Methods and Specification for Student Model V2

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1 Executive Summary

This document details revisions and extensions to the methods and specification to the student model (OLM).

Feedback on the NEXT-TELL OLM arising from interactions with teachers and other NEXT-TELL researchers

First the document brings together different types of feedback on the OLM:

- feedback from teachers about the existing OLM prototype implementation, and to guide future OLM development;
- feedback from teachers to feed into the design of the Communication and Negotiation Tool;
- feedback arising from analysis of constraints and dependencies in the NEXT-TELL development trajectory.

Since the first prototype version of the OLM has been implemented, it has been circulated to other NEXT-TELL researchers, presented at NEXT-TELL project meetings, and demonstrated in interactions in schools with teachers. These opportunities to present the current implementation of the OLM have given rise to feedback from teachers within schools, and from other NEXT-TELL researchers. The main finding from the school interactions is that different teachers from different countries highlighted different issues. These workshops may not have included teachers who were broadly representative of their countries. However, the findings from different countries included that Danish teachers expressed more concerns that the OLM might give rise to unwelcome student comparisons with other students, whereas the German teachers found that student to student comparisons might be a positive aspect of Open Learner Modelling. The need for flexibility is therefore recognised. Norwegian teachers were generally positive about using the OLM and suggested modifications to the design of its user interface. Also described is a participatory workshop concerned with gaining teacher insights into the development of the Communication and Negotiation Tool (CoNeTo).

Feedback about constraints and dependencies that have become apparent at this stage in the NEXT-TELL OLM development trajectory

OLM development is only part way through, but users are keen to make use of the OLM before it reaches a more mature implementation. The ultimate aim for OLM system development in T3.1, T3.2 and T3.3 is to respond to requirements from teachers, and requirements by incorporating automated throughput. However, mechanisms to support this automatic throughput have not yet been implemented. The requirement to facilitate some kind of interaction is analysed and one solution based upon student manual tagging of their work has been developed.

Information on competency frameworks used in Austria and Norway

Information is provided about how existing competency frameworks are used in different European educational systems. Two competency frameworks have been considered in detail. A framework for TESL is used in Norwegian schools is described. In addition, a framework for ICT skills in Austria is presented.

Update on how NEXT-TELL OLM fits with the SMILI OLM framework

A needs analysis is conducted with extensions and revisions made to the SMILI OLM framework description for the NEXT-TELL project. Key changes are described for how the NEXT-TELL OLM is situated within the SMILI framework. Of the thirteen SMILI OLM descriptors made for the NEXT-TELL OLM in D4.1, five remain unchanged and eight have been updated.

Update on NEXT-TELL OLM Use Cases

The NEXT-TELL OLM use-cases presented in D4.1 are revised and extended to give an extended set of D4.3 use cases. Of the fifteen use cases presented in D4.1, thirteen remain the same. One teacher use case is elaborated and one teacher use case is superseded by a much more detailed use case (coded as T3 in table 1). The original D4.1 and new D4.3 use cases as well as a small number of scenarios have been placed in appendices.
Basic Methods for OLM Interactions for Supporting Formative Assessment

Different types of possible interaction with the NEXT-TELL OLM are presented. These include describing how to manually enter students, groups, activities and competence levels into the OLM. In addition, how to get the OLM to provide visualisations of various kinds of formative assessment analysis, are provided.

Updates on Repertory Grid for Formative Assessment (RGFA) and the Collaboration and Negotiation Tool (CoNeTo)

Progress on the RGFA tool is described, with future steps for this and CoNeTo, laid out.

Overview

Overall this deliverable can be seen to deepen the methods and specification for the student model. Short term requirements to allow for meaningful manual interaction with the OLM and long term requirements for a fully integrated OLM with automated throughput of data originating in the ECAAD planner and ending up in an e-portfolio, have all been updated.
2 Introduction

2.1 Purpose of this Document

This document reports on the ‘Methods and Specifications for Student Model V2: Revisions and Extensions’. The preceding methods and specification for activity capturing tools V1 have been published in NEXT-TELL deliverable D4.1. The first set of tools has been released as NEXT-TELL deliverable D4.2. For the extensions and revisions we have taken into account: feedback received during interactions with teachers (in workshops and training events), experiences from the involved NEXT-TELL partners during development and evaluation of the tools delivered, and feedback received from the reviewers at the first annual review meeting.

2.2 Scope of this Document

This deliverable describes revisions and extensions to the methods and specification for the student model V2. Basic introductory information from NEXT-TELL deliverable D4.1 is not repeated in this deliverable. The focus is on adjustments to the plans for the first tool release. The scope of work package 4 described in previous deliverables (D4.1 and D4.2) remains unchanged. The activity capturing tools which will be integrated with the student model are covered in NEXT-TELL work package 3 with revisions and extensions described in deliverable D3.3.

2.3 Status of this Document

First draft for internal review

2.4 Related Documents

As this deliverable describes revisions and extensions it is recommended to be familiar with the preceding work package 4 deliverables D4.1 and D4.2. In addition, it also recommended to consult the strongly related revision and extension deliverables of related work packages, i.e. D2.3, D3.3, and D5.3.
3 Updated stakeholder requirements

3.1 Recent Participatory Design Workshops (PDWs) and other interactions with teachers: Implications for OLM design from workshops, consultation with end users and stakeholders

This section presents outcomes from recent participatory design workshops, relevant to OLM. The workshops (held in Denmark, Germany and Norway) are described in greater detail in Deliverable 6.3.

Relevant findings from workshops:

1. Danish teachers expressed concerns about not having enough computers for students to work on their own. They proposed a solution that students could work in groups and the competencies of groups could then be represented in the OLM. **Needs analysis for OLM: How might the OLM be adapted to cater for groups not individuals?**

2. Danish teachers also expressed concerns about how parents with limited resources might not be able to do much about recommendations arising from interaction with OLM: **Needs analysis for OLM: implementing graded or scaled levels of interaction so parents with minimal resources can still engage in a scaled down manner.**

3. Danish teachers expressed concerns about monitoring and comparison between students. This concern was partly ameliorated by thinking that comparisons would be between two points in time for the same individual. In contrast, the German teachers’ responses were that showing where students stand in a class is much more interesting (as quoted from D6.3 “meanwhile, they demand it”). **Needs analysis for OLM: How might OLM cater across cultural differences so that it is equally acceptable for cultures which are more or less accepting/welcoming of explicit comparisons.** One reasonable solution is to let the user configure the view however s/he likes it. This may bring the additional requirement that a teacher can define view for his activities/students. So a teacher should be able to define that comparisons are not possible this is true for students. So a student can only choose from pre-defined views which are set by the teacher from a larger set.

4. Norwegian teachers were very interested in what the NEXT-TELL OLM has to offer, especially possibilities to support on-the-spot decision-making (e.g. grouping students) and facilitation of incorporating assessment into the learning process. STEM teachers are interested in visualising competence goals in starplot form. **Teachers suggested some (anticipated) improvements to the user-experience by adding ‘drag and drop’ of competencies into activities and vice versa (to support teachers’ natural workflow); ensuring functionality across a range of browsers; and importing student lists and grouping.** Following the Norwegian OLM workshop, a questionnaire was distributed by email, with 6 respondents. There were mixed reactions regarding whether teachers would want to be able to adjust weightings given to information from students, peers, parents and various electronic sources, with some responding positively to these possibilities, and some neutrally. (There were no negative responses.) The questionnaire will be distributed more widely as the various teacher groups adopt or consider adopting the OLM.
3.2 Communication and Negotiation Tool (CoNeTo) Participatory Design Workshop

A participatory design workshop was held with 14 teachers and technology enhanced learning consultants on 05-Feb-2012. The participants were all enrolled in the Master of ICT in Learning (MIL) program. As reported in D4.1, we organized the session as a Future Workshop consisting of the three different phases of Critique, Fantasy, and Implementation (Kensing & Madsen, 1991).

In this section, we present the observations from the Critique and the Fantasy phases. The implementation phase is presented in the technical report for the CoNeTo (Communication and Negotiation Layer Tool).

3.2.1 Structure of the Workshop

The participants in the future workshop are teachers from diverse organizations settings ranging from primary and secondary schools to teacher education institutions and organizational learning departments. Building on the last PD workshop, this future workshop was also embedded in the MIL seminar called “Designing for Technology Enhanced Learning and Teaching” that the teachers had voluntarily signed up for. The workshop was 180 minutes in duration and consisted of a 30-minute introduction and orientation session, a 100-minute working period, and a 50-minute presentation period. Four researchers attended the workshop.

The workshop began with a plenary session on Critique Phase. The participants discussed current challenges encountered in classroom management and specifically classroom information management. The NEXT-TELL vision, methods and tools were then briefly introduced followed by a presentation of the teacher and student workflow diagrams and a schematic of the information flow. The PD participants then formed four groups of 3-4 persons for the Fantasy phase and employed the interaction design process to ideate, critique, discuss, sketch, and evaluate a technology enhanced teaching and learning solution to the communication and negotiation of the student activities and knowledge inference information and visualization in general and NEXT-TELL in particular.

The participants worked in Danish but produced their design artifacts in English. The facilitator answered questions and took notes. Each group then presented the salient points of the process (Fantasy Phase) and the product (the design artifact to inform the Implementation Phase) in a plenary session. Two groups created PowerPoint presentations to capture both the process and the product whereas the other two groups presented a sketch of their design artifact on a flipchart. The workshop concluded with a summary discussion and an open invitation for the participants to be involved in the design and development of the CoNeTo. Three teachers from the workshop expressed interest and a meeting was scheduled at the Copenhagen Business School to explore and plan collaboration activities.

3.2.2 Findings

Content analysis was conducted on the facilitator notes during the 3-hour session and the design artifacts created by the participant groups. Three key themes emerged:

1. Gamification of Teaching and Learning. There are influences from the contemporary design paradigm of Social, Local, and Mobile (SoLoMo) and “Gamification” in the conceptualization and the design of dashboards for the communication and negotiation tools for a data-driven classroom of the 21st century. This was supported by both formal and informal discussions with the participants as well as by a design critique of their sketches (see below).

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1 The Master Programme on ICT and Learning is a web based 2-year part-time education that is offered by Aalborg University in cooperation with Aarhus University, Copenhagen Business School, DPU (School of Education - University of Aarhus), Roskilde University Center, and IT Vest. [http://www.mil.aau.dk/index.php?id=463&L=0](http://www.mil.aau.dk/index.php?id=463&L=0)
2. **Control**: The issue of control was mentioned by all participants as being a key design consideration. In particular participants mentioned both the positive potential of communication and negotiation of teaching and learning activities and knowledge inference and the negative potential for the expansion of the extent and scope of the traditional classroom.

3. **“Cultural Fit”**: Participants reflected on their organizational and national cultures and tried to assess the “cultural fit” of the proposed solutions within their practice. There was an apprehension that technology enhanced formative assessment tools might be used for summative evaluation purposes and for performance monitoring of teachers.

### 3.2.3 Conclusion

The design sketches and the process notes were incorporated into the on-going design and development of the Communication and Negotiation Tool (CoNeTo). We decided to offer three different solutions an open-ended mind-mapping commercial tool (MindMeiser), a concept-mapping tool with scaffolding support (CMap Tools), to an artifact centered discussion tool (CoNeTo)—to support the socio-cultural aspects of the stakeholders’ communication and negotiation processes.

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**Figure 1: Design Sketches Created by the Future Workshop Participants**

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4 Needs analysis and design specifications: Intended revisions to the OLM’s current functionality

4.1 Updating stakeholder information relevant to OLM development from competence assessment frameworks

This section describes competence, learning goals and assessment frameworks so far incorporated into the NEXT-TELL OLM. These are given as examples, and can easily be extended to cover more frameworks as required by teachers in specific subject areas.

4.1.1 Competences Example 1: TESL in Norway

Norway has defined a set of national competence goals and a curriculum plan that have to be integrated into teaching and learning of English in schools (http://tev.hfk.no/templates/SchoolSubsite.aspx?id=15742). How this is to be realised is determined locally. In Nordahl Grieg high school (Bergen), teachers have regular meetings to discuss the details of how this should be achieved in their school. (Other schools and other countries may approach such details differently: see example in next section.) For the Norwegian example that has been implemented, there are three primary areas: language learning; communication; and culture, society and literature. These are related to target competences for specific points in school education: after two years; after four years; after seven years; and after ten years of study. As an illustration, after two years of English, students should be able to give examples in “language learning” for: situations where it may be useful to know some English, some common words and phrases of native English speakers, and English words and phrases related to their own interests. By the tenth year they should be able to: use a range of situations and strategies in language learning, identify similarities and differences in Norwegian and English and transfer to their target language of English, use appropriate basic grammatical and structural terminology, be able to independently and critically use a variety of aids, be able to describe and assess their own attempts at learning English. The “communication” target competences also become more complex, from examples after year two years, such as being able to understand and use common language associated with the immediate environment, understand simple instructions, and be able to ask and answer simple questions; to after ten years being able to master a wider range of vocabulary, understand both spoken and written texts in a variety of subjects, adapt language to suit the genre and situation, write appropriately argued and structured texts, etc. The “culture, society and literature” competence targets similarly increase in focus, from consideration of aspects of children’s daily lives and participation in culture and literature in different ways (e.g. using words, pictures, music and movement); to richer discussions of lifestyles, beliefs and cultures, explanations of issues in history and geography in the UK and USA, discussion of literature from a variety of genres, and creation of their own oral or written language that builds on inspiration from literature and art. Competences are expressed in the form of what students can achieve. As stated above, these and some additional and the intermediate (four and seven year) target competences, schools and teachers need to plan activities to enable students to achieve the competences. They also need to create an assessment of the degree to which the competences have been acquired and, correspondingly, some method of recording the outcomes. Given that all this is already necessary, it is a small step to move this information into the learner model. Thus, it can be considered alongside evidence from other sources - traditional and data gathered using routine and new technologies.

4.1.2 Competences Example 2: ICT Skills in Austria

Commissioned by BMUKK (Bundesministerium für Unterricht, Kunst und Kultur; the ministry http://www.bmukk.gv.at/), a reference framework has been developed for informatics literacy in Austria (http://www.informatische-grundbildung.com/), which is intended as a guide for teachers. Like the Norwegian example, it is competency-focused, also taking notions from the European Framework of Reference for Languages as a starting point for the competency-based framework. The design uses a graded competence model containing four central themes comprising content areas and associated learning objectives. These
indicate the expectations for students at the end of secondary level with reference to digital literacy and basic computer science education. While not an official national guideline or requirement, we have implemented these competences in the NEXT-TELL OLM as they bridge a gap in defining the learning needs or expectations for this level.

Three skill levels are envisaged, with the first (basic) already defined. This includes 70 competency descriptions in the categories of: information technology, people and society; computer systems; applications; and concepts. Each of these has sub-categories, for example for IT, people and society: importance of IT in society; responsibility for the use of IT; privacy and data security. As with the previous language example, ‘can do…’ statements are used. Examples for ‘importance of IT in society’: “I can name important applications of information technology”; “I can name areas in which computers cannot replace humans”.

As with the Norway example, teachers will also need to have some way of recording competences achieved, and so the previous comment for TESL in Norway, about extending this for incorporation into the OLM, also applies here. Furthermore, in Austria IT is a “cross-over” topic (crossing several subjects), therefore documentation is extremely important. Many Austrian secondary schools do not have IT as a separate subject – therefore the IT-education relies on work undertaken in other subject areas. In such cases the OLM will be central in helping to identify and document the ICT skills of students.

4.2 From stakeholder requirements to needs

4.2.1 Revisions and extension arising from considering how the OLM will be integrated with other systems, such as the e-portfolio and activity visualization elements of NEXT-TELL

Requirements arising from convergence of NEXT-TELL WP3 activity visualisation and NEXT-TELL WP4 OLM visualisations: modelling of activities and competencies

Some requirements for the NEXT-TELL OLM (in WP4) are closely linked to requirements for the non-OLM visualisation functions of NEXT-TELL (in WP3). One such WP3 activity visualisation requirement is to be able to add a datum for all students present in a group. This documents for a whole group, that a certain topic was addressed. This may not be viewed strictly as an OLM requirement (e.g. it does not provide information about students’ competencies). Whether this is considered to be OLM data will likely depend on whether the teacher thinks ‘exposure’ to be, for example, low-weighted evidence for the learner model in a particular case. However, either way, this datum may then be used in relation to competencies. For example, media education is a “horizontal topic”, addressed in different ways in many subjects. It must be made as easy as possible for any subject teacher to document what has been done, e.g. “watched iRobot (the movie) with the class and discussed it; class then wrote a diary from the view of a) Prof. Lennart, b) Spooner, c) Sonny (the robot)”

There are many further competencies which are related to these experiences, such as critical thinking about technology. A design requirement is that a student can add details to such ‘experience-data’ in order to increase his/her competence-level from “being exposed” to “understanding” or “having a skill”. So the high level requirement for the NEXT-TELL architecture arising from these situations is that there is a natural link between non-OLM activity visualisation (arising from WP3) and OLM-proper requirements (in WP4). Therefore scenarios, tools and visualisations in these two work-packages need to be closely integrated

Linking evidence of experiences in the e-portfolio to competencies in the OLM

As NEXT-TELL integration gathers pace, the importance of the requirement for integration between the OLM and the ePortfolio has been emphasised (see also D3.3). This integration will allow students and teachers to document claims in the OLM by link to a document in the ePortfolio.

A more advanced requirement is for a preview-feature (previewing an attachment). Support for checking a student’s claims by the teacher will also be required. One desirable development is that a teacher should be able to see ‘at a glance’, a list (one line for each student or by clicking next-next-next) of what students claimed about their work (including the preview). So, for example, the competency “formatted a document well” could easily be checked (maybe just ticking an OK-box next to it). Another additional feature is to be able to see all entries together with their type (Moodle-quiz, student’s manual entry, teacher’s manual entry); if a student’s
shown competencies are only based on his/her own (non-checked) manual entries, it might require a closer look by the teacher. These requirements arose from interaction of NEXT-TELL researchers with school-based teachers (such as in the workshops described in D6.3) and from subsequent discussions within NEXT-TELL.

4.2.2 Revisions and extensions arising from a requirement to find medium term alternatives to automated throughput

"A second set of eyes" principle. Ultimately, NEXT-TELL will include automatic assessment and data throughput from the student carrying out activities to the teacher viewing student performance and progress towards selected competencies. Automated throughput from classroom activities to OLM visualisation has not yet been implemented. This is currently a problem for those activities that will eventually allow this automated updating, because teachers do not have the time to assess competencies for all students in class in real-time, and then manually add this information into the OLM. As a result, intermediate solutions that will facilitate classroom use of the OLM without this capability have been explored. Our planned solution is to implement scenarios where the teacher gives students a learning task which is explicitly focused on one or more competencies. Then, during or on completing the task, students assess their own performance towards these key competencies. The task will involve production of some form of evidence for the student's achievement of the key competencies. The student can then ‘tag’ this evidence to show what they have achieved, and students can check each others' tagging. Such peer access to student OLMs is a core design requirement for the OLM not only to seed the learner model until more automatic throughput is available from other NEXT-TELL subsystems, but also to enable continuing peer assessment and collaborative involvement in the learner modelling process in contexts where teachers consider this useful.

The scenario titled: The tagging of competencies as a meta-competence (in the appendix section 10.1.15) gives more details for how this “second set of eyes” principle might be implemented in classroom practice.

4.2.3 Revisions and extensions arising from ongoing evaluation of current implementation

A minor change arising from discussion within NEXT-TELL is adding the ability to personalise the interface, for example, by uploading pictures.

4.2.4 Revisions and extensions arising from consideration of Cognitive Density

Crawford et al (2008) define Cognitive Density is the aggregate level of students’ engagement with learning materials and thinking. It relates to student engagement and participation; and teacher decision making and diagnostic power. For teachers and students it relates to time on task; metacognition; accountability; and overall production activity. It is a second-order effect of more controllable and measurable constructs:

- Communication density (increasing bandwidth of communication; enabling simultaneous channels and enabling message buffering)
- Content density (capturing work process and product; resource access and variety; more and better feedback to student; feedback to teacher),
- Temporal density (automate routine procedures; reduce down time; enable timely feedback; and differentiate task start/stop times).

Crawford et al (2008) suggest that effective practice is not to attempt to maximise Cognitive Density but to optimise it for particular curricular or pedagogical objectives.

Use of an OLM can be expected to provide improvements to Cognitive Density. This is because competencies and other learning states are easily and effectively visualised in OLMs for the individual use of teachers and students. OLMS can also be a focus for communication and negotiation and facilitate other forms of communication. Feedback is an important aspect of content density and OLMs are a natural and effective providing of feedback. Thirdly OLMs natural impact temporal density as they can provide feedback on learning as the learning activity progresses instead of having to wait for an assessment at the end of the learning activity. These three communicative, content and temporal dimensions to OLMs make them a strong tool in formative assessment for learning within the Cognitive Density framework. Further consideration of a theoretical motivation derived from Crawford et al’s (2008) Cognitive Density framework will feed into use...
4.3 Revisions and Extensions to the Needs Analysis Presented Through the SMILI OLM Framework

This section describes revisions and extensions to section 6.2 of D4.2: ‘Applications of NEXT-TELL to the SMILI OLM Framework elements’ (from Bull & Kay, 2007).

4.3.1 Extent of model accessible

As explained above, automatic throughput from classrooms to OLM has not so far been implemented. This will be carried out initially by using Moodle quizzes as input to OLM. Therefore scenarios discussed in the technical session in January 2012 Plenary in Vienna strongly focused on enabling peer interaction at this stage. This was an already envisaged mechanism that should also overcome the current problem of not having automatic input to OLM. For example, the student produces some work and then the student tags aspects of their own work. The student would be instructed in what type of tags to use: for example, tagging a piece of English written work for instances of grammatical use of a particular type, or competences according to a national framework. Then a peer would assess the tags on this piece of work and add feedback. Finally, the teacher may verify peer assessment of a student’s tagging of their own competencies. This may or may not require peers to have access to the OLM itself, but has identified an additional need for consultation with teachers in the design of such interaction.

4.3.2 Different representations

Currently attribute value representations for competencies are implemented in the OLM. However, from an assessment point of view, it will likely also be useful to accept non-numeric representations. We will investigate representations such as CbKST output, Hasse diagrams and repertory grid scales, cluster views, and multi-dimensional scaling views; and use of meta-data on such objects to enable searching and/or browsing. These would be additional representations where this level of detail is available, (though it would not always be possible or appropriate).

4.3.3 Similarity to underlying representation

NO CHANGE

4.3.4 Access to Uncertainty

In D4.1 it was noted that teachers and researchers would have access to uncertainty whereas other stakeholders would not, for purposes of clarity. However, the OLM is moving towards a situation where multiple stakeholders might comment on how a piece of evidence matches some set of competencies. Therefore, there may be different opinions (beliefs) about how particular evidence matches a set of competencies. The uncertainty arising in these instances will be heightened because the teacher will not always have time to check all student and peer tagging of competencies, so many examples of tagging will not be verified by the teacher. Therefore, the next scheduled release of the OLM will allow a certainty measure to be shown alongside data from various sources.

4.3.5 Role of Time

NO CHANGE

4.3.6 Access Method

In D4.1 it was noted that all stakeholders can access learner model data and student, parent, peers and teachers will (with student permission) be able to add evidence. The variety of routes by which evidence can be added to the OLM is being substantially elaborated. Adding evidence via additional routes rather than directly
to the OLM is not a new requirement. However, further details and weight are being added to the idea that competencies may also be linked to from elsewhere, such as E-Portfolios.

4.3.7 Access Initiative

Task T4.3 is concerned with describing systems for Communication and negotiation of the data held in the OLM. The OLM will therefore be linked to these subsystems. Arising from these interactions, new access initiatives may be required.

4.3.8 Access to Sources of Input

As with the item above (Access Method), the possible sources of input are being broadened. This is primarily as a result of including many different sources of data in the NEXT-TELL e-portfolio. Some of these may be used as targets of tagging with competencies. Competencies may be peer verified, teacher verified using sampling (so not all competencies verified), and comprehensively teacher verified. Ultimately, automatic source of input will be implemented alongside these (in line with the NEXT-TELL requirements).

4.3.9 Control of Accessibility (to Others)

A key scenario has been developed which involved teachers requiring students to tag their own work, and then swap and attempt to verify and comment on the tags of a peer. Therefore to do this activity every student would have to access another student’s work – (which is not in itself access to their OLM). When a peer is reviewing another student’s competencies in that student OLM, they would then need access to that student’s OLM. So control of accessibility should allow a teacher to instruct students to have access to this piece of work, without students being able to go on and look at all of a student’s work or other areas of the OLM that the student does not wish to be made available to them.

4.3.10 Control of Effect of Model on Personalisation

NO CHANGE

4.3.11 Flexibility of Access

NO CHANGE

4.3.12 Centrality of Open Learner Model to the Interaction

NO CHANGE

4.3.13 Evaluation (Evidence)

NO CHANGE
## Validation of OLM design: Use-cases and scenarios

### Status of previously reported use-cases

#### A table with old use cases from D4.1 and new revised and extended use cases for D4.3

In this section is presented a table showing the status of OLM use cases. Full descriptions of all these use cases are presented in the appendices alongside three scenarios developed from the teacher use case.

<table>
<thead>
<tr>
<th>code</th>
<th>Use case title</th>
<th>User/stakeholder category</th>
<th>First proposed</th>
<th>status</th>
<th>Codes of scenarios derived from use case</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Student is using an adaptive learning environment, as part of a classroom activity</td>
<td>Student</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Student plans future learning.</td>
<td>Student</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Student is undertaking a (non-adaptive) learning activity with his/her progress in gaining competencies being automatically monitored and visualised using electronic means</td>
<td>Student</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>Student is undertaking a (non-adaptive) learning activity with his/her progress in gaining competencies manually assessed and then manually entered into an OLM</td>
<td>Student</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>Student adding inferences to the LM using tools such as e-portfolios to provide the artefacts and learning based evidence</td>
<td>Student</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Parent provides extra support to the student.</td>
<td>Parent</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Parent monitors student progress.</td>
<td>Parent</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Parent provides extra information to the NEXT-TELL system.</td>
<td>Parent</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>Improving three-way communication which is focused on competencies between students, teachers and parents</td>
<td>Parent</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>OS1</td>
<td>Student helps another student who is struggling.</td>
<td>Peer/other student</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>OS2</td>
<td>Students collaborate to comprehend a problem.</td>
<td>Peer/other student</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>Just in time feedback on a classroom activity.</td>
<td>Teacher</td>
<td>D4.1</td>
<td>Superseded/by T3</td>
<td></td>
</tr>
</tbody>
</table>
# Methods and Specification for Student Model V2

<table>
<thead>
<tr>
<th>code</th>
<th>Use case title</th>
<th>User/stakeholder category</th>
<th>First proposed</th>
<th>status</th>
<th>Codes of scenarios derived from use case</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>Planning of future learning activities.</td>
<td>Teacher</td>
<td>D4.1</td>
<td>Elaborated to T4</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>Just in time feedback on a classroom activity – extended/elaborated version of T1</td>
<td>Teacher</td>
<td>D4.3</td>
<td>Extended/elaborated from T1</td>
<td>T3a, T3b, T3c</td>
</tr>
<tr>
<td>T4</td>
<td>Planning of future learning activities using ECAAD – extended/elaborated version for D4.3</td>
<td>Teacher</td>
<td>D4.3</td>
<td>Extended/elaborated from T2</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>Using the OLM in planning of future learning activities by adapting and modelling current good practice</td>
<td>Teacher</td>
<td>D4.3</td>
<td>Extended/elaborated from T2</td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>Monitor a school’s educational targets.</td>
<td>Administrator</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Identify extra teacher support required / teacher appraisal.</td>
<td>Administrator</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>Handover protocols as classes move up a year (and are admitted to and graduate from a school).</td>
<td>Administrator</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>Handover protocols when a class has an unexpected or unplanned change of teacher</td>
<td>Administrator</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>Allowing movement points between classes, (for example in schools where pupils are set by ability)</td>
<td>Administrator</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>PM1</td>
<td>Set budgets.</td>
<td>Policy maker</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>PM2</td>
<td>Decide if a current strategy is working.</td>
<td>Policy maker</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>PM3</td>
<td>Manage a process of curriculum change</td>
<td>Policy maker</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>PM4</td>
<td>Providing information to text book publishers and other commercial resource providers</td>
<td>Policy maker</td>
<td>D4.3</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>Evaluate pedagogical strategies.</td>
<td>Researcher</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>Evaluate the use of software tools.</td>
<td>Researcher</td>
<td>D4.1</td>
<td>Remains as D4.1</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1:** Status of previously reported scenarios: Remaining the same, Extended, Elaborated, Combined, Revised, Superseded, Withdrawn,
6  Basic methods for OLM interactions for supporting different formative assessment purposes

6.1  Different types of interaction

Grouping actions that OLM facilitates include:

- organising whole class revision activities, to meet the ‘centre of gravity’ of the current average competence for the class;
- organising individual revision activities, so every student only consolidates material they need help in;
- deciding on how to organise subgroups within the class. Sometimes a teacher may want to organise subgroups by ability with higher, medium, and lower ability groups. Sometimes the teacher may want to organise by ability differently, so that every group is mixed ability. NEXT-TELL allows this to occur in a more specific and timely way - not just organising according to long run averages but according to competencies in the short-term. This is a particularly valuable facet in subjects where students may buck the trend of average long run performance: for example, some students may have more or less prior exposure to technology.

6.2  Entering data

Groups can be defined and students assigned to these groups. Activities can be defined and competencies assigned to these activities. Then groups and activities can be linked together by assigning groups to activities. When this is done each student in a group has the competencies for each activity setup. In the current implementation all of this setup is manually done. The on-going use of the OLM to track student performance may involve updating of competence levels for individual student multiple times. This is currently also done manually. Figure 1 shows a screenshot where competencies are initially set-up for activities. Figure 2 shows a screenshot where an already setup competence (of alliteration use) is being updated for the Story Writing activity.
D4.3
Methods and Specification for Student Model V2

Figure 1: A screenshot showing the input screen for setting competencies – note the hierarchical tree structure for competencies
6.3 Visualising data

6.3.1 Group analysis that leads to individual data

A teacher may want to find if there exist individual students with particular problems or abilities: which students cannot do what most students can do? Or alternatively, which can already do what other students cannot do? The system needs to filter out those who need special attention as teachers do not have time to repeatedly attend to every student’s performances. Group analysis that leads to individual information has been highlighted as very important (see e.g. workshops in D6.3). The following visualisations are now available in the NEXT-TELL OLM.
Using ranking visualisation to find strongest and weakest students in a particular competency or average over all competencies

![Ranking visualisation](image)

*Figure 3: A ranking visualisation showing ordering by competence level*

Using histogram visualisation to illustrate the distribution of competence level

![Histogram visualisation](image)

*Figure 4: A histogram visualisation showing distribution of competence level*

### 6.3.2 Group analysis for whole group teaching

Teachers also want to view information for the whole class. One of the most important questions a teacher will want to ask when planning is: what total of competencies do my students currently have? What the teacher will be looking for is: which competencies are not yet addressed/claimed at all? In which competencies are the biggest variations?
Figure 5: A Skill meter visualisation showing competence levels for (i) average level of all competences for all students (ii) averages for particular students; and (iii) averages for particular competencies.

Figure 5 shows an example where the two competencies that are lower than the others are Simile use and Personification use. In the teacher’s next whole group activity he might focus on these two competencies as these are the two that the whole group need to improve on the most.

The Skill Meter can be used to give a breakdown of competence levels for an individual student, in this case Ben Barber, who gained fewer skills in the Personification use competence than the other five competencies.
D4.3
Methods and Specification for Student Model V2

Figure 6: A table visualisation opened up below a skill meter visualisation. Both show the competence levels, with the table being easier to read students into particular levels

6.3.3 Visualisation for change over time.

Figure 7: Visualisation of sparklines and graphs showing change over time
7 Update on NEXT-TELL Repertory Grids for Formative Assessment (RGFA) and CoNeTo

7.1 Introduction
The following section documents the updates to the NEXT-TELL method and tool, Repertory Grids for Formative Assessment (RGFA)\(^1\). We also provide a brief pointer towards release 2 of RGFA and developments following the annex to D4.2 on Communication and Negotiation Tools (CoNeTo), for release 2 of this tool.

7.2 Translation
We engaged Henrik Soeren Hansen and Signe Lejbacthe, the participating Danish teachers, in co-design activities that included functional specifications as well as software localization. The Danish teachers provided us the Danish translation for RGFA. We have now setup a spreadsheet of key-value pairs of terms for localization of RGFA into German, Norwegian Italian, and Polish.\(^2\)

7.3 Training Manual
A new version of the RGFA training manual has been created and shared with the Danish teachers and the NEXT-TELL partners.

7.4 Classroom Usage
Danish teachers have created 6 repertory grid exercises using RGFA, have established a test group of students and teachers to experiment with new designs, and are planning dissemination activities to other teachers in the school and their professional networks. Figure 8 below presents a screenshot of a Danish repertory grid exercise.

Figure 8. Example of a RGFA Exercise Created by Danish Teachers

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\(^1\) [http://cssl.cbs.dk/software/rgfa/](http://cssl.cbs.dk/software/rgfa/)

\(^2\) [https://docs.google.com/spreadsheet/ccc?key=0Aq3U96AWAl2ZdGY0QTQ4bkJ3eVmxcE1PUWxRcEZFYmc&ndplr=1#gid=0](https://docs.google.com/spreadsheet/ccc?key=0Aq3U96AWAl2ZdGY0QTQ4bkJ3eVmxcE1PUWxRcEZFYmc&ndplr=1#gid=0)
7.5 Roadmap for RGFA 2.0

1. Localization to support German and Norwegian classrooms
2. Teaching Analytics Support (For Constructs and Ratings)
3. Support for images and videos
4. Customizable exercise instruction text
5. Any other feature requests by teachers, students, and NEXT-TELL partners

7.6 Roadmap for CoNeTo 2.0

1. Implement HTML 5 version that is browser-based
2. Support Central Authentication Service (CAS) over HTTPS
3. Modification and deletion of relationship objects
4. Implement synchronous collaboration mode
5. Explicitly support face-to-face and synchronous tele-conferencing negotiations
6. Implement undo at the object level and investigate the feasibility of distributed undo
7. Make changes requested by the teachers and students and incorporate the findings from the field studies of CoNeTo 1.0, CMap Tools\(^4\), and MindMeister\(^5\)

\(^4\) http://cmap.ihmc.us/
\(^5\) http://www.mindmeister.com/
8 Conclusions

This deliverable has described revisions and extensions to methods and specification for the NEXT-TELL OLM. There are two ways in which we can consider an integrative view of this material. The first is to consider how the analysis that is described above fits into the design process. In earlier sections of the deliverable we have described how requirements have been assessed by interactions with other stakeholders. We have also described the kinds of frameworks for competencies which can be used to structure how an OLM will be used. We have also extended and revised later elements of the design process by updating use cases and giving a summary of the current basic methods for supporting different formative assessment purposes. A second way to take an integrative view of what is described here is to think about how this information relates to other deliverables. In particular, many developments in NEXT-TELL involve elements of visualisation and data capture which are not part of a strictly defined OLM but will closely relate to the OLM. The activity visualisation features described in D3.3 (particularly those relevant to Task 3.2) will be situated alongside and integrated with ‘OLM-proper’ data. We might term this activity modelling, as opposed to the learner modelling which would occur in the OLM. As NEXT-TELL OLM development progresses we expect this element of integration to become more apparent. This will include the likely development of scenarios which incorporate tools and procedures from work package 3 and work package 4.
# References

<table>
<thead>
<tr>
<th>Reference</th>
<th>Details</th>
</tr>
</thead>
</table>
10 Glossary

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

**BSCW**  The document store used in NEXT-TELL used for storing internal documents
**Document store**  see BSCW
**EuresTools**  The reporting tool used in NEXT-TELL
**PM**  Person month
**T**  Task
**WP**  Work package

**Partner Acronyms**

- **JRS**  JOANNEUM RESEARCH Forschungsgesellschaft mbH, AT
- **UniRes**  UNI RESEARCH AS, NO
- **KMRC**  Medien in der Bildung Stiftung, DE
- **TUG**  Technische Universität Graz, AT
- **CBS**  Copenhagen Business School, DM
- **BHAM**  University of Birmingham, UK
- **IOE**  Institute of Education, University of London, UK
- **EXACT**  eXact Learning Solutions SPA, IT
- **TALK**  Verein offenes Lernen, AT
- **BOC-AT**  BOC Asset Management GmbH, AT
- **BOC-PL**  BOC Information Technologies Consulting SP.P.Z.O.O., PL
- **MTO**  MTO Psychologische Forschung und Beratung GmbH, DE

**Abbreviations**

- **BS**  Baseline Study
- **CbKST**  Competence-based Knowledge Space Theory Training Course
- **CBT**  Computer Based Training
- **DBR**  Design-Based Research
- **ECAAD**  Evidence Centered Activity and Appraisal Design (builds on the ECD)
- **ECD**  Evidence Centered Assessment Design (e.g. PADI project)
- **EFL**  '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.
- **ENA**  Epistemic Network Analysis
- **ESL**  English as a Second Language; refers to learning English in the target language environment
- **HCl**  Human Computer Interaction
- **ICT**  Information and Communication Technology
- **IT**  Information Technology
- **LEPP**  Longitudinal Evaluation of Performance in Psychology (2nd generation e-portfolio)
- **NEXT-TELL**  Next Generation Teaching, Education and Learning for Life
- **OLM**  Open Learner Model
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.

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° 258114.
11 Appendix 1: Use case

11.1 Student

The following are two example user scenarios for a student’s use of the open learner model. The first concerns a student attempting to increase competency through viewing the learner model and the second the metacognitive activity of planning.

11.1.1 Use-cases from D4.1

| Title: Student is using an adaptive learning environment, as part of a classroom activity. |
| Code: S1 |
| Goal: Student is attempting to improve competency in a specific topic. |
| Initiating: Teacher. |
| Affect: Student. |
| Start Conditions: Student is studying a given topic. Teacher has facilitated the time and the activity. |
| End Result: Informed learning. |

Normal course for the use case:
- Teacher specifies a series of activities that should be completed in an adaptive learning environment.
- Student completes or partially completes an activity in the adaptive learning environment.
- Student can inspect inferences made about them and their knowledge at any point during use.
- Student can use this immediate feedback to influence their interaction and the selection of future activities (e.g. identifying strengths and weaknesses, concepts that require further work, specific problems to be addressed or the next activity to be completed.)
- Mistakes and incorrect knowledge held by the learner are identified as they occur. Through inspection the learner may address these immediately.

Exceptions:
- Learner is demotivated when problems are identified.

Title: Student plans future learning.

Code: S2

Goal: Identify and plan how to improve knowledge in areas of weakness.

Initiating: Student.

Affect: Student.

Start Conditions: The student has been working on a specific topic and the NEXT-TELL system has evidence of progress, competencies and skills.

End Result: Student creates a plan of subsequent studying that needs to take place.

Normal course for the use case:
- Student inspects their open learner model for a given topic.
  - Student identifies areas of strength and weakness.
  - Student can identify specific problems that will need to be addressed.
  - Student can identify aspects of the topic that have not yet been addressed.
- Student plans what extra work needs to be completed in order to increase competency and rectify problems.
- Student knows where to focus their effort next, in independent study.
- The student is able formulate appropriate questions to ask the teacher to clarify knowledge.

Exceptions:
- Student is disinterested or demotivated from viewing the information.
- Student has not yet developed adequate planning-based skills to effectively complete the task.
11.1.2 Current Progress and Use-cases from D4.3

Title: Student is undertaking a (non-adaptive) learning activity with his/her progress in gaining competencies being automatically monitored and visualised using electronic means

Code: S3

Relation to previous use-cases: extension/alternative to S1

Goal: To integrate use of electronic resources with regular classroom learning and NEXT-TELL learner modelling, assessment and recording.

Initiating: Teacher

Affect: Student and teacher.

Start Conditions: Within the school environment a teacher has specified competencies to be achieved and some activities that capture these competencies. Student is studying a given topic and using an electronic resource such as Moodle, an Intelligent tutoring application or an e-textbook.

End Result: Student views real-time updates on progress and the links to student’s work can appear in the student’s e-portfolio.

Normal course for the use case:

- Teacher has given student work to do. As the student undertakes the learning activity, evidence of their competence level is automatically sent to other systems. When activities and competencies are compatible information can be sent to the OLM and e-portfolio where this information can be visualised and integrated with evidence from other sources.

Exceptions:

- Problems in integration, preconfiguration, compatibility, some competency definitions

Title: Student is undertaking a (non-adaptive) learning activity with his/her progress in gaining competencies manually assessed and then manually entered into an OLM

Code: S4

Relation to previous use-cases: extension/alternative to S1

Goal: To bridge the integration of electronic resources with regular classroom learning and NEXT-TELL learner modelling, assessment and recording.

Initiating: Teacher

Affect: Student and teacher.

Start Conditions: Within the school environment a teacher has specified competencies to be acquired and some activities that involve using/demonstrating these competencies. Student tags examples of evidence.

End Result: Student views visualisation of the competencies they have achieved.

Normal course for the use case:

- Teacher has given student work to do. As the student undertakes the learning activity, evidence of their competence level is manually tagged by them, other students and/or their teacher. So the tagging of their work is a form of self assessment. This information can then be sent to the OLM and e-portfolio where this information can be visualised and integrated with evidence from other sources, or viewed separately.

Exceptions:

- Limitations where students cannot accurately tag their own competencies, peers cannot validate, and teacher has too many examples to check

Title: Student adding inferences to the LM using tools such as e-portfolios to provide the artefacts and learning based evidence.

Code: S5

Relation to previous use-cases: extends/complements S1
Goal: To allow students to include as accountable learning, information from activities done externally to the school.  
Initiating: Student, parent.  
Affect: Student, teacher, other organisations.  
Start Conditions: Student undertakes an activity externally to school which involves competencies relevant to school learning, particular in 21st Century skills like team-work and leadership.  
End Result: Student has entered information and may discuss this information with teacher who may approve of competencies added.  

Normal course for the use case:  
- Is undertaking an activity which has competencies included in their OLM and e-portfolio. Student can then add competencies achieved along with evidence for the achievement of those competencies. These competencies might take a range of forms – the particulars will depend on the particular context. For example, for 21st Century skills of team-working and leadership a student might provide a written reflection which described what the student achieved.
- This student led description might then be augmented with formal certification and personal testimony from leaders in the external organisation, such as the Duke of Edinburgh Award Scheme (http://www.dofe.org/).
- Teacher and student can negotiate how these competencies are added and approved. The student and teachers may sit together whilst updating the inferences in the LM or student and teacher might make a separate assessment of the artefacts and then discuss these post entry.

Exceptions:  
- When entry carried out by stakeholders other than the teacher there may be problems with consistency and comprehension between the school’s competency framework and the external body—

### 11.2 Parents and other stakeholders

The following are three example user scenarios for a parent’s use of the open learner model. The first concerns the parent providing their child with targeted help, the second the monitoring of the child’s progress and the third the provision of supplementary information.

#### 11.2.1 Use-cases from D4.1

<table>
<thead>
<tr>
<th>Title</th>
<th>Parent provides extra support to the student.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>P1</td>
</tr>
<tr>
<td>Goal</td>
<td>Targeted help for the student.</td>
</tr>
<tr>
<td>Initiating</td>
<td>Parent.</td>
</tr>
<tr>
<td>Affect</td>
<td>Student.</td>
</tr>
<tr>
<td>Start Conditions</td>
<td>Learner model contains recent information about the student.</td>
</tr>
<tr>
<td>End Result</td>
<td>Student is in receipt of extra-curricular support.</td>
</tr>
</tbody>
</table>

Normal course for the use case:  
- Parent checks the open learner model for the student.  
- Parent is able to identify subject content on which the student has recently been working.  
- Parent is able to identify how the student’s progress compares to that of his/her peers (e.g. in aggregate form).  
- Parent is able to identify competency and areas that need additional support.  
- Parent approaches student and offers support, if they are able to provide it.  
- Parent and student work through some problems together to increase competency.  
- Student may increase in confidence and competency.  
- (Student may provide the NEXT-TELL system with evidence that he/she completed additional activities with parental help.)  
- (Parent may provide the NEXT-TELL system with evidence that he/she completed additional activities with the student.)

Exceptions:  
- Student refuses help.
Title: Parent monitors student progress.
Code: P2
Goal: To be informed by a quantitative description of their child’s progress at school, independently from the child’s own account of their progress.
Initiating: Parent.
Affect: Parent.
Start Conditions: Learner model contains recent information about the student.
End Result: The parent is up to date with their child’s progress.
Normal course for the use case:
• Parent views the open learner model for the student.
• Parent is able to identify subject content on which the student has recently been working.
• Parent is able to identify how the student’s progress compares that of to his/her peers.
Exceptions:
• Parent has little computer literacy and struggles to interpret and/or identify the significance of the open learner model information.
• (Parent chastises the child for their weaknesses and demotivates the child)

Title: Parent provides extra information to the NEXT-TELL system.
Code: P3
Goal: Support the teacher by providing extra evidence about their child’s progress.
Initiating: Parent.
Affect: Student, Teacher.
Start Conditions: Student has engaged in educationally beneficial activities in the sight of the parent.
End Result: Teacher is informed of student progress. The learner model is enriched by an extra dimension of information.
Normal course for the use case:
• Parent witnesses the student engaging in educationally beneficial activities (e.g. watching a relevant documentary, reading of a specific book, time spent on homework, a trip to a museum, completion of an extra curricular exercise etc.)
• Parent recounts the qualitative and quantitative aspects of the student’s activity and provides evidence to the NEXT-TELL system.
• In the open learner model, the student and teacher can inspect (different) aspects of the inferences that result from the parent’s appraisal of the student’s actions.
Exceptions:
• Parent cannot identify appropriate information to offer the system.
• Student influences what information the parent provides.

11.2.2 Current Progress and Use-cases from D4.3

Title: Improving three-way communication which is focused on competencies between students, teachers and parents
Code: P4
Relation to previous use-cases: Combining P1. P2 and P3
Goal: To provide a platform where teachers, students and parents can communicate about the students progress.

Competencies: this use-case is focused on negotiation on competencies. There might be variants of this use case less relevant to OLM

Initiating: Student, parent, teacher.

Affect: Student, teacher, parent.

Start Conditions: Any of student, parent or teacher may want to initiate three way communication focused on student’s current competence levels.

End Result: Having a dedicated electronic forum for student-teacher-parent communication should lower the barrier to communications of this type, and give a clear focus for discussion on a student’s progress towards developing their competencies

Normal course for the use case:

A problem in parents’ experience of schools is that the only time three way conversations usually occur is occasionally at parents’ evenings. Parents can contact teachers but there are often not well used channels, perhaps being mediated by already busy school receptionists. A dedicated forum could be implemented for student-teacher-parent communication that is integrated with the records of the students work. Parents have access to summaries of student competencies, and as a part of this access may post comments, questions or requests for dialogue. The NEXT-TELL system therefore would provide a vehicle for parents to access progress and communicate to teachers through the same portal.

Exceptions:

- Even with a lowered barrier parents may be put-off communicating with teachers because they will feel that teachers are very busy. Teachers may also want to communicate most with the parents that do not choose to use the system.
- When competencies are not the key issues that student, parent or teacher want to discuss

11.3 Other Student (peers)

The following are two example user scenarios for peers’ use of the open learner model. The first concerns the provision of help to a peer who is struggling and the second a scenario where two students collaborate to comprehend a problem.

11.3.1 Use-cases from D4.1

Title: Student helps another student who is struggling.

Code: OS1

Goal: Help a student through difficulty without involving a teacher.

Initiating: Other Student (Peer).

Affect: Student, Other Student (Peer).

Start Conditions: Students have completed some work and are completing a similar activity.

End Result: The two students have conversed and exchanged knowledge.

Normal course for the use case:

- A student’s peer has inspected the student’s model and identified they hold understanding that student does not.
- The peer offers, or attempts to explain their current understanding to the student.
- The student and peer discuss their viewpoints on the knowledge.
- The student correctly understands their peer and is able to action the new knowledge.
- The peer consolidates their knowledge through explanation.

Exceptions:

- The student refuses help.
- The student is confused and does not have a fixed perspective on the knowledge.
- The peer is unsuccessful in explaining understanding to the student.
Title: Students collaborate to comprehend a problem.
Code: OS2
Goal: Both students make sense of the problem.
Initiating: Student or Other Student (Peer).
Affect: Student and Other Student (Peer).
Start Conditions: Students have completed some work and are undertaking a similar activity.
End Result: The students have made sense of the problem or have identified a course of action to be taken to rectify the gap in understanding.

Normal course for the use case:
- The student or their peer have inspected the other’s open learner model and identified that they are experiencing a common difficulty.
- The students communicate and exchange views to attempt to comprehend the difficulty.
- Students are able to identify a common understanding or a path of action to be taken to allow the problem to be resolved (e.g. ask for the help of the teacher, complete an Internet search.)

Exceptions:
- Students are unable to comprehend the problem or identify an appropriate course of action.
- Students abandon the common difficulty and take no action to attempt to resolve the issue at this time.

11.3.2 Current Progress and Use-cases from D4.3
No new use cases

11.4 Teacher
The following are five example user scenarios for teachers’ use of the open learner model. The first concerns providing ‘just in time’ help/feedback in the classroom and the second the planning of future learning activities.

The ‘Just in time feedback on a classroom activity’ described in D4.1 sketched out how a teacher might respond to feedback, gives details of how help might be targeted. More detail can be provided about triggering events for possible teacher intervention.

11.4.1 Use-cases from D4.1
Title: Just in time feedback on a classroom activity.
Code: T1
Goal: Dynamically adapt a lesson, based on the progress of students.
Initiating: Teacher.
Affect: Student and Teacher.
Start Conditions: The teacher and students are in the same location and all have access to a computer.
End Result: Teacher has been able to focus their help appropriately within the classroom and has adapted their lesson plan based on the progress of students.

Normal course for the use case:
- Students complete a (computerised) activity specified by the teacher.
- As the lesson progresses, the teacher monitors student progress and identifies difficulties students are having.
  - The teacher is able to target individual help to students having unique problems.
  - The teacher is able to amend the pace of the learning activity based on the progress of students.
  - The teacher is able to explain information that will resolve common difficulties amongst groups of students.
  - The teacher is able to instigate individual/group electronic/verbal dialogue with student(s).

Exceptions:
• There are too many problems to address fully within the timeframe.
• Students ignore the advice of the teacher.

Title: Planning of future learning activities.
Code: T2
Goal: Plan future lessons based on evidence available in the NEXT-TELL system.
Initiating: Teacher.
Affect: Teacher and Student.
Start Conditions: Students have previously completed work; inferences have been captured by the NEXT-TELL system.
End Result: Teacher has revised or planned a lesson, appropriate to the learning requirements of the students.
Normal course for the use case:
• In conjunction with the syllabus, the teacher identifies options appropriate for future lessons.
• The teacher inspects the open learner model for the whole class (to see general progress) and the open learner models of individual students (to identify specific problems and issues that need clarifying.)
• The teacher is able to plan appropriate activities to facilitate students’ learning of identified problems and propose a timeframe in which this could be done.
• The teacher is able to group students together based on common difficulties and allocate different activities to each group. Thus, for example, each student has work appropriate to their ability; more able students may cover additional content and less advanced students gain more basic knowledge. All students may be kept engaged and sufficiently challenged (without being bored.)

Exceptions:
• All students have unique needs.
• The teacher is unable to identify appropriate activities students could undertake to correct problems.

11.4.2 Current Progress and Use-cases from D4.3

Title: Just in time feedback on a classroom activity – (extended version for D4.3)
Code: T3
Relation to previous use-cases: Elaboration/extension of T1
Goal: Dynamically adapt a lesson, based on the progress of students.
Competencies: The OLM imports and visualises data in the form of individual competencies. However, these individual competencies can also help to describe learning goals. For example, a learning goal might be formed by listing a schedule by which a set of competencies will be achieved. Learning goals can be distinguished according to whether they are curricular goals (driven by requirements of a particular course or module) and personal learning goals (which are more open to being influenced by interests and personal objectives of the student).
Initiating: Teacher.
Affect: Student and Teacher.
Start Conditions: The teacher and students are in the same location and all have access to a computer (Or teacher and students in different locations but communicating electronically).
End Result: Teacher has been able to focus help appropriately within the classroom and has adapted his/her lesson plan based on the progress of students.
Normal course for the use case:
• Students complete an activity specified by the teacher. This is either a computerised activity or the outcomes of the activity are logged onto a computer.
• As the lesson progresses, the teacher monitors student development using a visualisation of progress from a computerised device and identifies difficulties students are having.
• Triggers for competence based interventions include:
  • some or all students have already learnt targets for lesson, or competence uptake is much faster than expected
  • competence uptake/learning is slower than expected;
• competence uptake/learning shows a big divergence within the class
• Custom triggers - the systems will allow the teacher to select the information which is monitored and can be accepted by the teacher as a trigger for intervention. The teacher can choose for visualisations of particular data to be available. This may be class averages or for competence levels for particular students depending on their immediate priorities or use of particular terminology (or the absence of using particular terminology). Teacher should be able to quickly select a subset of these triggers to be actively monitored in any lesson
• The kinds of interventions open to a teacher as a result of viewing the OLM can include:
  - The teacher is able to target individual help to students having unique problems
  - The teacher is able to amend the pace of the whole class learning activity based on the progress of students
  - The teacher is able to explain information that will resolve common difficulties amongst groups of students
  - the teacher is able to change type of content of activities part way through
  - The teacher is able to instigate individual/group electronic/verbal dialogue with student(s)
  - The teacher may use feedback to form subgroups of students, or change subgroups, or even reform whole class teaching from subgroups

The teacher may choose to intervene because of information about competence uptake or because of other measures of student activity which are not strictly competence based but which are likely to correlate with competence uptake.

Non-competence based interventions include:
• low student work rate (which may be measured from simple raw data about words typed, pages viewed etc);
• inappropriate student actions (such as student not using correct software or using other incorrect software) – related to WP3;
• Real time and automatic sensing of vocabulary and terminology use in TESL and STEM. This is a more ‘intelligent’ measure of student output that would need to be pre-planned for the particular lesson.
• Types of feedback which in a simple form are non-competence based may be adapted to become competence based, for instance, just using particular terminology in free writing may not be competence based. However, if a student tags where they use particular words or phrases with the competence is achieved and this tagging is checked by peers and teacher, then whether the student has used terminology correctly and tagged their use correctly, can both be considered competencies. Some of these competencies can also be cross checked with quizzes that test the same competencies.

Different kinds of data that can be input to the OLM include:

- Formal activity input, such as doing tests or questions
- Informal activity input, such as videos discussing progress (link to IoE research).
- Reports by experts on how a student achieves C21 skills

Exceptions:
• There are too many problems to address fully within the timeframe.
• Students ignore the advice of the teacher.

Title: Using the OLM in planning of future learning activities using ECAAD – extended version for D4.3
Code: T4
Relation to previous use-cases: elaboration of T2
Goal: To allow top-down planning of a course from existing competence definitions
Competencies: Competences come first, with the activity customised to match these competencies. These might be CEFR TESL competencies or STEM competencies
D4.3
Methods and Specification for Student Model V2

Initiating: Teacher, researcher
Affect: Teacher and students
Start Conditions: Teacher is looking ahead to plan work to match the individual needs of his/her students
End Result: A plan is constructed using ECAAD modelling software. This plan is based upon available descriptions of competencies and can be easily shared with other teachers and facilitates automatic monitoring and visualisation of activities.

Normal course for the use case:
- A teacher or researcher imports existing lists of competencies into an ECAAD planner. These might be competencies such as those in the CEFR framework or the Norwegian TESL and Austrian ICT frameworks described in this deliverable.
- Learning activities are modelled using the ECAAD software, using a paper and pen method, or informally. These are then monitored using OLM and feedback gained on relevant competencies for this activity
- Just-in time feedback is planned in.
- The plan can be formed into a formal model within ECAAD and shared and adapted by others

Exceptions:
- Teachers may find the planner too complex to use, and may need to be helped by researchers or use simpler templates for plans

Title: Using the OLM in planning of future learning activities by adapting and modelling current good practice.
Code: T5
Relation to previous use-cases: elaboration of T2
Goal: To allow a bottom-up integration of a planned activity with other existing planned activities. Teachers have favoured activities which they find provide good value. They may also want to analyse how these activities increase a range of competencies. So this use-case is an example of TISL.
Initiating: Teacher, researcher
Affect: Teacher, student
Start Conditions: Teacher wishes to integrate a currently high value learning activity within a broader curriculum framework.
End Result: The high value learning activity is modelled in terms of the competencies it provides, and is integrated within a broader scheme of work with a good balance of different competencies

Normal course for the use case:
- Teacher is planning an extended body of teaching activities and wants to integrate key activities which are high value in terms of enthusiasm for the students, whilst at the same time managing to balance provision of required competencies across the curriculum.
- Teacher can use ECAAD modelling software to assign competencies and monitoring routines to particular activities.
- Large number of lessons and learning activities can be considered together to ensure balanced provision of the competencies required by the curriculum.

Exceptions:
- Teacher may need help to input activities and then analysing the resulting models using software with which they are unfamiliar

11.5 School Administrator
The following are two example user scenarios for school administrators’ use of the open learner model. The first concerns the monitoring of a school’s educational targets and the second the provision of extra support to teachers.
11.5.1 Use-cases from D4.1

Title: Monitor a school’s educational targets.
Code: A1
Goal: An interim report of whether the school’s educational targets have been met.
Initiating: School Administrator.
Affect: School Administrator, Teachers.
Start Conditions: Students have completed some work. It is time in the school’s calendar for a progress review.
End Result: A report is produced. School management may discuss progress issues with teachers.
Normal course for the use case:
- School administrator views the open learner model for various class groups.
- School administrator identifies groups of students who are progressing as expected, groups exceeding expectations and groups that have fallen short of the target.
- School administrator is able to have an informed progress dialogue with the teacher.
- The teacher and school administrator can conclude reasons that justify student progress.
- The teacher and school administrator can decide on any necessary course of action to rectify problems that are in their early stages, including the allocation of additional resources.
Exceptions:
- Information is incomplete or distorted.

Title: Identify extra teacher support required / teacher appraisal.
Code: A2
Goal: Provision of professional and personal development where it is needed.
Initiating: School Administrator.
Affect: School Administrator, Teacher.
Start Conditions: Students have completed some work. A review is taking place.
End Result: Further support is provided for teachers, where required.
Normal course for the use case:
- School administrator accesses the open learner model for a teacher’s various class groups.
- School administrator uses the information about student progress as evidence as part of a teacher appraisal.
- School administrator and teacher, in collaboration, may identify extra personal and professional development that the teacher requires (e.g. training courses, classroom resources etc.)
- Teacher is provided with the additional support within the fiscal and time constraints of the school.
Exceptions:
- Teacher refuses additional help/support/courses.
- Other appraisal evidence is of greater importance and fully overrides the contribution of open learner model information.

11.5.2 Current Progress and Use-cases from D4.3

Title: Handover protocols as classes move up a year (and are admitted to and graduate from a school).
Code: A3
Relation to previous use-cases:
Goal: NEXT-TELL allows a systematic and formal sharing of data about students, whether moving up a year within a school or transferring between schools
Initiating: School Administrator.
Affect: School Administrator, Teachers., Parents
Start Conditions: When a school transition is about to occur and being planned for, all relevant parties can access and influence data being used in transition.

End Result: Placement of students and required monitoring or care packages result from properly considered student circumstances. Information for teachers for lesson planning and grouping.

Normal course for the use case:

- School administrators at separate schools communicate with each other, arranging for transfer of relevant selected information. These processes already occur in UK schools, with primary and secondary teachers having meetings to help primary school transitions. NEXT-TELL data will provide a firmer evidence base for these meetings, and may also allow extra information to be gathered if requested by the new school. For example, UK schools currently gain National Curriculum levels for students from their previous schools. A NEXT-TELL system will allow a more fine-grained and timely transfer of knowledge so that progress before and after the transition can be compared. So competencies in basic skills and more wide ranging subject content will all be transferred. This will then highlight when students have made a poor transition and are not settling in well.

Exceptions:

- Information is incomplete or distorted.

Title: Handover protocols when a class has an unexpected or unplanned change of teacher

Code: A4

Relation to previous use-cases:

Goal: NEXT-TELL allows a teacher to get quickly up to date with a new class, even in very short time scales, such as when a teacher is ill.

Initiating: School Administrator.

Affect: School Administrator, Teachers.

Start Conditions: A teacher has been assigned to a new class and looks over a ‘quick-summary’ of relevant information.

End Result: Teacher can appraise and update the summary information they received. They can use this to plan a lesson, pitch content and be aware of important issues – all preparations being tailored to the amount of time they have.

Normal course for the use case:

- However much time a teacher has, the NEXT-TELL system will allow an appropriate level of information. If a teacher only has a few minutes before going into a class they have never taught, they can use NEXT-TELL to access information about basic competencies such as literacy and numeracy level. If the teacher has a week to prepare and will be teaching the class for a term then the teacher may look in detail. If a teacher is only covering a single one hour lesson, then a very quick summary may be provided tailored to the particular content being covered. This would make it less likely for students to be presented with material which they have already learnt. This will work particularly efficiently if lessons have been modelled and learning outcomes already entered in the system.

Exceptions:

- Information is incomplete or distorted.

Title: Allowing movement points between classes, (for example in schools where pupils are set by ability)

Code: A5

Relation to previous use-cases:

Goal: For teachers and administrators to make principled decisions about moving pupils between classes

Initiating: School administrator, teacher.

Affect: School Administrator, Teachers, Students.

Start Conditions: Many schools set pupils by ability. A disadvantage of setting is that if pupils are found to be in the ‘wrong’ set there can be a time lag to change sets because the two classes may have covered different materials. Even when pupils are not set by ability, the current achievement of pupils may be an important factor.
when changing classes, for example, to ensure mixed ability groups.

**End Result:** Students are moved to new classes at points in time where they have covered the same material as the class they are moved to. Students may also be moved informally for short periods.

**Normal course for the use case:** A teacher thinks that a student is doing really well or really badly and wants to check whether a new group would be more appropriate. The achievement/competence levels of pupils are checked to see whether class changes can be made without disadvantaging students (for example the material covered by the two classes matches)

**Exceptions:**
- Information is incomplete or distorted.

### 11.6 Policy makers

#### 11.6.1 Use-cases from D4.1

**Title:** Set budgets.

**Code:** PM1

**Goal:** Revise the money allocated to specific educational institutions and to subject areas.

**Initiating:** Policy Maker.

**Affect:** School Administrator, Teacher, Student.

**Start Conditions:** Many students have used the NEXT-TELL system for a substantive amount of time.

**End Result:** Budgets are revised.

**Normal course for the use case:**
- Policy maker is able to view the aggregated open learner model for different institutions/subject areas.
- Together with other information, the policy maker is able to make an informed decision as to whether an appropriate amount of money and resource is allocated to specific subjects or specific geographical areas.
- Revisions are made to the budget.

**Exceptions:**
- Policy makers place too much emphasis on one source of information; this distorts their view.

**Title:** Decide if a current strategy is working.

**Code:** PM2

**Goal:** Revise national pedagogical strategies and initiatives, as appropriate.

**Initiating:** Policy Maker.

**Affect:** Teacher, Student and Parent.

**Start Conditions:** Many students have used the NEXT-TELL system for a substantive amount of time.

**End Result:** Pedagogical initiatives and strategies are revised.

**Normal course for the use case:**
- Policy maker is able to view the aggregated open learner model for different institutions/subject areas.
- Together with other evidence (and potentially control groups), policy makers may observe the effects of current pedagogical strategies and their variance across age groups and geographical regions.
- Policy makers may make informed decisions about the efficacy of strategies and initiatives.

**Exceptions:**
- Policy makers place too much emphasis on one source of information; this distorts their view.
### 11.6.2 Current Progress and Use-cases from D4.3

<table>
<thead>
<tr>
<th>Title: Manage a process of curriculum change</th>
<th>Code: PM3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relation to previous use-cases:</td>
<td></td>
</tr>
<tr>
<td>Goal: Curricula need to be updated periodically and sometimes this can be a radical and far-ranging process. With an integrated whole school curriculum, competencies being changed or adapted in one part of the curriculum need to be considered and balanced or reacted to in other parts of the curriculum.</td>
<td></td>
</tr>
<tr>
<td>Initiating: Curriculum managers.</td>
<td></td>
</tr>
<tr>
<td>Affect: whole school environment</td>
<td></td>
</tr>
<tr>
<td>Start Conditions: Decision at a strategic level to change curriculum. For example, the UK Department for Education’s decision to increase programming content in ICT and moving computer literacy skills/office skills to other subject areas: <a href="http://www.bbc.co.uk/news/education-16493929">http://www.bbc.co.uk/news/education-16493929</a></td>
<td></td>
</tr>
<tr>
<td>End Result: Having a system that keeps track of which competencies are accounted for, and where.</td>
<td></td>
</tr>
</tbody>
</table>

- **Normal course for the use case:** To manage a process of curriculum change and re-assign competencies within the whole school curriculum. A NEXT-TELL OLM should be able to match competencies to subject areas, and hence provide information to policy makers about where computer literacy skills might be taught. So in the examples listed, above being able to move the softer skills of computer literacy taught in curriculum areas outside of ICT, leaving more technically demanding programming skills to be taught in ICT.

<table>
<thead>
<tr>
<th>Exceptions:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Uptake of the NT system across multiple subjects required to identify cross-curricular support</td>
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<tr>
<td>- Information sufficiency</td>
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<tr>
<td>- Subject areas outside of ICT may involve lots of ICT skills but not have these currently listed as competencies to be taught towards and assessed</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Title:</strong> Providing information to text book publishers and other commercial resource providers</th>
<th><strong>Code:</strong> PM4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relation to previous use-cases:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Goal:</strong> To facilitate communication between schools and commercial content providers (such as text-book publishers) about what are key competencies being used to structure the school learning experience</td>
<td></td>
</tr>
<tr>
<td><strong>Initiating:</strong> Curriculum managers and commercial stakeholders</td>
<td></td>
</tr>
<tr>
<td><strong>Affect:</strong> whole school environment; central planners of curriculum; and commercial resource providers</td>
<td></td>
</tr>
<tr>
<td><strong>Start Conditions:</strong> Provision of new educational resources is a planned</td>
<td></td>
</tr>
<tr>
<td><strong>End Result:</strong> Textbooks and other media whose content closely matches the requirements of schools in terms of competence descriptors</td>
<td></td>
</tr>
</tbody>
</table>

- **Normal course for the use case:** NEXT-TELL should be able to provide not only information on the whole curriculum in terms of competencies, but also some information about how progress towards these competencies is managed. This might include common areas of student difficulty, common misconceptions etc. Publishers then may have additional indication on the weight they need to put on certain aspects of domain content, and where additional sample questions need to be added.

<table>
<thead>
<tr>
<th><strong>Exceptions:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Accuracy of information; consistency of meaning between stakeholders</td>
<td></td>
</tr>
</tbody>
</table>
## 11.7 Researchers

The following are two example user scenarios for researchers’ use of the open learner model. The first concerns evaluating pedagogical strategies and the second evaluating the use of software tools.

### 11.7.1 Use-cases from D4.1

| **Title:** Evaluate pedagogical strategies. |
| **Code:** R1 |
| **Goal:** Provision of professional and personal development where it is needed. |
| **Initiating:** Researcher. |
| **Affect:** Policy maker, Researcher. |
| **Start Conditions:** Many students have used the NEXT-TELL system for a substantive amount of time. |
| **End Result:** A hypothesis is accepted or rejected concerning the efficacy of a specific pedagogical approach/question. |
| **Normal course for the use case:** |
| • The researcher is able to view the aggregated and individual open learner model information for different institutions and different subject areas, applicable to the hypothesis. |
| • Together with a good evaluation design and potentially other evidence, researchers may observe the effects of a given pedagogical strategy and the variance that exists, amongst other appropriate aspects of open learner model information. |
| • Using formal analysis procedures, the hypothesis concerning a pedagogical strategy is either accepted or rejected. |
| **Exceptions:** |
| • Further analysis is required, as the information is not in a format applicable to the research question. |

| **Title:** Evaluate the use of software tools. |
| **Code:** R2 |
| **Goal:** Recommendation about whether given software tools are effective. |
| **Initiating:** Researcher. |
| **Affect:** Policy Maker, School Administrator, Teacher. |
| **Start Conditions:** Many students have used specific software tools with the NEXT-TELL system for a substantive amount of time. |
| **End Result:** The research question is answered and a recommendation given. |
| **Normal course for the use case:** |
| • The researcher is able to view aggregated and individual open learner model information for different institutions and different subject areas, applicable to the hypothesis. |
| • Together with a good evaluation design and potentially other evidence, researchers may observe the effects of a given set of software tools and the variance that exists, amongst other appropriate aspects of open learner model information. |
| • Using formal analysis procedures, the hypothesis concerning the deployment of specific software tools is either accepted or rejected. |
| **Exceptions:** |
| • Further evidence is required to be gathered to contextualise the findings that are substantiated in the open learner model, before a conclusion is drawn. |
12 Appendix 2: Scenarios

12.1 Title: Mean, Mode and Median (scenario code T3A)

Short description
A low level STEM scenario focused on three different kinds of average: mean, mode, and median. The goal is that when given numerical data, a student should be able to calculate the three different kinds of average; and also know when each of these averages is more and less useful.

Content
A lesson would introduce the requirement for averages, and then give examples that show how different kinds of averages are important.

After motivating the real-world importance of the subject, students learn how to calculate each kind of average.

After this they could then learn cases where each average of useful and less useful. For example, sometimes the mean is less useful if there are a few extreme outliers that skew this average, and the median may be a more helpful measure.

Competencies: Basic competencies will be to understand how to calculate each type of average. More advanced competencies might be concerned with being able to explain how outliers can affect averages, and which averages to choose if the affect of outliers needs to be minimised.

See below for links to more detailed lesson plans created by a teacher in Netherlands to be carried out using Texas Instruments tools.

Annex/ Additional information/ Existing material
A lesson plan focusing on this material has been produced by a NEXT-TELL teacher in the Netherlands:

12.2 Title: The tagging of competencies as a meta-competence (scenario code T3B)

Short description
A teacher wants students to reflect on how their works can be used as evidence for the competencies that they have achieved. So the teacher instructs the students to tag sections of their work that correspond to evidence for particular competencies specified by the teacher.

Content
A teacher is instructing students in a particular competence, and in addition instructing them in the meta-competence of recognising when they have achieved this competence. This is therefore a generic scenario which might be applied to many domains. For example, in STEM the correct use of a formulae and in TESL the correct use of some element of grammar. The activity has multiple stages:

- First students do some work
- Next the students tag this work with competencies suggested by the teacher
- Peers of the student then verify the student tagging (since the teacher may not have time to check all these tags him/herself). So the teacher instructs the students to swap documents so that peers attempt to verify the student tagging (and vice versa)
• The teacher can then check a sample of tags and can also check any difficult cases highlighted by either the peers doing the tagging or the original students, once they see the result of peer verification of their efforts.

• The whole class can then present results and discuss cases of particular interest

**Annex/ Additional information/ Existing material**

Currently the OLM is operating by manual input and does not yet have automated input of competencies. Automated input should be available when the results of Moodle quizzes and OLMlets assessments can be transmitting automatically to the OLM, and when other subsystems connect with data. However, even when this is possible there will still be some competencies which will more appropriately be ‘manually’ assessed.

12.3 Title: If-clauses (an English scenario with low level competencies) (scenario code T3C)

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**Short description**

There are three different kinds of if-clause in English that have to be learnt. This lesson is concerned with being able to understand and produce appropriately, these three kinds of ‘if clause’ in English.

(type condition I condition possible to fulfil; II condition in theory possible to fulfil; III condition not possible to fulfil (too late))

**Content**

The teaching material should break the competencies down with easier competencies dealt with first. So that the competence in distinguishing whether examples of use are the same or different without being able to give a detailed explanation or description of the categories, would be dealt with first. Then being able to actually classify examples explicitly into the three types would be a second stage; and finally being able to produce novel examples for each of the three kinds of ‘if clause’ would be a third more advanced competence.

One benefit of using low level competencies is that they suit measurement with detailed low level testing or questioning. Examples of three types of if clause are: ‘If I study’; ‘If I studied; and ‘If I had studied’.

The first level of competence would be to simply be able to group similar cases together. If examples of all three cases are mixed up, can students put them into three groups corresponding to the cases shown above? A second competence would be to use the cases in appropriate sentences, such as below.

<table>
<thead>
<tr>
<th>If I study,</th>
<th>I will pass the exams.</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you see John tonight,</td>
<td>tell him to e-mail me.</td>
</tr>
<tr>
<td>If Ben gets up early,</td>
<td>he can catch the bus.</td>
</tr>
</tbody>
</table>

A final more advanced competence would be to come up with novel versions of all three kinds of if-clause for new verbs, for example, such as ‘sleep’, ‘eat’, ‘delegate’ etc.

There are three levels of understanding here ranging from simple (can distinguish) to advanced (can reproduce). A teacher or researcher helping a teacher model these activities will need to be explicit about the types of learning artefact that could/would be used to evaluate whether each result is achieved. The student will need to produce examples of each of these competencies during the lesson, and formative assessment of their understanding should provide them with information about which of these competencies they have achieved and for those not achieved, how they might achieve them.

**Annex/ Additional information/ Existing material**

The three types of ‘if-clause’ are described in this webpage: [http://www.englisch-hilfen.de/en/grammar/if_type1.htm](http://www.englisch-hilfen.de/en/grammar/if_type1.htm)