Next Generation
Teaching, Education
and Learning for Life

Deliverable D5.3

Methods and Specification for TISL Components V2

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Table of Contents

1 Executive Summary

This document presents some modifications to the TISL (teacher inquiry into student learning) method and specification of components for NEXT-TELL software, version 2. It reports preliminary conclusions from ongoing research which is being conducted in the UK as part of NEXT-TELL researcher-led design studies (RDS I). TISL research is also being carried out by NEXT-TELL project partners in Norway (see deliverable D6.3). The purpose of the research is to introduce teachers to the concepts of teacher-led inquiry, as codified in the TISL method and to NEXT-TELL software which can support teachers' inquiries. There are two direct outputs of this research: (1) deliverable 6.3[1], which reports the fieldwork undertaken, and (2) this document, D5.3, which identifies changes to the TISL method and the supporting software.

TISL implements a form of design based research, by which teachers can conduct studies within their own classes as a part of formative e-assessment. RDS I builds upon research workshops carried out with practitioners (see D5.2) in project Year 1, but in contrast, it is being conducted as fieldwork in schools recruited in the UK. The outcomes of the fieldwork will be (1) refinement of the TISL method that is being introduced to teachers, and (2) further specifications of software to support teachers in creating and managing TISL research plans. This research is directly related to NEXT-TELL other work packages investigating ECAAD and SPICE, but because it is ongoing at the time of reporting, there are few obvious consequences for those work packages.

Data analysis from the RDS I fieldwork has not been completed. Nonetheless, WP5 researchers have drawn several conclusions from their fieldwork with teachers, which inform this document. The main findings are that teachers are, on the whole, able to make sense of the TISL method specified in D5.1 and are able to formulate their own teacher-led inquiry plans using the TISL approach. There is some confusion about how to refine an inspiration for research into a research question, and subsequently how to specify a research question. However, these problems can likely be addressed with better training.

A second finding is that lack of teacher time and limited (or non-existent) conceptions of research as a form of continuing professional development (CPD) are major constraints on their ability to conduct research in their classes. Thus teacher time is at a premium, perhaps more so than anticipated. This has significant consequences for the software specification. Even though TISL plans should be modelled in detail, the supporting NT software must be as simple to use as possible, or teachers will not adopt it. Consequently, a "least-best fit" approach should be adopted, which specifies the minimum set of user-interface elements needed by teachers to achieve their research goals. Another means to maximise teachers' available time would be to incorporate a library of TISL design templates into the software, which teacher could browse, adopt and adapt for their own purposes.

Further improvements to the software indicated by the fieldwork include enhancing the look-and-feel of the user interface (UI), using the principle of progressive disclosure to simplify the user interface, employing a wizard-style interface to capture TISL plans, simplifying the TISL time planner, and incorporating new data adapters to allow teachers to capture formative e-assessment data using audio services, commercial video annotation services (e.g., YouTube), and integrating with social networking tools.

The conclusions are that the ongoing research is continuing to inform the TISL method and that engagement with additional cohorts of teachers in RDS II will provide further feedback on refining it. Major changes to the software are already under way and version two is expected within the next few months. Many of the recommendations here can be incorporated into the new system. It will be imperative to test version 2 of the software with practitioners to identify additional refinements which can be incorporated into deliverable D5.4. Continuing fieldwork will also contribute to project objectives for producing teacher training materials in WP7.

[1] The findings have not been completed for inclusion in D6.3 and will instead be reported as a supplement to D6.4

2 Introduction

2.1 Purpose of this Document

The purpose of this document (D5.3) is to give an overview of the ongoing development of teacher inquiry into students' learning (TISL) components (R1), and research in the employment of the TISL method by teachers in schools. Specifically, this includes (1) the further development of an inquiry process planner that supports TISL, comprising Methods and Specifications for TISL Components V2: Revisions and Extensions, Needs Analysis, Requirements Specifications for strategic planning tool, (2) preliminary proposals for modifications to the TISL modelling tool. These arise from early research data in the form of exemplars of teacher-devised TISL plans, and data collected in 10 classes in the UK. Preliminary findings from engagement with these teachers are reported.

2.2 Scope of this Document

This deliverable gives an overview of the ongoing development of the TISL method outlined in D5.1 and components and specifications in D5.2, drawing upon early results from research into practitioners' use of TISL. It provides a brief description of research conducted with teachers at two UK schools, comprising approximately 60 teachers and 10 classes. The research is still currently being undertaken and therefore, preliminary research results are reported here, with more complete descriptions of the research itself to be provided in an RDS1 supplement in deliverable D6.4. However, findings from this work impact upon and are the primary drivers of recommendations in this deliverable. Although preliminary, the findings do indicate that modifications to the TISL Methods and Specifications described in D5.1, and TISL Components described in D5.2 should be considered (see sections 3 and 4). Such recommendations are made, in the form of use cases, example user interface (UI) elements, and recommendations that would support a simplified implementation of the TISL planning process.

Definitions of key terms used throughout this document are provided in Section 7 and abbreviations and acronyms used in NEXT-TELL are listed in the Glossary in Section 8.

This deliverable does NOT describe the development of a tool that supports school leaders' strategic planning in integrating ICTs in education (SPICE) – in relation to teaching, learning and assessment. Although a Deliverable Amendment suggested that this be reported here, this is still in a preliminary stage of design, with research emphasis instead (and necessarily) having been placed upon development of the TISL method and tools. It is proposed that this requirement be provided in the next deliverable (D5.4), as originally specified in the DOW.

2.3 Status of this Document

This is the final version, D5.3.7.

2.4 Related Documents

Before, or in conjunction with, this document it is recommended that the reader be familiar with the following documents and appendices:

Related Deliverables: D5.1, D5.2, D6.1, D6.2, D7.1

Appendix:

1. Simplified, TISL-W Modelling form

3 TISL Methods and Specifications V2

The TISL Method and Specifications V1 [D5.1] were produced from an extensive literature review and synthesis of findings within the NT team, and from research interviews with teachers. This section outlines refinements to V1 and is primarily informed by initial findings from RDS1 research in schools in the UK. A full report of the RDS1 studies is contained in D6.3 and a supplementary report in D6.4, but it is useful to provide a short overview here [4.1].

3.1 RDS1 overview

Research fieldwork was carried out in two schools in the UK during project Months 16-19. At the time of writing, this fieldwork is ongoing (see Table 1). One of the schools is an Academy school, Thomas Deacon Academy (TDA), and the second is ACS-Cobham International School, which comprises primarily ex-pat students and uses a US-based curriculum. At TDA, the head teacher of Science/STEM was engaged to run NT TISL research, and to lead a staff of 49 STEM teachers in using the TISL method and defining a TISL inquiry project. At ACS, a Computing teacher partnered with WP5 researchers to lead TISL workshops, resulting in recruitment and participation of 5 other teachers. STEM Teachers at TDA followed a TISL research plan defined by the Head of Science, and the participating teachers at ACS individually created their own TISL inquiry projects. These are currently being executed as part of RDS1 and RDS2, leading on potentially into TDS1 and TDS2.

Data are being collected with online forms, audio recordings, and feedback surveys. This is slightly different to the proposed fieldwork as described in deliverable D5.2 (Sections 4.3.1 and 4.3.2), which identified two use cases for RDS1. Use case D5.2(4.3.1) involves teachers using video as a primary data source. Use case D5.2(4.3.2) involved using statistical data as a primary data source. In the ongoing fieldwork, teachers at both schools have opted to use audio data instead of video, but will use statistical data, as proposed. In addition, the teachers at both schools have produced supplementary materials to support their TISL inquiries (e.g., handouts, flyers, data sheets, etc.); these are also primary data sources. All of these data sources are to be described in detail in D6.4, upon completion of RDS1.

School	Recruitment	TISL plans defined (classes)
Thomas Deacon Academy	Head of Science (lead) 49 STEM teachers	The Head of Science defined a TISL inquiry project which was conducted by 10 of the STEM teachers (i.e., 10 classes). A second refinement of this inquiry project is planned (March 2012), which will engage all 49 STEM teachers.
ACS Cobham International School	Computing teacher (lead) 4 STEM teachers	Each of the 5 participants defined a TISL inquiry project relevant to their own subject domain (i.e., 5 classes).

Table 1: Overview of RDS1 engagement in participating UK schools

3.2 Teacher time as a major constraint on Teacher Design Research

A guiding theoretical perspective of the development of TISL has been that enabling teachers to conduct Teacher Design Research (TDR) is a key principle of innovation in Continuing Professional Development (CPD) (see D5.1). One challenge for WP5 is that teachers are not easily able to re-frame their professional identities to encompass TDR. Preliminary work from RDS1 fieldwork corroborates this interpretation. Teacher time is a significant constraint. Teachers face severe limitations on their available time, and even though their student contact time may be a relatively modest percentage of their overall allocation, the available time for CPD was comparatively small. For example, studies [Eurydice, 2009] have shown that in the UK and Norway, an

allocation of 30 hours of CPD was considered a minimum, though in Norway this differs substantially between primary, lower and upper secondary schools. Although some of their non-contact time may be devoted to pre-defined CPD regimes, these are often constrained to specific structured training programmes using prepared materials. In the worst cases, there is no explicit training plan defined. They do not, as a matter of course, have unfettered time allocated for their own, self-directed CPD activities. Thus, teachers face institutional limitations on their ability to both conceptualise and engage their own research agendas.

3.3 Refining a method for technology-supported teacher inquiry (TISL)

NT researchers are currently evaluating teachers engagement and adoption of the TISL method as part of RDS I. The TISL Method V1 specified in D5.1 has two key layers, (1) a four-fold theoretical lens focusing on action, design, context and inquiry processes drawn from the literature on teacher research; and (2) a practice-oriented reconfiguration of these 4 perspectives that focuses on teacher teams, inquiry methods as an approach to teacher inquiry and teacher professional development, teaching and learning contexts and the notion of inquiry cycles as an iterative process for TISL-type teacher inquiry with ALTs (see D5.1). These are enacted as a model for undertaking TISL which is implemented in software via the TISL modelling tools. (see Table 2). These software tools have not yet been introduced to teachers in the UK (nor in Norway). Instead, we have begun by introducing teachers to the method (for example, in practitioner workshops as described in D5.2), and to a simplified, web-based TISL planner (see Figure 3 in the Appendix), with the objective that their feedback will inform the design of version 2. Also, considering that the current, Java-based platform will be substantially changed in version 2, it not worth the effort to train teachers in using the ADOxx platform based system, when a new system will soon be ready. We have concentrated efforts on feedback relevant to the method rather than the tools.

5-Step TISL Method	Meaning in Teacher Practice	Meaning in TISL Inquiry Tool
Establishing a trigger	Identifying a wondering, a problem, a puzzling issue	Modelling data sources, access mechanisms (*triggers*) and data boundaries (*extent of data corpus*)
Choosing a lens	Framing the focus for the inquiry process/scope, e.g. e-assessment	Identifying scope of data sources, calculation models, cause-and-effect relations
Planning for and collecting evidence	Formulating a research question - collecting/reviewing/interpreting related data sets	Aligning data capture/analysis to process/phases, execution and collection algorithms
Analysing practices	Reflecting on findings vis-à-vis past and future classroom practices	Generating reporting algorithms and mechanisms for data analysis
Enacting and adapting an action/ innovation	Enact informed change and share results with others	Providing dashboard visualisations, support for mediated actions, mediated project planning

Table 2: 5-Step TISL Method and its relations to teacher practice and TISL inquiry process planner

As the analysis has not been completed, it is not yet possible to make concrete assertions about modifications to the method (or modelling). However, preliminary feedback from teachers indicates the following:

- Despite being a research method, no part of the TISL method specifies a research question. This tends to leave researchers wondering where to posit their question(s). This should be clarified.
- The term “lens” is ambiguous. Even after clearly explaining the terminology, it is not immediately obvious to teachers what is meant, despite the description of this step as providing “focus” to the

inquiry. It may be necessary to further reinforce teachers' understanding of this as part of TISL training.

- In the first stages of defining a TISL plan (i.e., when teachers are putting their plan into the software), it is not always possible to complete a TISL plan in its entirety. This is particularly with step 5. It is difficult for teacher to envision how to enact and adapt to innovation and change, when they have not even begun to undertake the research that would lead to this. It is therefore perceived as somewhat artificial, or at best aspirational.

As discussed in D5.1, the challenge in this fieldwork lies in the transformation of teachers' personal knowledge into professional knowledge, which the teacher design and participatory design research methods aim to tackle. RDS1 operationalises this challenge by engaging teachers in the TISL method, based upon the TISL planning model (see Figure 1). NT researchers collaborate with teachers to engage in their design research, with the result that teachers are equal partners in the progress of the work undertaken and the interpretation of the results (Bannan-Ritland, 2008). This has notable consequences for the ongoing research, from the perspective of NEXT-TELL.

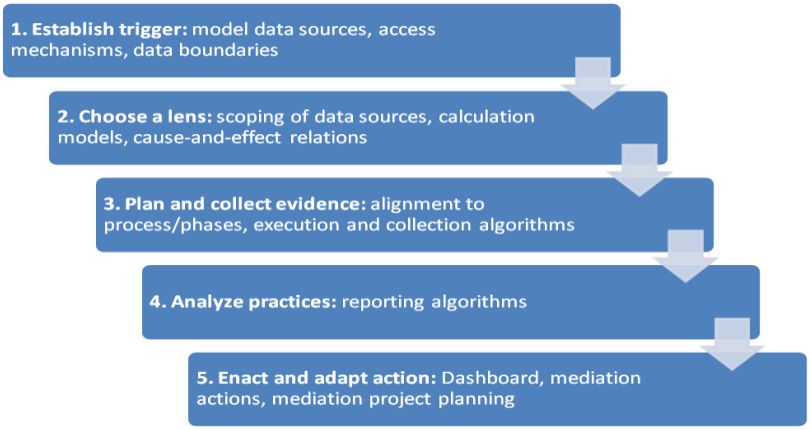

Figure 1: Structure and dependencies for the TISL Inquiry Process Planner

One of these is that teachers are free to define their own inquiries, and although these may be related to the STEM and TESL objectives of NT, some teachers whose core subject domains are outside these areas may also wish to employ TISL to conduct research. WP5 researchers encountered this at ACS, where teachers of English and French expressed interest in participating and have created their own TISL designs. We have encouraged them to continue to participate with the expectation that their TISL plans will illuminate opportunities and challenges to incorporating TISL in subject domains outside of STEM and TESL.

A second consequence of co-inquiry research is that the participating teachers may not chose to use the formative e-assessment tools for which NT has planned. Participating teachers have shown a great deal of creativity in the types of data resources they would like to use for both formative assessment and other purposes. An example of this is that teachers at both participating schools in the UK expressed the desire to use audio data as a method for formative assessment. Although data connectors are planned for Google Docs and EVA, none have been specified for audio analysis. This would seem a particularly useful approach for TESL formative assessment, since audio recordings of students could be automatically collected and organised for annotation. New types of formative e-assessment tools are likely to be called for by teachers in RDS II, and TDA I and II. This highlights the need for an extensible architecture that supports the addition of a variety of data adapters, as is currently planned for version 2. Some examples are given in Section 4.

A third consequence is that teachers may not be particularly interested in formative assessment *per se*. TISL has been intentionally specified at a relatively generic, high-level. Thus, it can be used by teachers to undertake a very wide range of research activities with their students. Although the NT project objectives are to situate its use primarily in support of formative e-assessment (thereby linking to the other strands of NT research), it is yet still possible to employ the TISL method for other purposes of inquiry. An example of this might include evaluating the success of teaching strategies based on student feedback. Although NT researchers continue to

encourage participating teachers to explore the possibilities for using NT tools to improve formative e-assessment, their interests and TISL plans may lead them in a different direction. This risk was not identified in the DOW.

3.4 Defining the "least best-fit" for Specifications

The technology tools envisioned by NT are meant to overcome some of the time constraints identified in 4.2 – the NT modelling tools and the TISL planner in particular should make it easier for teachers to conduct their work, by facilitating the planning of strategic goals, data collection and analysis. However, mitigating against this is the fact that a sufficiently robust toolset to support this work must encompass a level of complexity and granularity to adequately represent the TDR project. A resultant risk is that the abundance of features in the user interface increases to the point that the potential perceived benefits provided by the tools might not outweigh the burden imposed by learning to use them. The question raised by this is therefore: "What is the *minimum* required set of features that can adequately define a TISL project?" The answer to this question defines the "least best-fit" of features that teachers will require, i.e., the minimum required set of features that will adequately support teachers in TISL planning. This provides a starting point for the feature set specification of the TISL user interface (see below).

However, this perspective of "least best-fit" was not used to define the TISL Specification V1 because it was not possible to identify clearly the least best-fit feature set at the outset of NT whilst maintaining an agile development approach. The adoption of the ADOxx platform made available a large number of user interface (and backend) features for modelling and planning, and the agile approach mandates iterative refinement of the UI elements and features, as research results become available. Fieldwork in RDS1 is beginning to reveal both the features most likely to be needed and employed by teachers, and the contextual factors which affect their adoption of the NT tools. Early findings show that not all of these features are necessary for teachers to orchestrate the primary features of the TISL model. The further exploration of the teachers' (i.e., teachers-as-learners of TISL) contexts via the EoR method [Luckin, 2010] described in D5.1 will provide a clearer picture of the least best-fit feature set.

Defining the least-best fit does not preclude inclusion of the full range of UI elements that are supported in ADOxx platform. Additional features such as user notes, meta-data, diagrams and workflow representations, domain maps, and domain map models may also be required by some users. The specifications in D5.2 describe a sufficiently rich set of capabilities to define and execute a TDA plan to a high level of specificity. However, since preliminary fieldwork indicates that much of this rich feature set is not likely to be used, a simpler approach to TISL modelling may be needed. Learner (i.e., teachers-as-learners of the TISL planner) scaffolding can be provided to assist teachers in exploring the full range of capabilities of TISL modelling in NT specified in D5.2. Teachers who outgrow the minimum feature set for defining merely operational goals will then be able to define more nuanced and detailed TISL inquiry projects, employing the graphical UI modelling elements and the strategic goal modelling capabilities, such as the TISL indicator model, the TISL score card model, TISL inquiry process planner, and TISL sub-models (see D5.2 for a description of these features).

This challenge is very similar to the one described in D2.3, where reducing complexity is also an important topic. The persona-based approach used for ECAAD can also be applied for TISL. Following personas have been identified:

- Learner/student
- Pedagogical expert (e.g., teacher, researcher)
- Assessment expert (e.g., teacher)
- Implementation expert (e.g., teacher, policymaker, school leader)

For each persona a different set of tools and even different user interface (and functionalities) should be available. A use-case exemplifying this approach is described in Section 4.2.3.

To gauge the possibility of using a "least best-fit" interface to capture a TISL research inquiry project, WP5 researchers devised a web-based TISL planning form (TISL-W), using Google Forms (see Figure 1 in Appendices), to permit teachers to quickly and easily enter their proposed TISL inquiry projects. This form contains the minimum features needed to capture a TISL plan. It includes the 5 key steps of the TISL process presented as a

single web page, and incorporates additional demographic and scheduling information useful for both the teachers themselves, and NT researchers. The simplicity and familiarity of web-based UI widgets (e.g., text fields, drop-down menus) allows teachers to concentrate on the TISL inquiry process and TISL inquiry plan, and not on learning a new interaction paradigm.

Table 3 shows an exemplar TISL inquiry project generated by one participant at ACS. The use of a web-based form means that the kind of information elicited from teachers is substantially different to the information that teachers might enter into V1 of the TISL Modeller. It is textual and narrative. This kind of information would most likely be entered as a note section of the TISL Modeller V1, which may hide this level of detail from view during many of the modelling tasks. The use of a text-oriented data entry method foregrounds this kind of rich, narrative information. It is proposed that a similar approach be incorporated into the TISL Modeller. See Section 4.3.1 for a detailed description of the proposed form.

School ID	Teacher ID	Subject	Topic	1 - Establishing a trigger	2 - Choosing a lens	3 - Planning for and collecting evidence	4 - Analysing practices	5 - Enacting and adapting to innovation and change
ACSC	**PD**	Computer Science: Java Programming	Assessment	There are 4 different types of student assessment in the course: Lab work, mini projects, homework and reading assignments. All of these involve working on a computer, except the reading assignment. Students don't like current paper format used in reading assignments, which includes a multiple-choice questions for them to answer.	1. Change format of reading assignment so it can be done on a computer. 2. Conduct assessment in 2 steps: a. collaborative exercises, b. individual exercises RESEARCH QUESTION: Do students prefer, and perform better in, online multiple-choice questions?	Google form for multiple-choice questioning + audio recordings of students' opinions. RESOURCES REQUIRED: 12 iPod touches for student use	HERE ARE MY STAGES FOR DATA COLLECTION: Create and administer online assessment using multiple-choice questions previously assigned. Compare scores to paper assessment scores. Provide students with questions for small group discussion and recordings. Analyse audio data in April 2012.	Feedback will be used in developing courses for next academic year.

Table 3: Example TISL plan generated by teachers using the simplified TISL planning form

3.5 The need for training and acculturation to research

Additional teacher interviews are being carried out in RDS1, in which NT researchers are helping practitioners to learning and employ the TISL method. The aim of this work is to derive evidenced-based feedback about the use of the TISL method in real classrooms. At the heart of the TISL Model is the notion that ICTs (technology) can provide a useful support for teacher-led, evidence-based inquiry into students' learning. This work is being done to support teachers in developing an awareness of technology-rich teaching and learning contexts for managing innovation and change processes.

A further challenge to teacher uptake of TISL is in conceptualising the *teacher-as-researcher*, and teachers' development of research agendas and plans. The aspiration of NT in supporting Teacher Design Research lies in developing teachers' expertise as innovators through long-term engagement in iterative research in which

teachers' learning comes from their own research work and not from outside researchers (Bannan-Ritland, 2008).

One aim of WP5 work was to begin to explore the contention identified in D5.1 that collaboration between teachers in TISL should lead to better integration between theory and practice. Ideally, participants will work together to try to achieve an optimal design, reviewing and refining options by observing their use in practice and each contributing to the decision-making process and to iterative adaptations of the developing design. For this reason, it is important that users of the TISL method and tools see themselves as partners in a broader design process and that each is able to adopt a spirit of collaborative inquiry, in which all members of the design process are contributors to the research goals.

Moreover, this process of inquiry also comprises NT researchers, who not only act as researchers from the perspective on the goals of NEXT-TELL, but also as collaborative supporters in teachers' development of optimal research designs and in supporting their professional development as Teacher Design Researchers. This is in distinction to the Training objectives of NEXT-TELL, which are addressed in the D7 deliverables. Rather, the teachers must be trained in both the philosophy and methods of research implied by DBR, and at the same time they also must be trained in using the TISL method defined by D5.1, in order to undertake the collaborative DBR that is operationalised by RDS1 and RDS2. Moreover, their proficiency must be very well established, if they are to undertake the teacher-led research that is planned for TDS I and TDS II.

Notwithstanding the optimistic and altruistic aims of DBR and Teacher-led Inquiry as enabled by NEXT-TELL methods and tools, it is difficult to understate the substantial shift in practitioner world-view that must be achieved. NEXT-TELL researchers, are the primary vectors by which this shift is made. Thus, the fieldwork represents a balance between achieving the NT research objectives and achieving a paradigm shift in teachers' conceptions of their practice. These considerations have become evident during the RDS I research, but were not explicitly identified in the DOW or D5.1.

3.6 TISL Design templates

One possibility for overcoming teachers' time limitations, for accommodating their relative inexperience as researchers, and for supporting them in employing enquiry in their contexts might be the use of research design templates. As a corollary example, Learning Design patterns have been extensively studied in research in Education and have been shown to be useful to teachers for planning learning [see for example, Avigeriou, et al., 2003 and Mor & Winters, 2007]. Rather than coming up with their own TDR plans, teachers might draw inspiration from the TDR plans of their colleagues, provided that they capture a research project with a sufficient level of granularity. Teachers could use such templates, adapting and adopting them for their own strategic goals.

This might lead to the definition of a TISL design Template browser in the Modelling environment (see Section 4.3.2).

4 TISL Components V2

In Deliverable D5.1, we described two methodologies (see D5.1) comprised of preliminary models for progressing (1) teacher inquiry and (2) school leaders' strategic planning, drawing upon a substantial literature review and discussions among NT researchers. In Deliverable D5.2, these preliminary models were further developed to move towards the production of related inquiry process and planning tools which teachers and school leaders can use to support their application of these preliminary methods (see D5.1) in practice. Development of TISL Components V2 for this deliverable was carried out by introducing teachers to the use of technology tools to support the TISL modelling process by:

1. Engaging schools to train teachers about teacher-led inquiry and the TISL method
2. Inviting teachers to design their own teacher-led inquiries using tools of their choice

This work comprises RDS1. This section of the deliverable focuses on the impact of RDS1 preliminary findings on the TISL inquiry process planner and the consequences for TISL Components V2. As this RDS1 fieldwork is ongoing, it is important to note that these specifications are preliminary and not complete. A more complete specification resulting from data analysis will be included in D5.6.

4.1 Preliminary findings and recommendations

These recommendations result from heuristic interpretation of research that is ongoing. Final data analysis of RDS1 will be carried out upon conclusion of the fieldwork. Nonetheless, preliminary judgements can be made, drawing from recorded interviews and workshops carried out with participating schools. These are summarised below as feedback from participants, and early stage recommendations for TISL Components V2.

4.2 Feedback from participants

4.2.1 Overview

The following recommendations are collated from recorded interviews taken from RDS1 in 6 separate fieldwork engagements. The arise from observations made by teachers who used the web-based TISL-W planning form described in Section 3.4.

4.2.2 Recommendations and feedback from participants

Feedback from participants indicates the following modifications to the TISL modeller:

- Include a section in the TISL planner where details of the project background could be elaborated. This information can be collected in the Establishing a Trigger step.
- Include a separate section for listing the resources (e.g., hardware and software required by the TISL inquiry project, or being requested for it). Participants have included this information under Planning for and Collecting the Evidence.
- The ADOxx platform TISL planning modeller is at too fine a level of granularity to be useful to most teachers. A simple calendar-based planner would be sufficient. It would be ideal to connect this with existing scheduling/time management platforms already in use (e.g., Outlook, Google Calendar)
- The simplified, web-based TISL planning form was easy to use
- It is not clear which step should specify a research question, and indeed the TISL method does not explicitly mandate one. This should be clarified in the user interface.

4.2.3 Example Use Case

An example of using the simplified TISL planner is presented in the Table 3. This example is based upon a use case described in D4.3 (Section 5), and illustrates the use of NEXT-TELL software across several levels of functionality, including the Evidence Centred Activity and Appraisal Design (ECAAD) planner, the Open Learner Model (OLM), and the TISL planner. This example assumes that the front-end user interface is presented using a person-based approach, where the user role determines which UI elements are presented and their layout.

Title: Planning of future learning activities.

Goal: Plan future lessons based on evidence available in the NEXT‑TELL system.

Initiating: Teacher.

Affects: 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 (perhaps designing these in ECAAD).
- 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' correct 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 able students gain knowledge of the basics. All students may be kept engaged and sufficiently challenged (without being bored).
- The teacher uses the TISL inquiry planner to evaluate whether changes to the learning activities will result in students' improvement, and to evaluate the effectiveness of this new approach to the learning activity, based upon student feedback and discussions.

Exceptions:

· All students have unique needs.

· The teacher is unable to identify appropriate activities students could undertake to correct problems.

Table 3: Use case for teacher inquiry design using the TISL planner, building upon activity design (ECAAD) and evaluation using the open learning model (OLM).

In executing the TISL plan described in this use case (see Figure 2), an assessment expert (e.g., a teacher) can draft a TISL plan using either Google Docs (as free text) or a simplified, web-based form (i.e., TISL-W). The data is than converted via a data adapter for audio and made available in the rich TISL planner (with the full functionality), where an implementation expert (e.g., another teacher or researcher) can complete the TISL plan, if necessary. For example, a colleague who is a more experienced researcher may suggest changes or additions to a teacher's TISL plan created with the simplified planner.

The teacher or implementation expert can access a richly represented version of the TISL plan, using the full set of modelling features, if they are needed. This implements the principle of progressive disclosure, in that only the needed elements of the TISL planner are exposed to users and only at the time they are needed. A final TISL plan can be published and feedback can be elicited in the form of comments or live chat, within the Google Document. Published TISL plans can also be browsed by colleagues seeking inspiration for their own research, or who wish to adopt and adapt existing TISL plans.

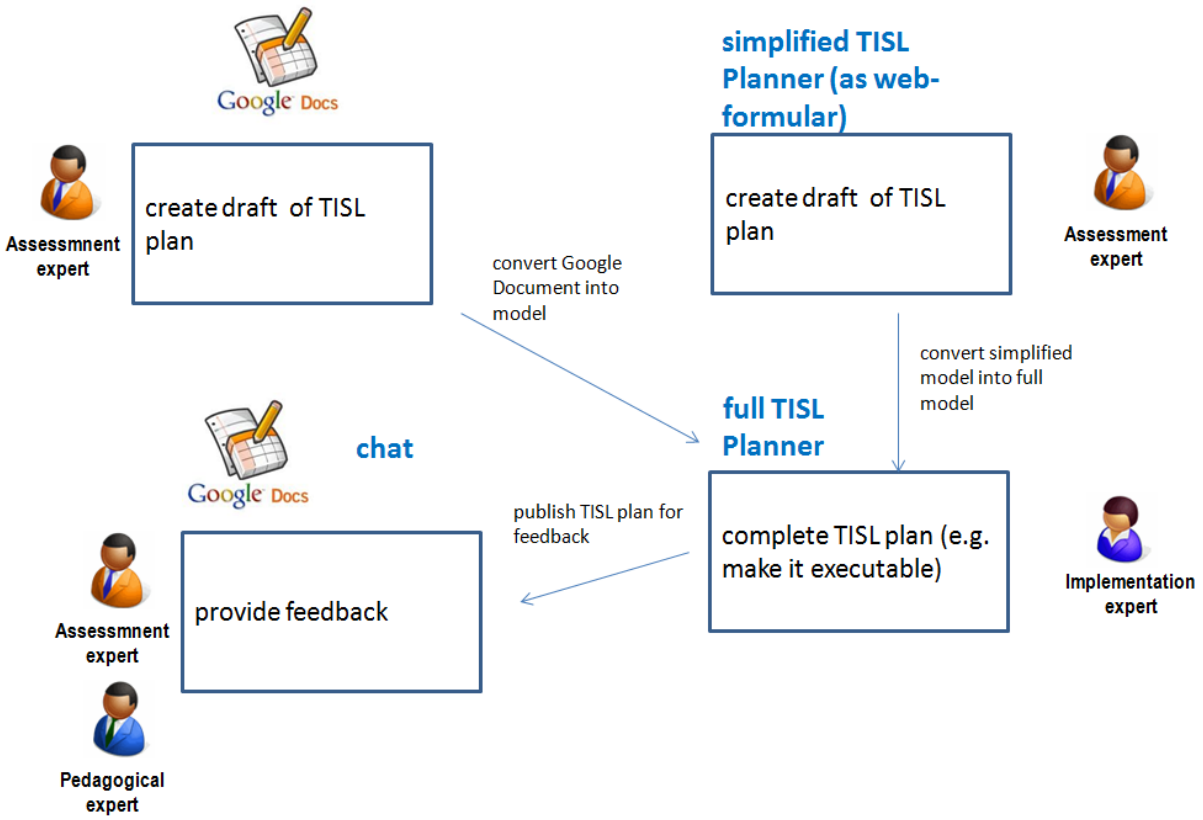

Figure 2: Use case as executed in the TISL planner

4.3 Modifications to TISL Modelling Tool

4.3.1 Proposed User Interface elements

Icons and "look-and-feel"

The Java-based UI icons and the look-and-feel of graphical elements are perceived as outdated. There is a substantial body of evidence from the Human-computer Interaction HCI literature that aesthetic factors substantially impact upon user acceptance [for an overview, see Norman 2005]. Thus, participant feedback in this regard should be taken seriously. Current plans to move towards web-based UI elements in V2 of the NT toolset should substantially address these concerns.

Progressive disclosure

In UI design, the principle of "progressive disclosure" relates to the layout of UI components, menus and widgets, and mandates that only the relevant information necessary to complete the immediate tasks at hand are displayed. This improves usability by presenting only the minimum data required for the task. Examples are to be found in office productivity tools in the form of truncated menus, and procedural task completion dialogues (so-called "wizards"). To maximise user acceptance and usability, the full complexity of the TISL modelling components should not be immediately exposed to users. This is partly accomplished though the use of collapsible menus in V1 of the tools and by setting their default state to be closed. The principle of progressive disclosure, should be applied where possible throughout the UI in V2.

Wizard-style/Web form TISL modelling interface

It is proposed that the next revision of the TISL modelling tool will incorporate a simplified TISL modeller view, based on the TISL-W form described in Section 3.4. It should use familiar, web-based UI widgets. Teachers will be able to initiate a basic TISL inquiry project using this form or wizard. Graphical representations of the TISL

process displaying UI elements such as TISL process steps and dashboard will also be created by the TISL modeller, but can be examined by teachers on an as-needed basis. Data adapters can be incorporated easily into such a form, using a simple UI widget such as a drop-down menu.

Simplified time manager/planner

The Gantt-chart metaphor of the TISL planner is perceived to be technocentric, and more detailed that teachers will need or accept. It is perceived to be too rigid to accurately reflect the dynamic teaching contexts within schools, wherein schedules shift often and unexpectedly. The cost-benefit of using the modeller in its present form as not justified.

A simplified time manager should be incorporated into the TISL modeller. A simple calendar-based user-interface element would be sufficient. Integration with external personal planners/time management systems (e.g., Microsoft Outlook, Apple Calendar, Google Calendar, etc) might be useful, but is not seen as essential.

4.3.2 TISL Design Template Module

Users have suggested the desire to produce reports that capture the narrative of their TISL inquiry projects. The V2 UI should incorporate a means to output standardised representations of TISL project plans in human readable form. These could take the form of standardised outputs which could be exported as word processing documents of PDF files. Such outputs are a key element that will make up the components of SPICE, but simplified, human-readable versions could also be used as a basis for sharing TDR practice, following the model of Design Patterns.

Electronic representations of these TISL Design templates, taggable with user-defined metadata, could be incorporated into a library of TISL inquiry projects in the V2 UI, which could be browsed by teachers who are looking to share, adopt, and adapt their TDR work. If the library were also browseable online, it could also link to a larger community of practice though an externally based social-networking or web-based forum.

4.3.3 Proposed Data Adapters

Existing/planned

The project has already planned to create data adapters for EVA, SecondLife (for TESL work), Moodle, and Google Docs. These data adapters are in various stages of completion at the time of writing but have not yet been deployed in a manner that they can be used by teachers in fieldwork. It is anticipated these will come online with the next software release.

SoundCloud

Participants in RDS1 studied in the UK indicated a strong desire to incorporate audio data analysis in their research. Although it is not clear how the use of audio data could be integrated with ECAAD, it is nonetheless perceived by participants as a valuable data resource for gaining insights into student learning, and thereby informing teachers' formative assessments.

One publicly available web-based, commercial software tools was identified for assisting with this process.

YouTube

Participants in RDS1 studied in the UK indicated a strong desire to incorporate audio data analysis in their research. Although it is not clear how the use of audio data could be integrated with ECAAD, it is nonetheless perceived by participants as a valuable data resource for gaining insights into student learning, and thereby informing teachers formative assessments.

Social Networking Tools

Increasingly, students are using social networking tools such as Facebook and Twitter to collaborate and share coursework. Teachers are also beginning to express the desire to harness social networking tools as a means of extending learning outside of the formal classroom setting. This is also becoming a noteworthy area of research in TEL.

5 Conclusions

This document has presented a summary of preliminary recommendations resulting from fieldwork in RDS I in the UK. The fieldwork leading to these findings is ongoing at the time of writing, but preliminary indications are that, with proper introduction and training, the TISL method can be adopted by teachers for describing and enacting their own teacher-led inquiries in their classrooms. Preliminary indications are that the TISL method will remain largely unchanged, though there should be clarification to teachers regarding how and where to specify their research objectives and question(s). Our experiences working with and training teachers in using the TISL method will be valuable for producing the training materials for WP7.

In terms of the TISL software components, teachers also would like to use a wide variety of data sources in defining their TISL plans. This confirms our project strategy to build an extensible architecture, particularly with regard to data adapters, as has been planned for version 2. In addition, although the ADOxx platform used for version 1 contains a rich set of UI tools for teachers to employ in modelling their TISL plans, these tools may offer a greater level of detail than teachers can use, given their limited time and resources. Version 2 of the NT environment will present a more accessible, web-based platform for teachers to use, and will employ persona-based interactions. The simplified TISL planning approach will be well suited to this environment. Thus, it will be imperative to engage teachers in using version 2 of the software in refining their TISL plans, and to conduct user evaluations of the revised platform as part of RDS II and in the teacher-led design studies.

6 References

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7 Definitions

This section provides an overview of key terms used in this deliverable. The key terms and definitions provided in Table 3 are provided to bridge the dialogue between designer/developers and social researchers, teachers, school leaders and other stakeholders participating in the NEXT-TELL project. They relate to the various inquiry, modelling and planning processes, tools and related components described in previous sections of this deliverable.

Term	Definition
Academy school	In the UK educational system in England (i.e., not Scotland, Wales, or Northern Ireland), a school that is directly funded by central government and independent of control by local government in England. An academy may receive additional support from personal or corporate sponsors, either financially or in kind. They must meet the National Curriculum core subject requirements and are subject to UK government inspection regimes. They are self-governing and most are constituted as registered charities or operated by other educational charities. Most are secondary schools for pupils aged 11 to 16.
boundary	scope of inquiry
dashboard	provides visualisations of the results of the inquiry process
data adapter	adapts data elements/artefacts contributing to values/indicators in TISL process
data element	informational artefacts that contribute to/shape/inform the inquiry process, e.g. student test results
data filter	filters data elements (e.g. filters log files for data that can be assessed/quantified)
domain map	a map of the Knowledge Domain
domain map model	models contributory values from Knowledge Domain, e.g. integer operations, knowledge of integers
influences	relates to the modelling of relations between strategic goals and their level of importance (strong, moderate, weak, critical, positive/negative)
inquiry process	use of TISL method and related tools as a systematic procedure for inquiring into students' learning
inquiry project	a single instance of inquiry which may comprise multiple inquiry processes
International school	In the UK educational system in England (i.e., not Scotland, Wales, or Northern Ireland), a school that is not directly funded by central government and which is independent of control by local government in England. International schools may define their own curricula independent of the UK National Curriculum and cater mainly to students who are not nationals of the UK, such as the children of the staff of international businesses, international organizations, foreign embassies, missions, or missionary programs.
modelling element	an object or process block
"least best-fit"	a specification of the minimum features set in a user interface that is needed to successfully complete a task
model type	variable model types within the overall TISL modelling set, e.g. Indicator model, Planning model, Assessment model, etc.

Term	Definition
note	permits 'open text' to be included within the TISL model during the inquiry process.
operational goal	relates to division of strategic goal(s) into short term (operational) goal(s)
process step	a way of visualising each step in the inquiry process using the TISL inquiry process planner, cf process blocks in workflow modelling or flow charts
Progressive disclosure	an interaction design technique often used in human computer interaction to help maintain the focus of a user's attention by reducing clutter, confusion, and cognitive workload.
step	one step within the TISL inquiry process, a block attribute depicting processes
strategic goal	the goal(s) or outcome(s) of teachers' inquiry (what they want to achieve through application of TISL methods and tools)
sub-model	detailed view of subset of processes within a specified inquiry project
TISL indicator model	identification of contributory artefacts and potential value indicators, e.g. test sheet, score, count as average test score
TISL planning model	a research plan comprised of a workflow model generated by teachers using the TISL inquiry process planner; single view; iterative design
TISL score card model	a way of modelling goals (outcomes) and indicators (contributory values) within the inquiry process
User acceptance	Refers to the likelihood that software users will be willing to adopt a tool for use in their task completion and goals
web form	an HTML-based input template for user data
wizard	a computer user interface that leads a user through a dialog of procedural steps/tasks to complete a clearly defined goal

Table 3: Definitions of key terms used in this document

8 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.Z.O.O., PL
MTO	MTO Psychologische Forschung und Beratung GmbH, DE

Abbreviations

ACS	ACS Cobham International School
CPD	Continuing Professional Development
DOW	NEXT-TELL Project description of work document
DBR	Design-Based Research
ECAAD	Evidence Centred Activity and Appraisal Design (builds on the ECD)
EVA	Educational Video with Collaborative Annotations, Analysis and Assessment
HCI	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
PADI	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.
RA	Requirement Analysis
RDS	Researcher-led Design Study (e.g, RDS1 and RDS2)
SRI	Stanford Research Institute

STEM	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
TDA	Thomas Deacon Academy
TDR	Teacher Design Research
TDS	Teacher-led Design Study
TEL	Technology Enhanced Learning
TESL	Teaching English as Second Language
TISL	Teachers Inquiry into Students Learning
TISL-W	A web-based TISL planning form based on least-best fit specifications
UI	User interface

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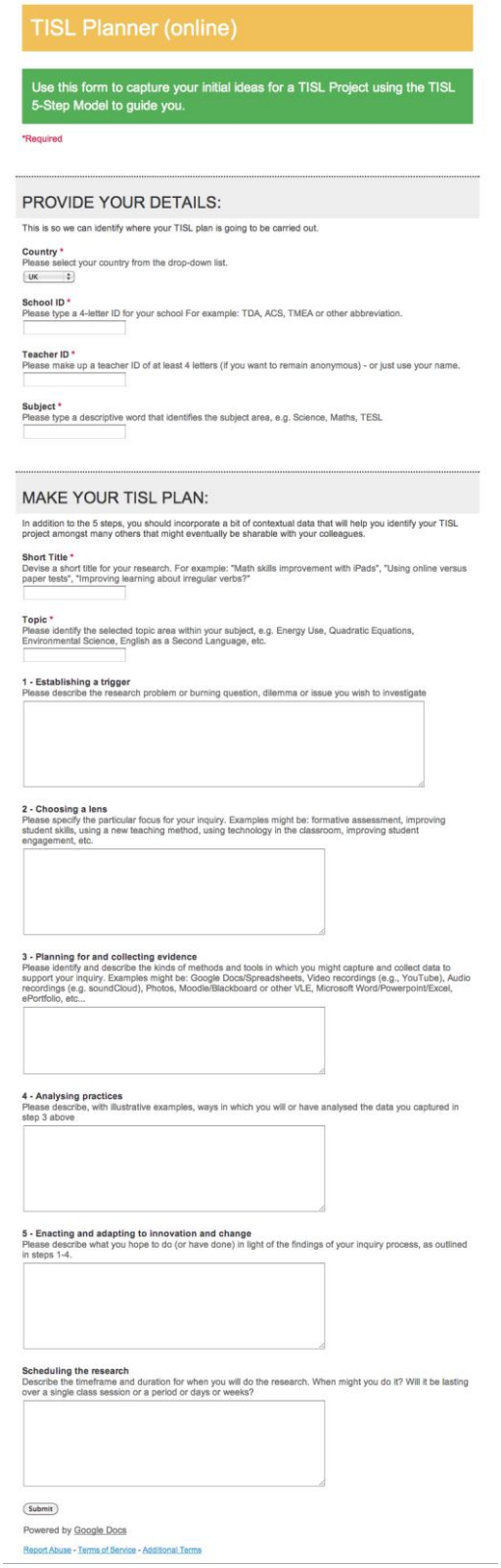
9 Appendix



TISL Planner (online)

Use this form to capture your initial ideas for a TISL Project using the TISL 5-Step Model to guide you.

*Required

PROVIDE YOUR DETAILS:

This is so we can identify where your TISL plan is going to be carried out.

Country *
Please select your country from the drop-down list.
UK

School ID *
Please type a 4-letter ID for your school For example: TDA, ACS, TMEA or other abbreviation.

Teacher ID *
Please make up a teacher ID of at least 4 letters (if you want to remain anonymous) - or just use your name.

Subject *
Please type a descriptive word that identifies the subject area, e.g. Science, Maths, TESL

MAKE YOUR TISL PLAN:

In addition to the 5 steps, you should incorporate a bit of contextual data that will help you identify your TISL project amongst many others that might eventually be sharable with your colleagues.

Short Title *
Devise a short title for your research. For example: "Math skills improvement with iPads", "Using online versus paper tests", "Improving learning about irregular verbs?"

Topic *
Please identify the selected topic area within your subject, e.g. Energy Use, Quadratic Equations, Environmental Science, English as a Second Language, etc.

1 - Establishing a trigger
Please describe the research problem or burning question, dilemma or issue you wish to investigate

2 - Choosing a lens
Please specify the particular focus for your inquiry. Examples might be: formative assessment, improving student skills, using a new teaching method, using technology in the classroom, improving student engagement, etc.

3 - Planning for and collecting evidence
Please identify and describe the kinds of methods and tools in which you might capture and collect data to support your inquiry. Examples might be: Google Docs/Spreadsheets, Video recordings (e.g., YouTube), Audio recordings (e.g. soundCloud), Photos, Moodle/Blackboard or other VLE, Microsoft Word/Powerpoint/Excel, ePortfolio, etc...

4 - Analysing practices
Please describe, with illustrative examples, ways in which you will or have analysed the data you captured in step 3 above

5 - Enacting and adapting to innovation and change
Please describe what you hope to do (or have done) in light of the findings of your inquiry process, as outlined in steps 1-4.

Scheduling the research
Describe the timeframe and duration for when you will do the research. When might you do it? Will it be lasting over a single class session or a period or days or weeks?

Submit

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Figure 3: Simplified TISL planning Tool. This can be accessed online at: http://bit.ly/GWPu5p