "NEXT-TELL light" version with a selection of possibilities NEXT-TELL had to offer that fit their specific interests.

Our approach to simplify NEXT-TELL solutions continued throughout the project duration and finally led to the development of our packages, which can be seen as one of our main contributions, and that also takes our main objective of considering the ecology of the classroom into account because the packages provide integrated sets of tools that are available online. Each package fit one main purpose (e.g., tracking of students’ learning → nextTRACK package, including myClass, LIP, and OLM) and only comprehends and integrates the NEXT-TELL tools that are necessary for that specific purpose together with a value proposition what makes dissemination quite easy. Furthermore, attention is paid to contextualising the packages with potential use cases, scenarios and training aids, in addition to the actual tools, to help teachers see how the packages could fit with or be adapted to their existing teaching practices. That means at the same time to enable teachers to reflect on their existing practices in themselves.

As stated in the introduction to this deliverable, one of the main goals of NEXT-TELL has been to support teachers in gleaning information about their students’ learning processes, and in particular to support teachers
in handling information about student learning in real time, and support them in individualising and optimising the learning environment while the learning is on-going. Throughout the duration of the project, it became increasingly evident that especially three content-free tools (LIP, OLM and myClass), two content-based tools (Sonic Divider and 1x1 Ninja - that also serve as assessment methods for the STEM field) as well as one of our methods (TISL) were of special interest to the participating teachers. All of these tools and methods focus on providing the teacher with, or helping him to gain more insight into students’ learning and understanding, although we have developed a much more extensive set of tools.

First, the content-free tools that gained most interest from teachers were LIP, myClass and OLM. LIP and myClass were specially tailored to the needs of teachers in Austria and not in the initial project set of tools. Therefore, those have been used mainly in Austria (with small exceptions that arose during the fourth project year when they expanded their coverage to Germany) and are experienced as easy to use in a day-to-day setting (once the setup is done). LIP and myClass are specifically designed to support real time classroom use, and may have uncovered a new way of working with assessment and appraisal data that teachers recognise as possible to align with their current pedagogical and content knowledge.

The OLM is perceived as interesting because of the obvious underlying concept and support of Assessment for Learning (which is also part of myClass and LIP, but not directly visible) and the opportunity it presents for students to engage in self- and peer-assessment activities, supporting classroom based learning-reflective activity for students. As a result, OLM has been extensively used in several of the classroom studies. Still, in terms of perceived usability, it is at times experienced as somewhat cumbersome and non-self-explanatory in use, and they occasionally feel challenged when using it on their own. Some teachers have been willing to invest time because they can imagine the possible benefits that come with it. As our experience with teachers using the OLM show it also seems to be demanding for teachers on a pedagogical side because a lot of the features it holds have not been used yet.

A possible explanation for why especially these three tools were noted as interesting could be that all three tools support activities that are already part of the everyday school practice - documenting learning processes of students as well as keeping evidence for development talks and the like - and furthermore hold the additional functionality of visualizing the inserted data. Zhao et al. (2002) found that innovations (i.e. tools) are more likely to be adopted by teachers if they fit their practices [Zhao, 2002]. We find that this is the case here as well. Especially the visualization features were highlighted as helpful by teachers, when they were going into discussions with students and their parents. In relation to the RAT framework, the visualization functionality provides an easy step from an amplifying technology use to a transforming one. An accumulated view on different learner data that can be filtered and displayed in an understandable way for several purposes (e.g., within class comparison or within student comparison on different competencies) is something that would not be possible that easily without the technology and is on the long term something that could make a tool indispensable for a teacher. For LIP and myClass it is additionally helpful that the process of inserting data is very timesaving for the teachers, as they are designed from the beginning to be used in real time in the classroom. Again in relation to the proposal of the RAT framework in chapter x, we have to note that the OLM was mainly used as an amplification for existing analogue practices (e.g., documenting processes, providing quantitative feedback) but is slightly advancing to be used transformatively (e.g., cumulative and comparative view on learners’ comprehension states and using those for individualization and further lesson planning). LIP and myClass were already extensively used in a transformative way.

The content-based tools represented in Sonic Divider and 1x1 Ninja were well received by the teachers, which can also be supported by the notion that tools are more easily adapted when they align well with existing practices following [Zhao, 2002]. As these two tools provide a clear usage scenario in themselves, and work as ready-made assessment solutions for practicing/rehearsing division and multiplication on a primary school level (in an intelligent tutoring system like way that is based on the cbKST framework), no additional knowledge was needed by teachers to apply them to their teaching setting. During the three studies in which the tools were used, we could furthermore show that the cbKST-based formative feedback which is provided by the tools lead to slightly superior learning results in comparison to visual feedback (correct/incorrect) or visual feedback with added auditive feedback.

The TISL method was mainly used and developed in England as well in Norway. We found that at the beginning of the project the teachers in the aforementioned countries were familiar with teacher research, and that it is a widely accepted approach to teachers’ professional development. This is different to Austria and Germany,
where teacher research is not well known and also slightly frowned upon. Taking this into account it gets clearer why the TDS studies were a special challenge and were most often undertaken with the close support of NEXT-TELL researchers in the two latter countries.

Nonetheless, we consider the development of the TISL method as a success and one of the key contributions NEXT-TELL has to offer. We worked very closely with teachers on this matter to make the method more practical to use. Given where we started with this method, and by working through feedback received from teachers taking part in the several TISL-related workshops, the different processes within TISL now are perceived by teachers as less academic and therefore much nearer to the practical teacher domain, what potentially lowers the integration into their attitudes and beliefs.

The studies conducted resulted in a very structured approach to teacher inquiry (TISL heart) that was also implemented into the TISL Planner. Furthermore our studies provided us with a theoretical understanding of how teachers share professional experiences for the sake of development of practices within this domain, and how teachers’ inquiry thus might impact school change.

On a non-tool specific level, we found that the integration of tools and technology into teaching is challenging and demanding for teachers and for students as well if they are to be used in a pedagogical sensible way. Although we would like to argue that our tools inherit (socio-constructivist) pedagogical concepts and were designed with the purpose of instructional use in mind which – on a theoretical level and by taking Hughes conceptualization of “technology integration” into account [Hughes, 2013] – should lower the threshold to use them pedagogically sensible and integrate them into ones teaching, this does not seem to be the case. This has something to do with the fact that our tools were not meant as ready-made solutions for teachers, but rather as a starting point in a DBR-inspired empirical research and development process. In fact teachers are more used to “already established tools” when they use technology which would mean that NEXT-TELL tools would require more TPACK by teachers although the developments inherit pedagogical affordances. Notwithstanding the fact that the idea of a co-design process was appreciated by teachers (and as the development of e.g., myClass shows partly also very successful), co-design is difficult if requirements from several different school systems and teacher personalities needs to be covered. Several changes and updates in the tools that were made due to new requirements that went beyond bug fixing were received as confusing when features were moved to different places within the tool or disappeared or when the interface changed although the features were still the same.

Apart from that it could also have to do with the fact that the underlying pedagogical concepts are not common practice for most of the participating teachers so that not only a new technology needed to be learnt. Additionally, our developments furthermore forced to rethink one’s own attitudes. Teachers more than once mentioned that they generally liked the opportunity to step one step back and think about, investigate and reflect upon competencies and learning goals they demand by their students but of course this is a challenging thing to do.

9.2 Challenges, Pitfalls, and Recommendations – Lessons learnt from Pilot Studies in schools

This section of the Deliverable illustrates what we have learnt during the past four years in regard to conducting research in schools and will furthermore provide suggestions as to how these challenges can be addressed in the future. After that, we will carve out recommendations for further training in and disseminating of the NEXT-TELL tools and methodologies.

Based on our experience in implementing our studies, we have identified several categories/areas of challenges from which we would like to draw some lessons learnt for potential future projects. Before doing so, we would like to stress once more that our results and experiences come from case studies in eight different countries with indeed around 250 teachers but of those 250 only few teachers worked with the same set of tools or same version of tools and same methods and therefore there are limits to the generalisability of the results. We stress this again because when a reader studies our lessons learnt, it might seem that we claim representativeness of our experiences to draw such lessons learnt. Every teacher and context is different and there is no one-size-fits-all solution.
It has been challenging for us to identify appropriate participation candidates who were willing to participate for more than a year. Essential selection attributes for participants were not only being interested in our field of study but also motivated to participate and being knowledgeable enough to use our tools as intended not only technologically but foremost pedagogically.

By addressing several different school leaders and teachers, we also became aware that the concept of a pilot project is something that is not easily understood by teachers and other school representatives.

Usually a teacher has a concrete pedagogical problem, which he needs a direct solution for. Although teachers in general liked the idea of being part in a co-design process, the expectations between project partners and participants deviated widely. Teachers are due to their already high workload foremost interested if a tool facilitates their work and their current practices, the research perspective - what precise effect a tool might have - is often far less interesting to them.

Keeping interested teachers on board was especially demanding when our tools were in an early development state. After reaching a point of maturity it became easier to approach and keep teachers because the value became clearer to them. As teachers cannot be monetarily rewarded for their efforts in research participation in most European countries, this also proved to be challenging when teachers realised they needed to volunteer their own resources which are scarce as long as they did not see their personal value which at first sight stands above the integration of technology into their teachings if this is not visibly facilitating their work.

We furthermore learnt, that the more complex a tool is perceived to be by a teacher (in terms of the technology itself as well as the underlying pedagogy) the more it is necessary to let them learn the tool gradually because they are otherwise scared off. The threshold for effective use of the tool needs at least to be visible. This might seem trivial but as we already stated, we were of the opinion that the integration of pedagogical concepts into a tool might lower the threshold and that only the tool perspective would needed to be trained. It turned out that this just seems to be the case for tools that also inherit specific content so that those tools can mainly work as cognitive tutors on their own.

During this learning/training process it is necessary to support the teachers as best as possible because one single negative experience (e.g., failed log-in, changed GUI due to an updated version) with a tool that is not directly mitigated by a project member can lead to a turn off.

On top of that, schools have large planning cycles. Of course this is more or less common knowledge but it often took several months until studies could be implemented, which we did not expect. Extra time for research trials is sparse and needs to be included as best as possible into the school year which usually requires a well organised planning approach that at best starts six months before the beginning of the new school year.

Getting into classrooms during the school year is very difficult and only possible if one makes use of already existing relationships. We strongly recommend including schools already in the planning and granting phase of such huge projects. Schools should be bound by contract as project schools and rewarded adequately for their efforts.

Translating Assessment for Learning (AFL) concepts into applicable teaching strategies with our tools proved somewhat problematic because some participating teachers were not familiar with the notion of AFL. Therefore, we see intensive face-to-face training on such key concepts (not only on tool perspective) as indispensable before enacting in research activities to find out if tools have a positive impact on students’ learning and teachers’ teaching.

A big issue was that the tools were first only available in English. We did not initially expect that this would be that much of a challenge. Many of the participating non-English Teachers repeatedly said that not only they have a problem with that but that of course this is especially difficult for their students. This issue was addressed by the consortium and the most popular tools were translated by the consortium into the respective languages but it should be considered to already involve this into the planned developmental work.

We finally draw some conclusions from our reported challenges that can be seen as general recommendations when developing tools in a co-design process with schools:

- tools need to be designed aligned with methods already used at schools, if they are to be usable at low-level entries without much training needed;
- no two teachers are (remotely) alike in their documentation practices, which proves to be a huge obstacle for developers used to, at least semi-, standardised processes from industry or university;
• teachers are willingly accepting changes of their practices if they can see the benefits gained in time or easiness of classroom practice during the initial training/introduction;
• even the most basic infrastructure cannot be used as a basis for planning school usage;
• students and parents are open to changes, and perceive them as helpful and welcome, when they allow them to participate in the learning process or have a clearer understanding about the foundations of the measurement the teacher has conducted;
• pedagogical change forms the basis of transition regarding tool usage, seldom the other way around.

Furthermore, we can identify the following obstacles for a seamless implementation:
• insufficient infrastructure for the students to use the tool (out-dated software, insufficient user rights for the teachers to set up their students, hardware not available in classroom);
• insufficient infrastructure for the teachers (no hardware available in classroom, software/hardware not able to be used for training, no Wi-Fi in the school);
• time is perceived as a scarce resource to teachers, and is a part of the equation when teachers consider to use new tools in support of altered practices.
• seldom to no previous understanding of competency grids or formative assessment on the side of the teachers;
• school boards are often inconclusive on the amount of support the teachers would get for their work with regards to equipment and workload reduction what forces the teacher to invest a lot of personal time.

9.3 A RA-T-PACK perspective on teacher training – Experiences with teacher training and development

During four years of NEXT-TELL, we have worked with several schools and gained valuable insights into the use of technology in schools that can be explained by applying the frameworks that we presented in the introductory part of this deliverable (chapter 3). Both frameworks are initially meant for the teacher side (either to “measure” the potential knowledge for integrating technology or “self-assessing” the technology use in order to reflect upon and move it forward). We use ideas from both frameworks to formulate recommendations for further training of our methodologies, which also has an impact for dissemination purposes.

TPACK offers an analytical lens that helps to understand teaching with technology, and in particular to understand new and forming situations of teaching with technology. As a basic starting point, teaching situations are regarded as inherently complex, even representing what Koehler and Mishra (2008) describe as wicked problems [Koehler, 2008, p. 18], especially when new technology is introduced. Introducing a technology entails reconfiguration and reinterpretation of the other knowledge bases in the model - the pedagogical and the content knowledge, meaning that a “solution” leads to new “problems”. It is not only a matter of adapting the content and the pedagogy to new technology. The challenge for teachers, then, becomes a matter of flexibly “navigating the space” [Koehler, 2008, p. 18] represented by pedagogical, content and technological knowledge.
The implications for teaching practices implied by a TPACK perspective are that rather than finding permanent problem solutions, effective teaching with technology is achieved through employing a design perspective on teaching practices. A design perspective on teacher practice implies that teachers need to see through “design-coloured glasses (...) and be inventive” (Perkins, 1986, p. 36, cited in [Koehler, 2008], italics added for emphasis). One example of ways teachers carry out design activities are through curriculum design - even with centrally governed curriculum reforms, teachers still have to adapt these to practices to be carried out in the classroom. Koehler and Mishra (2008) list the following consequences of TPACK for teachers, with particular respect to teacher development, also applicable to experiences with teachers who have participated in the NEXT-TELL project:

- **Teachers need more than isolated technology skills**: In addition to learn how to operate a certain technology, a sense of purpose with the technology (or curriculum/pedagogy) needs to be incorporated.

- **Development of TPACK is spiral-like and gradual**: because of the abovementioned complexities involved in learning new technology for teaching, it is advantageous to begin with well-known and simple technologies before advancing.

- **Demands from the subject matter or content**: As each area of teaching has different affordances, technology cannot be applied in a uniform way, but differ by content and also pedagogical approach.

- **The importance of practice in learning**: Following the view of teaching as navigating ill-structured domains, TPACK implies a practice-oriented approach. Working on concrete rather than abstract or conceptual problems is better suited in this kind of setting. Working on solutions to practicable problems can still be generative for forming the basis of knowledge to solve new problems, however.

- **The importance of context in learning**: Because of the complex nature of teaching, and the requirement of flexibility of teachers, the view of teachers as designers of for example curriculum acknowledges how they adapt to multiple and ever-changing contexts [Koehler, 2008].

Our initial approach to only train the teachers turned out not to be effective because many of the teachers we have been working with were not fully aware of the Assessment for Learning concept (especially in Austria and Germany), which is why we experienced that some of our tools were used as replacement and amplification of analogue tools (e.g., OLM as a grading tool). An obstacle was that some of the practices supported by our tools (e.g., ECAAD tool and methodology for lesson planning) were so far away from current practices of the participating teachers that those were not used although they hold the potential for transformation. Another interpretation is that they already carry out lesson planning, but do not take the time to write down or model their steps. This is in line with Zhao et al., who found that an innovative technology is less likely to be adopted the more it deviates from existing values, pedagogical beliefs and practices of teachers [Zhao, 2002].

In a more recent training workshop (project year 4), we took the opportunity to discuss the needs for training support with teachers, and made some insights that can be informed by observations such as those made in the RAT- and TPACK-inspired above paragraphs. As a part of the workshop, the teachers used existing training materials directly in trying to learn the tools (for the sake of reviewing the materials). One group of teachers used an introductory PowerPoint presentation on the OLM while working simultaneously with OLM itself, toggling between the two windows. The teachers explained this by a need for contextual and high level take on the purpose of OLM, available in condensed form in bullet points, while at the same time trying to understand how these ideas were manifested in the tool. The chosen way of working can in one way be understood by all insights offered by Koehler and Mishra (2008) in the list above, perhaps with the exception of demands from the subject matter. Knowledge about purpose and potential use contexts for our tools are also a prerequisite for transformational use by teachers.

This also supports the idea that tool presentations both for training purposes, and also to elicit teacher participation and interest should at least initially be kept quite clear and focused. That is not to say that complexity should be avoided at all times, but rather that it should be acknowledged that development is gradual. An earlier feedback session with teachers and school leaders (project year 2) drew the responses like that there were too many tools, too many acronyms, too inaccessible descriptions, and that the pedagogical ideas were hard to see as a consequence. The packaging of the NEXT-TELL tools together with descriptions of
possible use cases and scenarios can be seen to remedy this, as it takes the pedagogical and content knowledge of the teachers as a starting point.

Teacher 1: “User support is alpha and omega in the beginning. To students, user manuals are also important in the continuation. That's why a combination is important here.”

Teacher 2: “In the beginning, direct user support is favourable. A user manual has to be simple and well organised for students to use it. Video can be good too, the students mostly like that.”

Teacher 3: “It takes time to understand. I think it is important with a common run-through, and then try on your own, or/and in a workshop.”

In terms of preferences of direct training and participation support, there are as many opinions as there are teachers, and each teacher has his or her own preferences. In the teacher training workshop (project year 4) described above, we also found a variety of preferences when it came to mode of the materials. Some preferred video, as they were able to pause and navigate backwards and forwards, other preferred textually based documents. Most teachers valued PowerPoint presentations because of the clarity of what was presented. Most of the teachers pointed to the need for direct support from someone proficient in the tool in question, which can be seen in the above responses from teachers in this workshop.
## 10 References


11 Glossary

Terms used within the NEXT-TELL project, sorted alphabetically.

Partner Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>JRS</td>
<td>JOANNEUM RESEARCH Forschungsgesellschaft mbH, AT</td>
</tr>
<tr>
<td>UniRes</td>
<td>UNI RESEARCH AS, NO</td>
</tr>
<tr>
<td>KMRC</td>
<td>Medien in der Bildung Stiftung, DE</td>
</tr>
<tr>
<td>TUG</td>
<td>Technische Universität Graz, AT</td>
</tr>
<tr>
<td>CBS</td>
<td>Copenhagen Business School, DM</td>
</tr>
<tr>
<td>BHAM</td>
<td>University of Birmingham, UK</td>
</tr>
<tr>
<td>IOE</td>
<td>Institute of Education, University of London, UK</td>
</tr>
<tr>
<td>LL</td>
<td>Lattanzio Learning SpA, IT (former eXact Learning Solutions SpA, IT)</td>
</tr>
<tr>
<td>TALK</td>
<td>Verein offenes Lernen, AT</td>
</tr>
<tr>
<td>BOC-AT</td>
<td>BOC Asset Management GmbH, AT</td>
</tr>
<tr>
<td>BOC-PL</td>
<td>BOC Information Technologies Consulting SP.Z.O.O., PL</td>
</tr>
<tr>
<td>MTO</td>
<td>MTO Psychologische Forschung und Beratung GmbH, DE</td>
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</table>

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Baseline Study</td>
</tr>
<tr>
<td>CbKST</td>
<td>Competence-based Knowledge Space Theory Training Course</td>
</tr>
<tr>
<td>CBT</td>
<td>Computer Based Training</td>
</tr>
<tr>
<td>DBR</td>
<td>Design-Based Research</td>
</tr>
<tr>
<td>ECAAD</td>
<td>Evidence Centered Activity and Appraisal Design (builds on the ECD)</td>
</tr>
<tr>
<td>ECD</td>
<td>Evidence Centered assessment Design (e.g. PADI project)</td>
</tr>
<tr>
<td>EFL</td>
<td>'English as a Foreign Language'; EFL refers to learning English in a non-English-speaking region, such as studying English in an Asian or Latin American nation. Typically, EFL is learned as part of a student's school curriculum or for career purposes if working for an international corporation.</td>
</tr>
<tr>
<td>ENA</td>
<td>Epistemic Network Analysis</td>
</tr>
<tr>
<td>ESL</td>
<td>English as a Second Language; refers to learning English in the target language environment</td>
</tr>
<tr>
<td>HCI</td>
<td>Human Computer Interaction</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LEPP</td>
<td>Longitudinal Evaluation of Performance in Psychology (2nd generation e-portfolio)</td>
</tr>
<tr>
<td>NEXT-TELL</td>
<td>Next Generation Teaching, Education and Learning for Life</td>
</tr>
<tr>
<td>OLM</td>
<td>Open Learner Model</td>
</tr>
<tr>
<td>PADI</td>
<td>The PADI project aims to provide a practical, theory-based approach to developing quality assessments of science inquiry by combining developments in cognitive psychology and research on science inquiry with advances in measurement theory and technology.</td>
</tr>
<tr>
<td>RA</td>
<td>Requirement Analysis</td>
</tr>
<tr>
<td>RDS</td>
<td>Researcher-led Design Study</td>
</tr>
<tr>
<td>SRI</td>
<td>Stanford Research Institute</td>
</tr>
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</table>
The Science, Technology, Engineering, and Mathematics (STEM) fields are collectively considered core technological underpinnings of an advanced society, according to both the National Research Council and the National Science Foundation.

Acknowledgement: The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 285114.
Visualisation of Learning Processes

Dear Participant,

In the following you will find different visualization ideas as they are used in the Next-Tell project. The visualizations depict information on the learning domain and student data in a virtual learning environment and aim at supporting learners or instructors. The main purpose of these visualisations is to provide a quick and understandable overview on the current status of learning.

You are kindly requested to have a close look at each visualization and to respond to the subsequent questions. The purpose of this is to assess the quality and usefulness of the presented visualizations. By providing feedback, you help us to decide on which visualizations to use and how to improve them.

There are no right or wrong answers, we only ask you to provide honest and accurate answers. All of your answers and personal data are anonymous and will be handled with care.

Thank you very much for your collaboration!
If you have further questions please do not hesitate to contact me!
eva.hillemann@tugraz.at

Demography and Background

Gender:
Please choose only one of the following:
- Female
- Male

Age
Please write your answer here:

Teaching Experience *
Please write your answer here (in years):

Students’ ages
Please write your answer here (in years):
Figure 1-1

Please have a look at the following figure visualising the current learning progress of individual pupils (in percentage terms).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Partially disagree</th>
<th>Neither nor</th>
<th>Partially agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Please have a look at the figure and answer the following question.

Boris Bann is better than Callum Campbell and Florian Fink. *

Please choose only one of the following:

Yes

No

Comments:

Please write your answer here:
Please have a look at the following figure visualising the current learning progress of individual pupils (in percentage terms).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree 1</th>
<th>Partially disagree 2</th>
<th>Neither nor 3</th>
<th>Partially agree 4</th>
<th>Strongly agree 5</th>
</tr>
</thead>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.
Please have a look at the figure and answer the following question.

Callum Campbell is better than Boris Bann and Florian Fink. *

Please choose only one of the following:

- Yes
- No

Comments:
Please write your answer here:

Figure I-3

Please have a look at the following figure visualising the current learning progress of individual pupils (in percentage terms).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.
Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Strongly disagree (1)</th>
<th>Partially disagree (2)</th>
<th>Neither nor (3)</th>
<th>Partially agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

- ○
- ○
- ○
- ○
- ○

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

- ○
- ○
- ○
- ○
- ○

Please have a look at the figure and answer the following question.

Florian Fink is better than Callum Campbell and Boris Bann. *

Please choose only one of the following:

- ○ Yes
- ○ No

Comments:

Please write your answer here:

Figure I-4
Please have a look at the following figure visualising the current learning progress of individual pupils (in percentage terms).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Partially disagree</th>
<th>Neither nor</th>
<th>Partially agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Please have a look at the figure and answer the following question.

Phil Piper is better than Paul Asbury and Florian Fink. *

Please choose only one of the following:

Yes

No

Comments:

Please write your answer here:

Figure I-5

Please have a look at the following figure visualising the current learning progress of individual pupils (in percentage terms).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.
Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Partially disagree</th>
<th>Neither nor</th>
<th>Partially agree</th>
<th>Strongly agree</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Please have a look at the figure and answer the following question.

Paul Asbury is better than Wilfried Fashion and Florian Fink. *

Please choose only one of the following:

- Yes
- No

Comments:
Please write your answer here:

Type of Figure I
Please indicate which of the figures previously shown you find most useful for getting a detailed overview of individual pupil’s learning progress. When answering the questions please have the following aspects in mind: comprehensibility, usefulness, and amount of information. * 

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Comprehensibility</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Please write your answer here:

Figure II-1

Please have a look at the following figure visualising the current achievement of competencies in a specific teaching subject. Imagine that you would use this figure as basis for a conversation regarding the upcoming school certificate with one of your pupils (age 11 to 15).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>I find this figure suitable for getting an overview of the current status in the learning process.</th>
<th>Strongly disagree</th>
<th>Partially disagree</th>
<th>Neither nor</th>
<th>Partially agree</th>
<th>Strongly agree</th>
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<tr>
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I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Comments:
Please write your answer here:
Please have a look at the following figure visualising the current achievement of competencies in a specific teaching subject. Imagine that you would use this figure as basis for a conversation regarding the upcoming school certificate with one of your pupils (age 11 to 15).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Partially disagree</th>
<th>Neither nor</th>
<th>Partially agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find this figure suitable for getting an overview of the current status in the learning process.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Comments:
Please write your answer here:
Please have a look at the following figure visualising the current achievement of competencies in a specific teaching subject. Imagine that you would use this figure as basis for a conversation regarding the upcoming school certificate with one of your pupils (age 11 to 15).

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.

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Comments:

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</table>

I find this figure suitable for getting an overview of the current status in the learning process.

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

Comments:
Please write your answer here:
Figure II-6

Please have a look at the following figure visualising the current knowledge state of an individual pupil (green-rimmed). This figure shows you that this certain pupil has the competences a, b, and c.

Please answer the questions by indicating the extent to which you agree or disagree with each of the statements.
Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th>Strongly disagree 1</th>
<th>Partially disagree 2</th>
<th>Neither nor 3</th>
<th>Partially agree 4</th>
<th>Strongly agree 5</th>
</tr>
</thead>
</table>

I find this figure suitable for getting an overview of the current status in the learning process.

☐ ☐ ☐ ☐ ☐

I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.

☐ ☐ ☐ ☐ ☐

Comments:
Please write your answer here:
Type of Figure II

Please indicate which of the figures previously shown you find most useful for getting a detailed overview of individual pupil’s strengths and weaknesses (in terms of competencies). When answering the questions please have the following aspects in mind: comprehensibility, usefulness, and amount of information. *

Please choose the appropriate response for each item:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensibility</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Information</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Please write your answer here:

Thank you very much for your collaboration!

If you have further questions please do not hesitate to contact: 
[eva.hillemann@tugraz.at](mailto:eva.hillemann@tugraz.at)

Please visit the project website: 
[www.next-tell.eu](http://www.next-tell.eu)