ITL Research Design

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ITL research
Innovative Teaching and Learning
Sponsored by Microsoft's Partners in Learning

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1. Introduction and Research Questions

This paper describes the design of Innovative Teaching and Learning (ITL) Research, a multiyear global research program sponsored initially by Microsoft's Partners in Learning, with increasing partnership from governments and other stakeholders around the world. Now entering its first post-pilot year, ITL Research investigates the factors that promote the transformation of teaching practices and the impact those changes have on students' learning outcomes across a broad range of country contexts.

Education and political leaders in countries around the world have recognized the imperative for preparing their youth for the 21st century, a goal that many believe requires fundamental transformation of educational opportunities and the integration of technology into teaching and learning (Ananiadou & Claro, 2009). But educational change is complex and takes place within an ecosystem of influences that range from national policies, programs, and supports to local community contexts and school-specific professional cultures. Rather than examining each component individually, ITL Research takes a broad look at school ecosystems, seeking to contribute to the current understanding of how effective transformation of teaching and learning supported by technology is taking place. This multiyear research program makes use of parallel case studies for deep investigation of the national and school-level factors that shape teaching practices within particular country contexts and looks across the cases to provide global stakeholders with information and informed recommendations on the future of teaching and learning.

The primary focus of this research is on innovative teaching practices that provide students with learning experiences that promote 21st-century skills. "Innovative teaching practices," in the ITL model, are characterized by student-centered pedagogy, learning opportunities that transcend the school walls, and the integration of information and communication technologies (ICT) into teaching and learning. From a research perspective, one of ITL's unique contributions will be a set of methods that can support the measurement of those teaching practices across highly divergent schooling contexts, from emerging markets to advanced industrialized countries. A second important contribution is the study of the connection between teaching practices and the resulting achievement of students' 21st-century skills (Pedró, 2009).

But ITL Research is not solely a research program: it also seeks to use the tools and definitions that it develops to support educators who are working to improve the quality and relevance of the education they provide to students. In parallel with the development of the research methods described in this document, ITL Research is establishing tools and processes based on these methods that are tuned to use by educators, in order to generate "usable knowledge about practice" (Bryk, 2009, p. 599) that can catalyze collaborative reflection and practice improvement. All methods and tools developed on this project are available to the public at http://www.itlresearch.com/

Global research questions are as follows:

1. To what extent are innovative teaching practices associated with 21st-century learning outcomes? [1]
2. What school-level conditions are associated with innovative teaching practices?
3. What national or regional program supports and professional development are associated with innovative teaching practices?

ITL Research is a three-year study. In 2009-10, the methods and tools described in this document were piloted in four countries (Finland, Indonesia, Russia, and Senegal) that were selected in part to reflect the range of economic, cultural, and educational conditions around the world. 2010-11 is the main year of data collection, carried out in a total of eight countries (the four pilot countries plus Australia, Mexico, the United Kingdom, and the United States). The final year of the program will include final data collection and reporting as well as support to schools to help them monitor and improve their 21st century teaching practices and outcomes.

The remainder of this document describes the following elements of the ITL Research design:

- *Theoretical Framework.* This section describes the logic model on which the design is based and the key constructs that will be investigated in this research.
- *International Study Design.* This section describes the balance of global and country-level activities in this multi-national study, and the organization and management of the global team of research partners.
- *Methods and Instrument Design.* This section presents the multiple methods that are part of ITL Research, and the process of development, testing, and administration for each type of instrument.
- *Sampling*. This section lays out the global sampling guidelines that researchers in each country are trained to enact for their local samples.
- *Project Reporting.* This section describes the reports that are produced from this project at the global and national levels.
- *Analysis.* For more technical readers, this section provides an overview of the analytical methods that the project uses to assess the technical quality of pilot instruments and explore research questions.

More information about the study design as it evolves will be posted online at http://itlresearch.com/.

[1] For purposes of this study, “21st-century learning outcomes” are defined as the following set of skills: knowledge building, problem-solving and innovation, skilled communication, collaboration, self-regulation, and use of technology for learning.

2. Theoretical Framework

An assumption in the ITL research design was that the research questions and instruments needed to be informed by an international perspective, rather than a particularly U.S. or North American one. The literature that contributed to the design and instruments for this study includes leading multinational studies such as the Second Information Technology in Education Study (SITES; Law, Pelgrum, & Plomp, 2006) and the Programme for International Student Assessment (PISA; OECD, 2006); frameworks for 21st-century learning (e.g., UNESCO, 2008; Partnership for 21st Century Skills, 2004; Government of South Australia, 2008; ISTE, 2007, 2008); and research on specific constructs related to teaching practices that are associated with positive student outcomes (e.g., Bryk, Camburn, & Louis, 1999; Groff & Mouza, 2008).

These inputs contributed to the logic model shown in Figure 1. While this framework does not claim to be a comprehensive picture of all of the influences that support or shape changes to classroom practice, it does include a range of key constructs that research has shown to play particularly important roles.

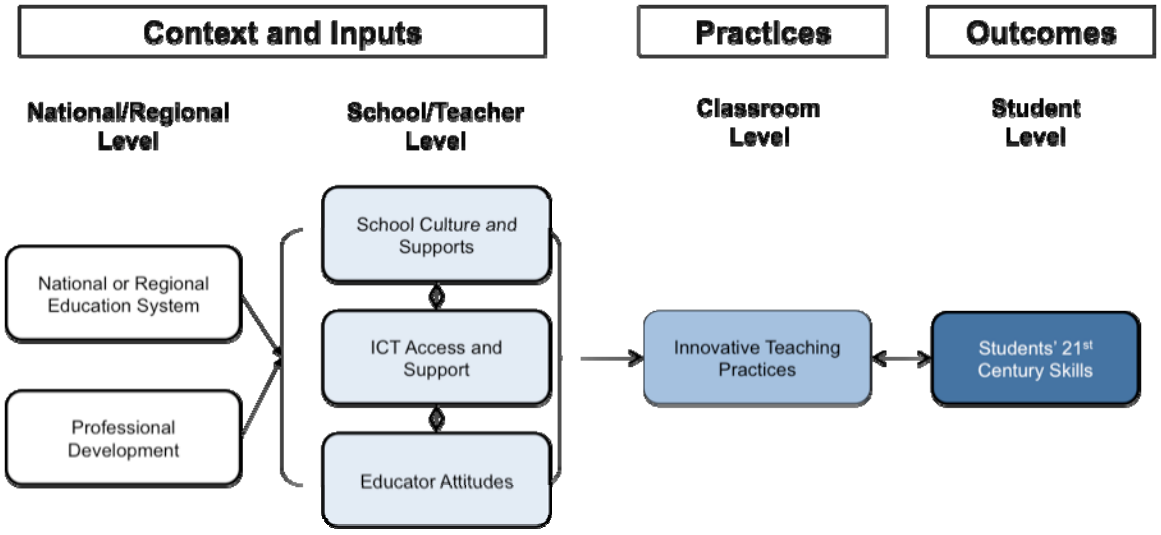

Figure 1. ITL Research Logic Model

The model is described as follows:

- *Innovative teaching practices* are the main focus of investigation. As noted above, innovative teaching practices for the purposes of this study consist of the following three primary constructs:

  Student-centered pedagogies. In this research, student-centered pedagogies include models of teaching and learning that are project-based, collaborative, foster knowledge building, require self regulation and assessment, and are both personalized (allowing for student choice and relevance to the individual student) and individualized (allowing students to work at their own pace and according to their particular learning needs). Each of these elements has a strong base of prior research linking it to positive outcomes for students in terms of development of 21st-century skills; see, for example, Bransford, Brown, & Cocking, 1999; Darling-Hammond et al., 2008.

Extension of learning outside the classroom. This construct refers to academic activities that reflect the nature of high-performing work groups in the 21st century. Learning activities extend beyond the traditional boundaries of the classroom, include individuals beyond the classroom community, provide opportunities for 24/7 learning, foster cross-disciplinary connections, and promote global awareness and cultural understanding.

ICT integration in teaching and learning. This construct relates to uses of technology by teachers and by students. Because the impact of ICT can vary widely depending on its pedagogical application (Myndigheten For Skölutveckling, 2008), this construct includes a focus on *how* ICT is used and not simply *whether* it is used.

- Innovative teaching practices are shaped by a host of *school- and educator-level factors*. The model focuses on three overarching constructs:

  School culture and supports that shape teaching practice. For example, research has shown that teacher *communities of practice* can provide a powerful force for change (Little, 2006) and that *trust among teachers* is a critical enabler of the types of interactions that are essential for positive change to take root (Bryk & Schneider, 2002; Shear et al., 2009).

  ICT access and support, including such factors as location, availability, and functionality of ICT tools. Research has shown, for example, that while access is an essential condition for ICT integration in the classroom, educators cite lack of support as a primary challenge (Law, Pelgrum, & Plomp, 2006).

  Educator attitudes shape educational reform in powerful ways. In ITL Research, this construct includes teacher beliefs about teaching and learning (for example, their beliefs about new vs. traditional pedagogies; Becker & Reil, 2000), teacher motivation and self-efficacy (Gibson & Dembo,1984), and teacher attitudes toward and comfort with ICT.[2]

- School and classroom factors operate in the context of *national and regional education systems*

Students' 21st Century Skills

Knowledge Building. Students move beyond the reproduction of information to construct knowledge that is new to them.

Problem-Solving and Innovation. Students solve problems for which there is no previously learned solution, make choices in their approach, and implement their solutions in the real world.

Skilled Communication. Students present their ideas in ways that are clear and compelling, and present sufficient relevant evidence on a topic or theme.

Collaboration. Students work together in groups, take on roles, and produce a joint work product.

Self-Regulation. Students plan and monitor their work, and make revisions based on feedback or self-assessment.

Use of ICT for Learning. Students use ICT to construct knowledge; choose when, where, and how to use it; and evaluate the credibility and relevance of online resources.

[2]Pilot year results that showed challenges measuring teacher beliefs in ways that were valid across country contexts. While educator attitudes remain an important construct, their measurement in this research will be primarily through qualitative means.

(including structure, policy, vision, and capacity) and *program supports* (including professional development in particular, which may be available through programs sponsored by government, NGOs, or the private sector).

- Finally, *students' 21st-century skills* include broad skills that are seen as important goals of innovative teaching practices. The ITL Research model characterizes these skills as knowledge building, problem-solving and innovation, skilled communication, collaboration, self-regulation, and use of ICT for learning, as described in the box above.

These key constructs are described in more detail in Appendix A, which includes the specific definitions that operationalize each of the constructs for the purposes of ITL Research and the methods (described below in section 4) through which each of the constructs will be measured.

3. International Study Design

Following the model of other significant multinational research projects (e.g., Law, Pelgrum, & Plomp, 2006; Kozma, 2003; OECD, 2006), ITL Research uses a distributed design to carry out research that is at once global and local in scope. The project's initial sponsor is Microsoft's Partners in Learning, with increasing partnership from sponsoring governments and other stakeholders in participating countries (see Table 1). The research program is managed by Langworthy Research, with the support of a team of international education experts and advisors.[3] A global research organization, SRI International, is responsible for research design, coordination, and results synthesis, ensuring that instruments and overall design parameters are developed centrally and implemented consistently across countries. At the same time, a national partner in each country is engaged to carry out the local research and participate in a global network. Research partners are selected through a competitive proposal process, and each represents a leading independent or university-based research organization in its country. The country partners create local design plans and adapt instruments as required to ensure that the research is appropriate to the country context and serves local as well as global needs.

This design enables a coherent global research program that includes country-level studies focusing on issues and programs that are important within each country. Education systems and schools within the eight participating countries range from progressive to traditional, and from mature reform programs to early explorations into supports for new teaching practices. This research program's case study approach will enable both country-level and global researchers to study innovation in context. Many elements of change will be country and context specific; the study is also designed to look for global patterns or insights.

The target student age range for this research is 11 to 14, so the design in each country will involve the level of schooling that serves most students at these ages. In different countries, this is either upper elementary or lower secondary school.

These and other important country-specific design parameters are described in the Country Research Plan that each country partner develops before research begins. Plans are reviewed by SRI, the global research organization, to ensure appropriate levels of consistency across countries.

Global and country-level participants and sponsors in ITL Research for 2010-11 are shown in Table 1. A more complete global organization chart can be found at http://itlresearch.com/.

[3] In 2010-11, project advisors include Francesc Pedro and Tarek Shawki (UNESCO); Robert Kozma (Kozmalone Consulting); Patricia Wastiau (European School Net); Seamus Hegarty (IEA); Lynn Nolan (ISTE); Hamish Coates and Geoff Scott (ACER); Michael Fullan (Ontario Institute for Studies in Education, University of Toronto); Deirdre Butler (St. Patrick's College, Dublin); Erik Yankah (Yankahlink Advisors); Bee Yann Lee (St. Andrew's Junior College, Singapore); Jenny Lewis (Australian Council for Educational Leaders); Nancy Law (Centre for Information Technology in Education (CITE), University of Hong Kong); Leo Burd (MIT Media Lab); David Dwyer (University of Southern California), and Greg Butler and Kati Tuurala (Microsoft).

Table 1. Global ITL Research Team

Country	Role	Organization
Global	Project sponsor Project management and oversight Global research lead	Microsoft Partners in Learning Langworthy Research Center for Technology in Learning, SRI International
Australia	Country research partner Country research sponsor	SORTI, University of Newcastle New South Wales Department of Education and Training
Finland	Country research partner Government partner	Agora Center & Finnish Institute for Educational Research, University of Jyväskylä National Board of Education
Indonesia	Country research partner Government partner	Centre for Strategic and International Studies Ministry of National Education (MONE)
Russia	Country research partner Government partner	Institute of New Technologies, Moscow The Academy for Teachers Training and Professional Retraining for Educators (APKiPPRO)
Mexico	Country research partner Country research sponsor	Proyecto Educativo Secretaria de Educación Publica, Mexico
Senegal	Country research partner Government partner	Association of Teachers and Researchers of ICT in Education and Training National Ministry of Education
UK	Country research partner Country research sponsor	London Knowledge Lab Specialist Schools and Academies Trust
USA	Country research partner Country research sponsor	Center for Technology in Learning, SRI International Stupski Foundation

Training and teambuilding across the distributed global research team are accomplished by, on average, two face-to-face workshops per year. In the first two years of the project new country orientation and methodological consistency are facilitated by a kickoff meeting each September that includes training on each research instrument, along with specific instructions for localization, administration, and data reporting for each method as well as discussion of common research procedures. A separate 4-day workshop is held later in the school year to train research partners in the rubrics and procedures to be used for local coding of learning activities and student work. As the research progresses, the focus of these meetings is expected to evolve from training and orientation to the sharing of research results in formats that are open to the

broader research community. These meetings are supplemented by regular telephone conferences and ongoing electronic communications between the global and country research partners in order to support and monitor ongoing consistency and research quality.

4. Methods and Instrument Design

For a systemic understanding of educational reform, and following the logic model presented in Figure 1, it is necessary to collect data at multiple levels within the system, from the national or regional context to the school, educator, classroom, and student. As a result, this study employs mixed methods, with an integrated design that provides detailed definitions of essential constructs to ensure consistency across instruments. The study's methods are introduced in Table 2 below.

Table 2: ITL Research Methods Summary

Method	Purpose	Levels of System Addressed
Surveys of teachers and school leaders	Provides quantitative data from a large sample of respondents[4] to describe teacher and school leader experiences of national context and programs, school culture and supports, and self-reported beliefs and practices.	National/regional, school, educator, classroom
Interviews with school leaders and teachers	Provides richer and more contextualized data from a smaller sample of respondents on participants' experience of reform and the factors that shape it.	National/regional, school, educator, classroom
Analysis of Learning Activities and Student Work (LASW)	Uses artifacts of actual classroom practice to measure opportunities for 21st-century learning according to a set of dimensions that are defined consistently across countries and classrooms (See Appendix A).	Classroom, student
Classroom Observations	Allows researchers to observe and describe classroom environments and learning activities in common ways across country and school contexts.	Classroom
Student Focus Groups	Elicits data on students' experience of teaching and learning from a small sample of students.	Classroom, student
Interviews with national/regional education leaders	Provides system-level data on education goals, national programs and strategies, and challenges within the country.	National/regional
Achievement Data	Where available, provides data on student academic achievement.	Student

[4] As described in Section 5. Sampling Plan, the survey sample of teachers is not nationally representative, but includes both schools nominated as featuring "innovative" instruction and schools that are more typical of the instruction received by a similar student population.

ITL Research integrates these methods to provide data on the constructs in the study's conceptual framework. Where possible, particular constructs are informed by multiple methods (as illustrated in Appendix A). For example, constructs related to innovative teaching practice—an important focus of this research—are investigated through teacher reports on surveys and interviews, observations of classrooms by trained researchers, and artifacts of classroom practice in the form of learning activities that teachers ask students to carry out. In other cases, a construct is included in whichever form of data collection is likely to provide the best and most efficient source of the information. For example, technology that is available throughout a school is reported on the school leader survey, while the teacher survey asks teachers for their individual experiences of technology availability and use.

The sections below describe the design process for each type of instrument and for piloting and other refinement processes, as well as overall guidelines for administration in each country.

4.1. Educator surveys

Wherever possible, SRI drew from prior research to inform both the content and structure of questions that measure particular constructs. For both the teacher and school leader surveys, the development process began with a search for existing instruments that could be a source of relevant scales[5] that had already been validated through prior research. Many of these scales had to be modified, however, to fit the focus of ITL research or the constraints of a multinational study. For example, questions that ask teachers to describe the frequency of particular classroom practices are often challenging to position appropriately in multi-national studies: for example, because school schedules vary widely, "twice per week" may have different meanings in different places. For ITL Research, we ask teachers to describe specific frequencies of practices, but we also ask how many times per week their class meets in order to inform the analysis of their responses. Most questions were customized to the needs of ITL Research; questions and scales that remain intact are attributed within the survey.

The content of the teacher and school leader surveys is different, to take advantage of the different perspectives and experiences of the people in these two roles. The ITL Research teacher survey focuses on the teacher and on classroom practices, asking teachers to report their background experiences as teachers; their beliefs about pedagogy and about teaching with technology; the teaching and learning practices used in their classrooms; the access and use of technology in their school and classroom; the professional development in which they participate; and their experience of school leadership and professional culture.

The ITL Research school leader survey focuses on school-level issues, asking them in a factual format where possible that can be answered accurately in the event that the school leader delegates survey completion. School leaders are asked to report background information regarding the number and characteristics of students and teachers at the school, contextual factors, supports provided to teachers, and the availability of technology to teachers and students at the school.

[5] Survey "scales" are sets of items that work together to evaluate a complex construct, as described in Section 7. Pilot Analysis.

In the pilot year, the teacher survey was tested first through a “think-aloud” style focus group with five U.S. middle school humanities teachers, who took the survey and then met to discuss and provide feedback on each question. The survey was then updated and piloted with approximately 200 teachers through an online survey network in the United States. Results of this pilot were used to tune the scales that make up the survey.

The resulting survey was translated for each country, where country research partners verified translations and conducted think-alouds with local teachers using a common protocol. In a think-aloud, subjects take the survey while verbalizing their thoughts aloud in response to researcher questioning, to make sure that survey takers are interpreting questions in the ways that survey developers intended. This activity identified language and phrasing that need to be customized to make the questions and responses easily understood for teachers in each country. Updates took place in collaboration with the global research team to ensure that meanings of items did not change.

Following local translation, testing, and customization, the research partners ready the surveys for administration. In some countries, the teacher and school leader surveys are available in both online and paper forms, depending upon which is most accessible for the educators in each region; in other countries, administration is 100% online or 100% paper-based. Locally appropriate procedures for administration are described and negotiated through country research plans, and common procedures discussed as a group during researcher training. For example, research partners all work to obtain a response rate of 70 to 80% of teachers from each school in their sample in order to use the data in the larger study analysis, but they provide the teacher incentives for survey completion that are considered most appropriate locally.

In the pilot year analysis process, the global research team analyzed scale reliability as well as unpredicted patterns in the data that indicated some questions that might not have been interpreted as intended in particular countries. Based on these results, feedback from the research partners, and design updates, the surveys were updated for post-pilot administration in 2010-11. In each country, the think-aloud process only takes place in the first year in which each country participates in ITL Research, but the translation of changes, verification, and tuning to ensure local applicability all take place each year of survey administration.

4.2. School site visits

In the first year of ITL Research participation for each country, research partners conduct one brief (2-day) school site visit in each of six schools. School site visits consist of one school leader interview, four teacher interviews, and one classroom observation of each teacher interviewed. Interviews are conducted according to a structured protocol that guides the interview to cover themes related to the conceptual framework of the study. Because survey data will also be available from the same respondents, the interviews are used as an opportunity to obtain richer data on participants’ goals and experiences. School leaders are asked about the national and regional educational context, the school culture and supports provided to teachers, and the roles of innovation and technology in the school leader’s goals for the school. Teachers are asked to describe the teaching and learning practices used in their classrooms, the professional development activities in which they participate, and the roles of technology and innovation in their teaching practice. Like the surveys described above, both of these interview protocols are translated

by the country research partners and customized to use language and phrasing most appropriate to the country. They are also customized to inquire specifically about the particular educational initiatives and priorities that are active in each country, and to discuss teaching practices appropriate to the range of educational and technological innovation that is expected in the region.

The classroom observation instrument used in ITL Research builds on an existing observation instrument that was used in the global evaluation of Microsoft's Innovative Schools Program (Shear et al., 2009). The instrument was modified somewhat to fit the specific constructs and definitions of the ITL Research conceptual framework. In the pilot year of the research, modifications were piloted in two U.S. classrooms with two observers, with changes made as needed to improve clarity of items and consensus between observers. Subsequent to the pilot year, the instrument was further updated to improve clarity and concreteness of items, to offer stronger scaffolding to researchers for descriptive data capture, and to offer stronger scaffolding toward the instrument's eventual use as a coaching tool for educators. The observation instrument is the subject of explicit training in the researcher kickoff meeting. There, researchers practice using the observation form by viewing video segments of a variety of classrooms and discussing areas of agreement and disagreement in order to build common interpretation and practice across countries. In addition, researchers in each country conduct two of their four observations in each school jointly in order to confirm reliability and negotiate the application of constructs to local classrooms.

Research partners synthesize the qualitative data gathered from interviews and observations in the form of a country-specific report that follows a common template. Classroom observation results are also summarized in spreadsheet form for submission of discrete data for global analysis.

For countries in their second year of ITL Research (i.e., the four pilot countries in 2010-11, and the four additional participating countries in the subsequent year), the broad site visits to six schools will be replaced by more focused school-based case studies in three schools. The goal of these case studies is to conduct deeper qualitative research that enables a richer, more contextualized picture of innovative teaching and learning and the supports and challenges that teachers face as they change their teaching practices. In most cases the three schools that are the target of case studies are a subset of the six schools visited in the previous year, selected through a structured nomination and confirmation process that takes into account both country selections and the full global portfolio of cases. Case studies are designed locally according to global guidelines, and often include two visits to each of the schools over the course of the year. Case study research uses the same protocols as the broader site visits for classroom observations and student focus groups, but separate interview protocols that are intended for deeper customization to the topic of each case and the context of each school.

4.3. Learning activities and student work (LASW)

While most of the methods in this study will be familiar to readers, this section focuses on an innovative and less widely used component of the research: the analysis of samples of the learning activities or assignments (LA) that students are asked to do as part of their academic work, and the student work (SW) that they complete in response. The goal of this method is to allow for rigorous analysis of the actual activities of classroom practice in a way that is comparable across school and country contexts, without requiring either a disruption in normal classroom activities for research purposes or the ongoing physical

presence of a researcher in the classroom. The rubrics that support LASW analysis also serve a valuable purpose in operationalizing the constructs used to describe innovative teaching practice: how exactly will we recognize knowledge building and collaboration, for example, when we see them in the classroom? The method engages teachers in the coding of classroom artifacts, providing a structured opportunity for them to examine practice that makes this method valuable for professional development as well as for research.[6]

In the pilot phase of ITL Research, this method of student work analysis serves as the primary means of measuring student outcomes. In future years, partnerships with other research organizations are expected to expand the set of methods that ITL Research uses to measure student skill development.

The analysis of learning activities[7] and student work builds on a research tradition that began in studies of school reform in Chicago (Bryk, Nagaoka, & Newmann, 2000) and has since been applied in research on both domestic (Matsumura & Pascal, 2003; Mitchell et al., 2005) and international (Shear et al., 2009) education reform programs. This method uses a set of clearly defined rubrics and definitions to score samples of learning activities and accompanying student work submitted by teachers across a defined sample of classrooms. Earlier work used the method to rate the authenticity and intellectual complexity of assigned work (Bryk, Nagaoka, & Newmann, 2000) or its rigor and relevance (Mitchell et al., 2005).

ITL Research uses rubrics that focus on the degree to which learning activities provide opportunities for students to develop 21st-century skills, defined in five dimensions (knowledge building, problem-solving and innovation, collaboration, self-regulation, and use of technology for learning), and the degree to which student work exhibits these skills. These rubrics build on those used in the evaluation of Microsoft's Innovative Schools Program (Shear et al., 2009), with modifications to map more closely to the constructs in the ITL Research logic model and to international frameworks (e.g., ISTE, 2007; ISTE, 2008; UNESCO, 2008). The adaptation process involved review of the changes with experienced LASW coding leaders and experienced teacher-coders, with refinements as appropriate to ensure the clarity of key concepts.

In ITL Research, researchers in each country collect samples of learning activities and student work, and lead coding sessions in which a set of master teachers (not the teachers who provide the sample of learning activities) are trained to carry out the coding activity on the collected samples in the local language. While definitions are agreed upon internationally, assignments and work are analyzed locally, allowing for a deeply contextualized understanding of each artifact. The global research team then analyzes the resulting scores to examine the characteristics of classroom activity across schools and countries and over time. The design of this study also allows limited analysis of the relationship of LASW results to teacher self-reported practices and supports from the educator surveys of teachers in the LASW sample.

To promote consistency in the complex process of coding across countries, each step of the process is supported by detailed procedures, instructions, and templates. For example, the global research organization provides a set of detailed instructions for collecting samples of learning activities and student

[6] Rubrics from this project will be made publicly available for use either for professional development or by researchers.

[7] The prior work using this method used the term "teacher assignments" rather than "learning activities." We prefer the latter term because it suggests the possibility of more student-centered approaches to instruction, as opposed to "assignments" that might be assumed to be entirely teacher-directed.

work, cover sheets to be completed by teachers, training materials for local teachers in the selection and submission of learning activities and student work samples, and procedures and templates for labeling. Similarly detailed procedures are provided for recruiting local teachers to work as coders and for the administration of the coding workshop. Rubrics and coding materials are distributed to country research partners at a common train-the-trainer workshop, which includes detailed training on the rubrics themselves, practice coding on sample classroom artifacts, and logistical supports for the in-country coding workshops.

4.4. Achievement data

To the extent possible, researchers in each country will collect student achievement data from national or regional standardized tests that represent important and age-appropriate measures locally. The goal of achievement data collection is to compare progress of schools within the sample to ensure that innovative practice does not have a detrimental effect on more traditional measures of student achievement. The specific tests chosen are expected to vary widely across countries and regions with respect to the academic standards upon which the assessments are based, the formats of available data, and the ages of students taking assessments. For this reason, achievement data will be used to inform local analysis within each country case study, but comparisons will not be made across countries. In future years, it may be possible to incorporate data from multinational assessments such as PISA into the study.

5. Sampling Plan

Research partners in each of the participating countries are asked to follow a set of sampling guidelines to design the specific sample for their country. In the pilot year of ITL Research, the survey sampling plan was based on the participation of schools and teachers in several "focus programs" specific to each country. Because of pilot year sampling challenges, in part driven by the widely varying designs and participation patterns in the chosen focus programs, the sampling guidelines were modified beginning in 2010-11 with the goal of facilitating consistent implementation in each country. The revised sampling procedure uses a nomination process to identify schools that feature relatively "innovative" instruction according to ITL Research definitions; researchers also select a set of schools that are more typical of the teaching and learning environments experienced by the same student populations. These guidelines are summarized in Table 3 below, followed by more detailed sample descriptions.

Table 3. ITL Research Sampling Guidelines

Method	Country Sampling Guidelines	Estimated Eight-Country Sample for 2010-11
Survey schools	24 schools per country (or enough to yield 650 teachers as below), representing 3-4 selected geographical regions in each country	192 schools
Teacher survey	All teachers in survey schools (n=650 total) that teach students aged 11-14 (or a subset of those grades in larger schools)	5200 teacher surveys
School leader survey	1 school leader in each survey school (n=26)	192 school leader surveys
LASW schools	6 schools per country; a subset of the survey schools in 1-2 geographic regions, selected for innovative teaching practices	6 schools
Learning activities	6 learning activities from each of 8 teachers per site visit school (n=288); teachers of humanities and sciences	2,304 learning activities
Student work	6 samples of student work for each of 3 learning activities collected per teacher (n=864)	6,912 samples of student work

In addition, in the four countries new to ITL Research in 2010-11, site visits will be conducted to each of the LASW schools, including interviews and observations with 4 teachers per school as well as 1 school leader interview and at least 1 student focus group per school. In the four countries that participated in the pilot year of research, 3 of the 6 LASW schools will be visited for case studies, with exact sample sizes for qualitative data collection varying slightly by school.

5.1. Educator survey sample

Teacher surveys will be administered to all teachers of students aged 11-14 in a sample of 24 schools in each country (or a sufficient number of schools to provide at least 650 teachers). Schools will all be at the same level of schooling in each country, the level that serves the most students between ages 11 to 14 (either upper elementary or lower secondary). The sample is not intended to be nationally representative; instead, the 24 schools will be selected to represent a range of innovative and more "typical" teaching practices. Country research partners are asked to structure a survey school sample in each country that includes the following:

- A nominated sample of 12 "innovative schools," recognized for teaching practices that are consistent with the innovative teaching definitions on this project and representing a range of student demographics as measured by locally-relevant indicators.[8] The nomination process is conducted with the help of a nominating committee made up of representatives with strong familiarity with the schools in each target region (e.g., representatives of the local education authority, regional school coaches, or other local education experts). In countries where innovation of teaching practices happens mainly among individual teachers rather than at the school level, the committee is asked to select schools that are known to include multiple teachers whose practice has innovative components.
- A sample of an equal number of schools that serve a similar population of students. For each "innovative" school, one school will be selected in the same community or a nearby community and serving a similar group of students that is seen as "typical" of the instruction that these students might expect to receive. This sample is designed to offer a matched sample of more typical schools, rather than to be representative of the entire range of schooling in the country or region.

In most cases, the teacher survey sample will comprise all teachers in nominated schools that work with students aged 11-14. If nominated schools are very large, researchers may choose to survey all teachers in a subset of these grades to achieve a sample size of approximately 650 teachers. If nominated schools are small, the sample may need to be expanded beyond the recommended 24 schools to achieve the same number of teachers.

School leader surveys will be administered to one school leader in each school selected for the survey sample.

5.2. Learning activities and student work (LASW) sample

In each country, six schools will be selected to participate in the collection of learning activities and student work, some of which will also be the subject of site visits or case studies. Because the purpose of these methods is to look more deeply at instructional innovation, country research partners are asked to select schools for LASW collection that are likely to be strong examples of instructional innovation and ICT

[8] For example, in various countries these indicators might include a publically-reported measure of family socioeconomic levels, or the school's public/private designation.

integration relative to typical schools in the country. These schools will be a subset of the schools selected for the survey sample.

Eight teachers in each school are selected to submit LASW samples. To the extent permitted by the size of the schools, these will be teachers of humanities (for example, literature, history, or civics) and science subjects (for example, environmental science, biology, or chemistry), and teachers of grades that serve students between the ages of 11 and 14.

From the activities they conduct with their students between October and December of 2010, each teacher will be asked to select three learning activities for submission. These learning activities should, in the teacher's judgment, provide students with strong opportunities to learn 21st-century skills. They will be asked to submit three additional learning activities used during the January to May timeframe. Country research partners will visit the schools to train teachers in selecting learning activities and completing cover sheets, and will support these activities as needed.

For two of the three learning activities used between October and December and one of the learning activities used between January and May, teachers will also be asked to submit six samples of the work that students completed in response to the assignment. Researchers will draw a separate set of student names (with replacement and including alternates) for each learning activity from the class roster, to ensure a random assortment of student work, and request work for six of those students for each learning activity.

5.3. School site visit and case study sample

In each country's first year of ITL Research participation, research partners conduct brief site visits (typically carried out in two days by two researchers) in each of the six schools between January and May, as appropriate to the school schedule in each country. At a minimum, in each school the researchers are asked to interview the school leader, interview four teachers, conduct a structured observation of four classes (one class taught by each of the four interviewed teachers), and conduct at least one student focus group. These will be teachers of students in the 11- to 14-yaer-old age range, and, to the extent possible, be teachers that submitted LASW (therefore teachers of humanities and science subjects). . The teacher sample should include some teachers who are nominated for their use of innovative teaching practices and are known to use technology in their teaching.

In each country's second year of participation in the research program, researchers will conduct case studies that allow a deeper investigation of practices and supports at each school, but they will take place in fewer schools (3 rather than 6). In most cases, these schools are a subset of the schools that were visited in the first year. Case study schools and topics are selected by a nomination process that leverages existing information about teaching practices in the schools and strives for a balance of topics across schools in the global sample. Specific interview and observations samples for case study schools will be designed locally, but in most cases will consist of a total of 5 teachers and 2 visits over the course of the year.

6. Project Reporting

In each year of data collection, project reporting takes place on both national and global levels.

Country research partners create two main reports each year. The first is a qualitative summary. For countries that completed 6 site visits, the report follows a template that asks for a narrative synthesis of results across schools on topics related to teaching and learning as well as school and national supports and challenges. For countries that conducted case studies, researchers will complete a factual debrief on salient topics to facilitate global analysis, and create a narrative case study report for each school they visited. This reporting is completed in English as input to global reporting. In addition, researchers will create a country results report in the local language, usually in the form of a presentation to stakeholders, to present the results of the research and facilitate discussions about implications for practice and policy.

At a global level, primary project reports include a briefing deck of research results, a written executive summary, and a variety of presentations for policy audiences. Each of these reports draws on all data sources, including quantitative data (surveys, LASW coding results, and classroom observation data) submitted by each country, supplemented by analysis of each country's qualitative reports. The section that follows describes the analysis process on which these reporting activities are based.

7. Analysis

The preceding sections have summarized sampling criteria, data collection, and project reporting in ITL Research. This section outlines the validation of measures carried out during the pilot year and presents a high-level data analysis plan for readers who wish to have a deeper understanding of the technical design for ITL Research analysis.

7.1. Instrument analysis

One important function of the pilot year was to assess the quality of the instrumentation. While performance of all instruments was analyzed in the pilot year, this introduction to the process focuses on the instruments that feature most strongly in quantitative analysis (educator surveys and LASW rubrics). Although a number of instrument updates were warranted, SRI analysts generally found strong evidence that the instruments captured a range of self-reported and observed behaviors, and that the scores derived from these instruments were reliable.

SRI conducted a pilot test with approximately 200 U.S. teachers to revise problematic survey items and refine scales based on bundles of related survey items.[9] We computed the internal reliability[10] of each

[9] Typically, a variable like "extended classroom community" is measured by asking several questions related to student collaboration with community members. The individual item responses are typically given a score from 1 to 4. We then compute the mean of these item scores and treat that result as a "scale score" representing the variable "extended classroom community."

survey scale consisting of 3 or more items, and made some adjustments based on the results. For example, we decided to remove "project-based learning" as a scale, and tuned or removed items in some other scales. We also examined the correlations among conceptually related measures in the surveys in order to decide whether the items from two or more scales should be combined. For example, we determined that combining the personalized learning and individualized learning scales enhanced scale reliability and made sense conceptually. Performance of items and scales were subsequently re-analyzed based on results of pilot survey administration both within each country and across countries, with results used as inputs to survey design improvements for the following year. Detailed tables of educator survey scale reliability are presented in Appendix B.

In the pilot year, we also refined the LASW coding rubrics based on the results of a review by U.S.-based teachers who were experienced as LASW coders and coding trainers. Then, after receiving the LASW scores submitted by each of the four countries, we examined descriptive statistics to ensure an adequate range of scores are being reported. A preponderance of scores at the low end of the scale suggested the possible need for rubric revisions to better match the current state of instructional innovation in pilot countries. Strong inter-rater reliability statistics for the scorers within each country, however, demonstrated that most dimensions of the scoring rubric were interpretable in consistent ways across coders.

7.2 Model building and testing

In this research, we build and examine two statistical models, one based on the full sample of 650 teachers per country, and a second model based on the more limited sample of 48 teachers per country from whom LASW data were collected in addition to survey data. Because the ITL research sample is non-representative, both models are designed to identify salient relationships between variables, rather than to provide national or global estimates for the frequency of specific practices. A model based on the full sample allows us to precisely measure the relationships among variables that are captured by the survey instruments.[11] The second model – based on the sample of 48 teachers per country – is used primarily to assess the relationship between teaching practices and learning outcomes.[12] We combine data from teacher surveys, learning activities, and student work in a model designed to show which specific measurable practices are most strongly associated with 21st-century learning outcomes. Due to the smaller sample size, the margin of error for relationships in this model is larger and therefore introduces a greater degree of uncertainty around the measured relationships.

[10] Reliability is a measure representing the coherence of a group of items comprising a scale. In other words, respondents who score highly on some items of a coherent scale also tend to score highly on other items within the same scale; the items work as a "cross-check" for one another. When there is low coherence among scale item responses, the scale scores are unlikely to provide meaningful information for answering our three core research questions. In such cases knowing the limitations of a scale's reliability can help us interpret "null" findings (such as no detectable relationship between a particular school-level support and teacher practices).

[11] Technically, a structural equation model (SEM) will be constructed. SEMs model the relationships among variables while accounting for the technical qualities of the instrumentation. See Kaplan (2000) for background and details on SEM.

[12] This model needs to account for the fact that information about student learning is clustered within specific teachers. A variation of a hierarchical linear model (Raudenbush & Bryk, 2002) is appropriate in this application.

"Innovative teaching practices" is a common dependent variable in these models. The index for innovative teaching practices is constructed from eight scales (see Table 4), weighted to place equal emphasis on each of the three major constructs of innovative teaching—student-centered pedagogy, ICT integration into teaching and learning, and extension of learning beyond the classroom. For each scale, we compute a standard score by setting the mean to 0 and the standard deviation to 1. Standardizing the scales allows us to fairly compare constructs that occur with different "typical" frequencies. Next, we combine the scales and "restandardize" the overall index using the same procedure. This process results in an aggregate innovative teaching practices index for each individual that is not absolute, but rather relative to other teachers in the sample.[13]

Table 4. The Innovative Teaching Practices Index

Construct	Sub-construct	# of items
Student-centered pedagogies	Knowledge-building	6
	Self-regulation and assessment	4
	Small group work	3
	Personalized and individualized learning	6
Extension of learning beyond the classroom	Extended classroom community	7
	Global awareness/ cultural understanding	3
ICT integrated into teaching and learning	Teacher ICT use	11
	Student ICT use	14

We also construct indices for "basic" and "high level" uses of ICT in the classroom so that we can look at the prevalence of these practices and how they relate to other elements of innovative teaching. Table 5 lists examples of the types of items that are included in these indices.

Table 5. Examples of Basic and High-Level ICT Use

Basic student ICT use	High-level student ICT use
Take quizzes or tests in a multiple choice or short answer format	Take quizzes or tests in an innovative format
Find information on the Internet or other electronic resources	Analyze or synthesize data or information

[13] Due to different sampling procedures across countries in the pilot year, scales were standardized so that teachers were only compared to peers in their own country. For 2010-11, both within-country and across-country standardization will be explored.

Write or edit stories / reports / essays using word processing	Create presentations or other multimedia products
Practice skills or procedures	Use simulations or animations to explore a system or abstract concept
Turn in homework assignments or other class work	Communicate with people from outside the school about school topics

7.3 Analysis supporting specific findings

The models are used to test a set of selected relationships within and across countries. When relationships are consistent within specific countries, we can be more confident that the overall result derived from pooled data is not driven by the particular characteristics of one or several countries.

To what extent are innovative teaching practices associated with 21st-century learning outcomes?

We analyze this first research question using the sample of 48 teachers per country that submitted samples of learning activities and student work. We begin by describing the nature and distribution of the learning activity and student work scores. Next, we examine the extent to which scores on the learning activities predict scores on the student work. We then look across multiple measures of innovative teaching practices (in particular, the relevant scales derived from the teacher survey and the ratings of the learning activities[14]) to determine whether these measures are consistent across teachers – that is, do teachers who report higher degrees of innovative teaching actually demonstrate higher degrees of innovation through their learning activities and practice? Finally, we correlate the indices of innovative teaching from the survey data with the scores on student work. A positive relationship would suggest that when teachers are engaged in more innovative teaching practices, students are able to demonstrate greater mastery of 21st-century skills.

What school-level conditions are associated with innovative teaching practices?

Items related to school-level conditions appear on both the school leader and teacher surveys. Therefore, our analysis for this question begins by merging the survey data from the larger 650 teacher sample with responses from the school leaders, which number approximately 26 per country. Next, we construct indices of school-level qualities based on definitions outlined in Appendix A, and correlate them with survey measures of innovative teaching practices. Data from classroom observations supplements this analysis, as it offers point-in-time estimates of the association between variables like class size and technology access and observed innovative teaching. Using qualitative data from site visits, we can also triangulate the assessment of school qualities with data from teacher and administrator interviews.

[14] An innovative teaching practices measure is also available from the direct observation of classroom instruction. However, since each teacher's classroom was only visited once, this measure relates only to a single point in time and is difficult to compare to the other measures that ask about practices throughout the year or sample them multiple times.

What national program supports and professional development are associated with innovative teaching practices?

Using indices of innovative teaching described above, we analyze how levels of innovative teaching vary across teachers who are exposed to different forms of professional development, and in schools that operate in a range of contextual conditions (e.g., socioeconomic conditions of the surrounding community) described on the school leader survey. In addition, we examine the critical features of professional development activities that are most strongly associated with innovative teaching practices.

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Appendix A

Mapping of Logic Model Constructs and Definitions to Instruments

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
National or Regional Education System											
	• Structure and organization of national/regional system	The national or regional educational funding, governance, and organization of schools, and the impact of these elements on schools at the local level.	●								
	• Standards and accountability policies	National or regional expectations for student knowledge and skills (what students should know and be able to do) as articulated and described for schools, educators, and students. In addition, responsibility of educators and schools to meet these standards, and the implications for educators and schools when the standards are not met.	●				●				
	• National or regional instructional and ICT goals	National or regional goals for teaching and learning, and expectations regarding the role of ICT in classroom instruction.	●				●				
	• Key strategic initiatives	National or regional policies for improving teaching and learning as implemented at the local level. May relate to perceived need for significant changes to instruction (e.g., new curriculum standards), or goals for student outcomes (e.g., initiatives to reduce dropout rates).	●								
	• Level of economic and technology development	The extent of financial and technical supports (both public and private) for educational programs and schools, and the extent to which each region has adequate equipment and human resources to support schools and students. This construct also includes the socioeconomic conditions and level of technology development in the region/nation more generally.	●		●		●				
Professional Development											
	National, regional, or local professional development programs	Opportunities for educators to participate in activities that support improvements in teaching practices, ICT skills, and ICT integration. Effective professional development is ongoing and relevant to daily teaching and learning. Includes less formal professional development opportunities (e.g., mentoring) and opportunities that teachers seek out beyond their own school (e.g., participation in an online teacher network).		●	●	●	●				

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
School Culture and Supports											
	• School vision (for teaching and learning, curriculum, and ICT)	Broad goals and plans for curriculum, teaching and learning, and professional community within the school, and how clearly and consistently the vision is communicated by school leaders.		●		●	●				
	• Common vision among school staff	The extent to which there is a shared understanding about goals for teaching and learning and how those goals should be met 1) among teachers in a school and 2) between teachers and school leaders.		●							
	• Shared leadership practices and policies	The extent to which educators work together to make decisions and set policies about school management and instruction. In distributed leadership, decisions and leadership tasks are shared among administrators, staff, and teachers, and structures (e.g., meeting times, teams) are in place to make key decisions.			●		●				
	• Collaboration / community of practice	The extent to which educators learn from each other and work together to improve teaching and learning, and the strategies they use to do so. Includes both process and cultural supports for teacher collaboration.		●	●	●					
	• Culture of continuous improvement	The extent of ongoing reflective dialogue among educators about student work, student outcomes, and pedagogy in order to improve teaching and learning. This construct relates to practices that promote continuous school improvement, and is different from a culture of continuous student assessment.		●	●	●	●				

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
ICT Access and Support											
	• ICT in the school	The range of ICT tools available to students and educators, both within and outside of the school. ICT is defined as tools and resources used to communicate, and to create, disseminate, and store and manage information. ICT includes digital tools such as computer hardware and software, networks, digital cameras, mobile phones, and graphing calculators.		●	●		●	●			
	• Location, availability, functionality	The extent to which ICT in good working condition is easily accessible to educators and students, where and when they need it.		●	●		●	●			
	• Support for ICT and ICT integration	The extent to which educators and students have the necessary technical support to operate ICT tools and to integrate ICT into their work.		●	●	●					
Educator Attitudes											
	• Teacher beliefs about teaching and learning	The beliefs held by teachers about instructional practices that help students learn best.				●	●				
	• Teacher self-efficacy and motivation	Teachers' beliefs about their own ability to help their students learn—even the most challenging students—rather than believing that students will fail because of students' own shortcomings or outside factors. Also includes teachers' satisfaction in the teaching profession, felt professional respect, and autonomy to make instructional decisions in the classroom.				●					
	• Teacher ICT skills and attitudes	The extent to which teachers are trained, skilled, and feel confident about their own technological skills and their readiness to use ICT in the classroom. Also includes the value educators place on ICT use in the classroom, and their vision of how ICT impacts teaching and learning.		●		●	●				

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
Innovative Teaching Practices											
	• Student-centered pedagogies	Student-centered pedagogy provides learning opportunities that are shaped by the needs and interests of the student. Using this approach, students are active learners, and instructors work to facilitate student learning.				●	●				
	Project-based	Project-based learning opportunities engage students in open-ended, long-term (1 week or longer) questions or problems, usually one with no known answer or no previously learned solution.		●				●	●	●	
	Collaborative	Students are asked to work together in small groups on one or more phases of a task. Strong examples of collaborative activities ask students to take on different roles/expertise and create interdependent products.		●				●	●	●	
	Knowledge building	In doing their work, students must generate ideas and understandings that are new to them. Students build knowledge through interpretation, analysis, synthesis, or evaluation.		●				●		●	
	Self regulation and assessment	Students are required to take responsibility for their own learning. They must plan and monitor their own tasks. They know the criteria that define "success" for this task, and they must revise their work based on feedback from teachers or peers or based on self-reflection.		●				●	●	●	
	Personalized	Students are allowed to learn in ways that are relevant to their own background, experiences, and interests. Students can choose the topics they will learn about, the tools or strategies they will use, and the types of work products they will create.		●				●	●	●	
	Individualized	Teachers make it possible for individual students to work at their own pace or adjust instruction based on individual students' skill levels and learning needs. At higher levels, the work of each student is guided by an individualized learning plan.		●				●			

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
	• Extension of learning outside the classroom	Learning opportunities extend beyond the traditional boundaries of the classroom, involving problems, people, and activities from the community, the nation or the world.				●	●				
	Extended classroom community	Students have opportunities to collaborate or communicate with people from outside the classroom (e.g., community members, family members, or experts); create work products that are used by people outside the classroom; or receive feedback from people outside the classroom.		●				●	●	●	
	24/7 learning	Students' learning activities extend beyond the time or space of the classroom, either physically (e.g., student work at an internship in the community) or through technology connections (e.g., remote access to classroom resources).		●					●		
	Cross-disciplinary learning	Students are encouraged to connect their learning to content from two or more traditional classroom disciplines (such as history and economics, or literature and science).		●				●	●	●	
	Global awareness and cultural understanding	Students have the opportunity to consider and explore information, cultures and concepts from outside their geographic area, or to study topics that relate to the interconnectedness of the world (e.g., flu pandemics or global warming).		●				●	●		
	• ICT integration in teaching and learning	The ways in which students use ICT to enable their learning activities, and the ways in which teachers use ICT for teaching and other professional practices.				●	●				
	Student ICT use	Uses of ICT by students as part of their learning process. Includes the ways that students use ICT, and the affordances for learning that result. At higher levels, students use ICT to do work that could not be done through other means.		●				●	●	●	
	Teacher ICT use	Uses of hardware/software by teachers, either for instructional purposes or to support other aspects of their professional role. At higher levels, teachers use ICT to access resources beyond the classroom or participate in professional learning communities beyond the school.		●				●			

Construct	Sub-construct	Definition	Country Context Form	Teacher survey	SL Survey	Teacher Interview	SL Interview	Classroom Observation	Student Focus Group	Learning Activities	Student Work
Students' 21st-Century Skills						●	●				
	• Knowledge building	Students are skilled in combining new information with what they already know to generate ideas and understandings that are new to them. Students are able to build knowledge through interpretation, analysis, synthesis, or evaluation.		●							●
	• Collaboration	Students are skilled in working together in small groups on one or more phases of a task. In strong examples of collaboration, students take on different roles, develop complementary expertise, and create interdependent products.		●							
	• Problem-solving and innovation	Students are able to successfully address a problem or issue with no known answer or design a product that meets a set of constraints. The solution is innovative when it successfully meets a real-world need.		●							●
	• Use of ICT for learning	Students are able to use ICT to construct knowledge. For example, they analyze multiple sources of information they find on the Internet, or they use a computer-based simulation to investigate a complex natural phenomenon. Students also make choices about when, where, and how to use ICT tools, and judge the credibility of resources they find online.		●							●
	• Skilled communication	Students are able to communicate their ideas in ways that are easily understood and compelling to a target audience. Their work products are coherent and well-organized, and contain sufficient, relevant evidence to support a topic or theme.		●							●
	• Self-regulation and assessment	Students are able to plan and monitor their own work. They are skilled in reflecting upon their work products at multiple substantive stages, and make revisions in response to feedback from teachers or peers or based on self-reflection.		●							

Appendix B

Scale Reliability (Cronbach's α) for Teacher and School Leader Surveys

Teacher Survey

Teacher Scale	# of items	Finland	Indonesia	Russia	Senegal
Extended classroom community	7	0.77	0.79	0.80	0.78
Global awareness / cultural understanding	3	0.72	0.75	0.77	0.79
Knowledge building	4	0.82	0.82	0.81	0.77
Personalized and individualized learning	6	0.81	0.82	0.77	0.75
Self-regulation and assessment	4	0.91	0.94	0.93	0.90
Small group work	3	0.79	0.83	0.91	0.84
Barriers to ICT use	9	0.88	0.94	0.90	0.86
Collaboration-practice (Teacher level)	5	0.81	0.88	0.82	0.83
Collaboration-support (Teacher level)	3	0.81	0.64	0.66	0.71
Common vision among school staff (Teacher level)	3	0.86	0.74	0.76	0.72
Culture of continuous improvement (Teacher level)	3	0.69	0.81	0.73	0.78
Direct transmission beliefs	3	0.51	0.29	0.48	0.31
ICT Access: Classroom scale	4	0.51	0.63	0.58	0.46
ICT Access: School scale	4	0.50	0.54	0.54	0.53
Impact of ICT on learning	4	0.71	0.81	0.72	0.61
Innovative teacher beliefs	4	0.62	0.38	0.50	0.32
School vision (Teacher level)	4	0.88	0.67	0.82	0.81
Student 21C skills	8	0.83	0.88	0.89	0.82
Student ICT: All Tech	14	0.89	0.95	0.92	0.93
Student ICT: High+Med Tech	10	0.85	0.94	0.88	0.90
Student ICT: Low Tech	4	0.87	0.89	0.87	0.88
Teacher ICT: All Tech	11	0.86	0.94	0.89	0.89
Teacher ICT: High+Med Tech	7	0.81	0.90	0.84	0.83
Teacher ICT: Low Tech	4	0.79	0.91	0.85	0.87
Teacher self-efficacy	4	0.71	0.65	0.63	0.47
Value of student ICT use	5	0.80	0.83	0.79	0.70

School Leader Survey

School Leader Scale	# of items	Finland	Indonesia	Russia	Senegal
(Innovative) professional development goals	4	0.52	0.85	0.73	0.88
(Innovative) school vision for curriculum	5	0.79	0.23	0.87	0.85
(Innovative) school vision for ICT	6	0.77	0.61	0.88	0.70
(Innovative) school vision for teaching and learning	8	0.84	0.52	0.87	0.76
Alignment between education and reform	4	0.16	0.47	0.87	0.84
Barriers to ICT use	14	0.81	0.90	0.94	0.92
Collaboration/community of practice	4	0.59	0.37	0.18	0.41
Continuous improvement - combined	9	0.78	0.71	0.65	0.76
Continuous improvement - student learning	5	0.54	0.78	0.55	0.75
Continuous improvement - teaching practice	4	0.68	0.61	0.53	0.52
National or regional authority support	4	0.64	0.94	0.67	0.76
Parent/community involvement	4	0.81	0.61	0.38	0.74
Professional development goals	7	0.60	0.92	0.79	0.93
School vision for curriculum	9	0.78	0.63	0.85	0.90
School vision for ICT	11	0.88	0.80	0.82	0.80
School vision for teaching and learning	14	0.82	0.69	0.85	0.74
Shared leadership	8	0.84	0.84	0.73	0.50