Increasing ICT use with students around the world: Intel® Teach Essentials survey results from 13 participating countries

June 2011

Daniel Light and Elizabeth Pierson

EDC/Center for Children and Technology

Executive Summary

The Intel® Teach Essentials Course has been the flagship program within Intel's efforts to partner with national governments to improve education. Over the last decade, the program has trained more than 10 million teachers in more than 60 countries. The Essentials course offers teachers the knowledge and skills to integrate information and communication technologies as critical tools to encourage active student learning. This report presents findings from a global survey study on the Essentials Course in thirteen countries that was completed in January 2011.

The Intel Teach Essentials Course offers ministries a program to help meet their goals of creating a well-trained cadre of teachers who are able to integrate ICTs into student-centered and inquiry-driven learning activities. The Essentials Course is offered in different formats (online and face-to-face) and versions (5.4 and 10) but the core of the course remains consistent. The Essentials Course focuses on training teachers to integrate ICT across the curricula as a tool for learning, and to design and implement inquiry-driven, project-based learning activities by creating their own unit plan during the training. The curriculum also discusses crucial factors for creating high quality student-centered learning environments.

Intel has supported the evaluation of its Intel Teach programs since they began in 1999. In 2005 and 2006, Intel had conducted two global survey studies, in 2009, Intel decided to re-launch the international impact survey to get measure of the current state of the Essentials Course across a range of countries and contexts. A redesigned international survey was administered in thirteen countries. While there were 2,473 total respondents, this report focuses on the 1,922 valid classroom teacher responses.

The Essentials Course continues to show positive outcomes

Intel has established four key indicators that provide a general indication of program success by measuring whether participant teachers are using materials created in the training, are using more technology with students and for planning, and are using more project-based teaching approaches. Significant number of teachers report positive changes indicating that the Essentials Course is having an impact on teachers from all regions.

Indicator 1: 75% of teacher respondents reported using all or part of their Unit Plan since participating in the Essentials Course

At the core of the Essentials Course is the creation of a unit plan, including model student work samples, support materials, and an implementation plan. Asking teachers to develop a real unit plan and encouraging them to use it in their classroom creates an opportunity for teachers to experiment with these new practices and tools, gives them a chance to think deeply about the issues involved in integrating ICT into their teaching and finally, allows

them to come to their own understanding of whether and how these practices support student learning.

Indicator 2: 63.7% of respondents reported increased use of technology for lesson planning and preparation[1]

The Essentials Course supports teachers in using technology for lesson planning and preparation. In the Essentials Course, teachers learn how to use the Internet to find information and classroom resources, and create teacher support materials. This finding suggests that the teachers are leaving the training program with the skills necessary to use technology to support their teaching.

Indicator 3: 80.7% of respondents have used new technology activities with students

Beyond the implementation of the unit plan, the Essentials Course is intended to influence teachers' approaches to integrating technology across their teaching more broadly. The survey asks teachers if they have used technology in new ways with their students since they completed the program.

Indicator 4: 53.1% of the teachers reported an increased use of project-based learning activities with students[2]

Project-based learning, in the context of this newly revised International survey[3] encompasses three different types of learning approaches: engaging students in extended investigations; in-depth research into a topic; and problem-solving activities.[4] Project-based teaching is one of the more advanced and challenging pedagogical approaches and therefore the least developed among this teaching sample worldwide

School-level contextual factors that improve program success

In order to understand how they might influence the long- term goals of increasing student use of ICT and project-based approaches, the survey collected information about two key school-level contextual factors that support program success: access to ICT resources for students and school-level support..

---

[1] One country reported extremely low results on Indicators 2 and 4, which suggests that teachers there face unique constraints in using ICT for planning. Without this country the international mean would be 73.4%.
[2] If the country reporting an extremely low response on Indicator 4 where removed the mean would be 59.8%.
[3] Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."
[4] Jason Ravitz, "Project Based Learning as a Catalyst in Reforming High Schools," in *American Educational Research Association* (New York2008).

Easy access to school-based ICT resources helps Participant Teachers use more ICT with their students

The survey collected information about how students access computers at school. A majority of teachers report that the students in their school have access to computers only through a computer lab (58.1%) and nearly a third of teachers report that their students have access to computers in both a lab and classroom setting (30.4%). Only a small percentage of teachers in the sample report working in a 1:1 laptop environment (3.7%).

The analysis found that teachers whose students have lab and classroom access to ICT, or have a 1 to 1 environment, were both significantly more likely to use ICT than their peers who only have access to a computer lab. This finding suggests that having some flexibility in where students can access the Internet enables teachers to use more ICT with their students.

Robust school-level support helps teachers be more successful, but many teachers do not receive sufficient support

The international survey asked participants whether they received adequate support in three areas: administrative support, technical support and instructional support. Slightly more than half of the Essentials participants surveyed felt they had adequate instructional and administrative support while implementing technology activities, and the results are below 50% for technical support.

The data suggest that school-level support has varying influence on the four different Outcome Indicators. Support appears to be less important for encouraging teachers to use the unit plan or to integrate some new ICT activities but plays an important role in lesson planning and preparation (Indicator 2) and getting teachers to adapt project-based approaches (Indicator 4). For example, 66.7% of teachers reported all three supports had increased their use of project-based approaches compared to only 37.7% who reported no supports at school.

Conclusion

The findings from the international survey indicate that the program is still successful at encouraging teachers to experiment and change their practice to incorporate more ICT into their professional practice. The study also highlights the importance of key contextual factors that make that enable teachers to be more successful with the program: easy access to ICT resources for their students and receiving adequate support. These findings reiterate similar observations from previous qualitative and quantitative reports that highlight the importance for MOEs and local education authorities to provide adequate access to ICT and to put in place adequate support structures to ensure that the Essentials Course will help the MOE meet their own objectives of promoting student-centered learning and ICT use for students.

Introduction

Intel® seeks to support the development of modern, high-quality educational systems worldwide by being a partner to national governments in improving education to prepare young people for the 21st century. The Intel® Teach portfolio of professional development programs for educators is a core component of Intel's philanthropic efforts to support education transformation. Within the portfolio, Intel Teach Essentials Course has been the flagship program since its creation in 2000.

Over the last decade, the program has trained more than 10 million teachers in more than 60 countries. The Essentials course offers teachers the knowledge and skills to integrate information and communication technologies as critical tools to encourage active student learning. Through its expanding portfolio of professional development programs, Intel Teach is also supporting the teaching of critical thinking skills, project-based approaches, authentic assessment strategies, and developing school leaders to effectively support and enhance technology -rich learning environments.

Education Development Center's Center for Children and Technology (EDC/CCT) has been coordinating the worldwide evaluation of the Intel Teach Essentials Course since March 2003. This report on the global evaluation of the Essentials Course draws on findings from an online impact survey that was submitted by thirteen countries in January 2011.

The Role of Intel Teach Essentials Course in Preparing Teachers

Around the globe, ministries of education are promoting information and communication technologies (ICT) as an element of a modern education system. Although research demonstrates that the effective use of ICT is dependent on teachers' ability to select instructionally appropriate ICT and to use it in the context of effective instructional strategies,[5] the research from countries around the world highlights the challenges and difficulties of integrating technology into the classroom.[6] Therefore, nations engaged in

---

[5] Mary Webb and Margaret Cox, "A Review of pedagogy related to information and communications technology," *Technology, Pedagogy and Education* 13, no. 3 (2004).

[6] Sadegül Akbaba-Altun, "Complexity of Integrating Computer Technologies into Education in Turkey," *Journal of Educational Technology and Society* 9, no. 1 (2006); Victor Cancino Cancino and Sebastián Donoso Díaz, "El programa de informática edcuativa de la reforma educativa chilena: Análisis crítico," *Revista Iberoamericana de Educación* 36(2004); Comenius, "Informe Final - Enlaces Portátil: Abriendo Camino para un país digital," (Santiago: Centro para el desarrollo de innovaciones en educación, Universidad de Santiago Chile, 2008); Michael M. Grant et al., "Computers on wheels: an alternative to "each one has one"," *British Journal of Educational Technology* 36, no. 6 (2005); Daniel Light and Charles Rockman, "The Emerging Paradigm of Teaching and Learning in Discovery Schools," in *Evaluation of the Jordan Education Initiative* (Washington, D.C.: Education Development Center, 2008); "Schoolnet Toolkit," (Bangkok: UNESCO Bangkok;

educational reform must make teacher education, both pre-service and in service, a high priority for investment, since the quality of instruction is central to improving academic achievement.[7]

The Intel Teach Essentials Course offers ministries and other educational authorities a program intended to help meet their goals of creating a well-trained cadre of teachers who are able to integrate ICTs into student-centered and inquiry-driven learning activities. The Essentials Course is offered in different formats (online and face-to-face) and versions (5.4 and 10) but the core of the course remains consistent. The Essentials Course focuses on training teachers to integrate ICT across the curricula as a tool for learning, and to design and implement inquiry-driven, project-based learning activities. The curriculum also discusses crucial factors for creating high quality student-centered learning environments. Evaluations conducted in many countries have demonstrated the impact of the program.[8]

The Essentials Course is constructed around known attributes of good professional development,[9] such as focusing on issues that are directly relevant to teachers' everyday work, offering a well-defined concept of effective learning, and offering opportunities for teachers to develop knowledge and skills that broaden their repertoire of teaching approaches.[10] The Essentials curriculum moves teachers through the development of a unit plan that incorporates project-based approaches and imbeds ICT in their student activities. The implementation in the classroom of the unit plan that teachers designed during the

---

Commonwealth of Learning, 2004); Bridget Somekh et al., "ImpaCT2 - Pupils' and Teachers' Perceptions of ICT in the Home, School and Community," (London: British Educational Communications and Technology Agency, 2003); Usha Vyasulu Reddi and Vineeta Sinha, "India: ICT Use in Education," in *Metasurvey on the Use of Technologies in Education in Asia and the Pacific*, ed. Glen Farrell and Cédric Wachholz (Bangkok, Thailand: UNESCO-Bangkok, 2003).

[7] David Cohen, Stephen Raudenbush, and Deborah Ball, "Resources, Instruction and Research," (Seattle: Center for the Study of Teaching and Policy, 2000).

[8] Cengiz Hakan Aydin, Murat Ataizi, and Hasan Çalişkan, "The Intel® Teach Essentials Course Turkey Evaluations: October 1, 2006 – March 30, 2007," (Eskisehir, Turkey: GLOKAL, 2007); Educational Computer Institute, "Final Report: INTEL® Teach to the Future Project Evaluation," (Temuco, Chile: University of La Frontera, 2003); Tomoe Kanaya, Daniel Light, and Kathrine McMillan Culp, "Factors Influencing Outcomes from a Technology-Focused Professional Development Program," *Journal for Research in Technology Education* 37, no. 3 (2005); Wendy Martin and Simon Shulman, "Intel Teach Essentials Instructional Practices and Classroom Use of Technology Survey Report," (New York: EDC/Center for Children and Technology, 2006); Carol Oakley, "Intel® Teach Program (Australia) Evaluation Report on the Impact of the Essentials Course " (Melbourne: Deakin University, 2006); Teacher Foundation, "A Comparative Study of ICT Leadership in Schools: A Case Study of 4 Government-aided Schools in Gujarat," (Bangalore, India: Teacher Foundation, 2005).

[9] Martin and Shulman, "Intel Teach Essentials Instructional Practices and Classroom Use of Technology Survey Report."

[10] Michael Garet et al., "What Makes Professional Development Effective? Results from a National Sample of Teachers," *American Educational Research Journal* 38, no. 4 (2001); Mary Kennedy, "Form and Substance in Mathematics and Science Professional Development," *NISE Brief* 3, no. 2 (1999); Susan Loucks-Horsley, Katherine Stiles, and Peter Hewson, "Principles of Effective Professional Development for Mathematics and Science Education: A Synthesis of Standards," *NISE Brief* 1, no. 1 (1996).

course is a key feature of quality professional development, since it allows teachers to experience and value the new teaching approaches.[11]

The curriculum is delivered through a train-the-trainer model. A cadre of senior trainers is trained in each country, who then train Master Teachers from a local educational authority or school. The training uses commonly available software, focusing primarily on how to use word processing, presentation software and web-based resources to support students in conducting web research and creating presentations, web pages, and written materials.

Survey and Data Collection

Intel has supported the evaluation of its Intel Teach programs globally since they began in 1999. The evaluation strategies vary depending on the program, country context, and what Intel wants to know about its programs. In 2009, Intel decided to re-launch the international impact survey to get a quick look at the current state of the Essentials Course across a range of countries and contexts. The last international survey was completed in 2006.[12] For the current study, the international survey was redesigned and thirteen countries were recruited to participate. To simplify the dissemination strategies and lower the cost, the survey was designed to be administered online.

Developing the Survey

The new survey was developed by EDC using the previous Intel Teach global impact survey[13] and updating it to reflect changes in the program in the intervening years. EDC also sought to shorten and simplify the survey to make it easier for teachers to complete. SRI International oversaw the process of translation, dissemination and data collection. The English language version of the survey was posted online in Lime Survey® by SRI. SRI then trained local evaluators on how to access Lime Survey to create a translated version of the impact survey that would feed data back in a consistent format. Twelve countries conducted the survey online and Turkey administered a paper and pencil version of the survey. A number of countries had discrepancies of varying degrees in their online survey that affected some of the data, resulting in the exclusion of their data from certain analyses.

Data Sources

EDC aggregated and analyzed all data from an impact survey submitted by participating countries. The impact survey covered issues such as teachers' implementation of a technology-rich lesson; obstacles and challenges to implementation; changes in teacher

---

[11] Thomas R. Guskey, "Professional Development and Teacher Change," *Teachers & Teaching* 8, no. 3/4 (2002).

[12] Daniel Light, Roshni Menon, and Simon Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006," (New York: EDC/Center for Children and Technology, 2007).

[13] Daniel Light et al., "Intel® Teach to the Future Essentials Course: Impact Survey Results for 2005," (New York: EDC/Center for Children and Technology, 2006); Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."

practice; and technical infrastructure in the schools in which the respondents work. Between August 2010 and January 2011, thirteen countries submitted impact survey data on the Essentials Course that could be analyzed for this report (See Table 1). The database contained 2,473 respondents as of January 30, 2011. This represented the most recent survey results for each country.

Limitations of International Survey Research

There are a number of limitations to an online international survey in the context of evaluating a large, multinational teacher training effort. First, international surveys can provide only a surface-level indication of teachers' reaction to the program and their attempts to build off of the training. International surveys present a decontextualized view of educational processes that, at best, support only weak inferences.[14] This is only augmented by the great diversity and complexity involved when looking at a program in thirteen different countries. Second, the difficulties inherent in an evaluation study that needs to locate participant teachers long after they have completed a training make it challenging to get a large sample. Finally, unique circumstances or events in a particular country can impact national results and those results may also affect the international mean.

Nevertheless, a survey study is very valuable in the context of Intel's full range of evaluation work examining its programs. The international survey provides a window into participant teachers' perceptions and reactions to the Essentials program and simple measures of how they have followed up that resonate both with current research on good professional development and ICT integration and with the more localized qualitative and quantitative research done at the country level.

Response rate

The survey administration process has changed substantially from previous years when the survey was administered in a paper and pencil version. For this round of data collection, the survey was administered online in all but one country. In each country, a local research group or the local training agency e-mailed a survey request to groups of participant teachers and master teachers. The response rate varied across the participating countries. (See Table 1).

Across all 13 countries there were 2,473 total respondents.

---

[14] Marshall Smith, "Drawing Inferences for National Policy from Large-Scale Cross-National Education Surveys," in *Methodological Advances in Cross-National Surveys of Educational Achievement*, ed. Andrew C. Porter and Adam Gamoran (Washington, DC: National Research Council, 2002).

Table 1: Countries represented in the sample

Region	Country	Number of respondents	Number of classroom teachers
META	Egypt	341	175
	Turkey	340	293
	Jordan	288	202
	Saudi Arabia	94	77
	South Africa	76	57
Total		1,139	804
LAR	Costa Rica	19	9
	Brazil	39	17
	Argentina	254	187
Total		312	213
Asia	India	291	285
	Thailand	159	111
	Sri Lanka	382	355
	Philippines	83	62
	Pakistan	107	92
Total		1,022	905
Total respondents:		2,473	1,922

Table 2: Description of Intel courses taken by sample

	Course Description	Percentage
Completion date (n=2,426)	2007 and before	18.8%
	2008	17.3%
	2009	29.9%
	2010 and later	34%
Delivery Method (n=2,386)	Online	29.9%
	Face-to-face	70.1%
Timing (n=2,452)	Pre-service	6.6%
	In-service	93.4%

Description of the respondents and course participation

Data gathered on the teachers included year of course completion, course delivery method (face-to-face or online), and whether they took the course as in-service or pre-service. Well over half of the respondents had taken the course in the last two years: 29.9% took it in 2009 and 34% took it in 2010 or later. Of the respondents, 54% were Intel Master Teachers.

Reflecting the way the Essentials Course is offered in many countries, most of the respondents took the course as a face-to-face course. Only Argentina, India and Turkey had more than 50 respondents who had taken an online version of Essentials. Also, the course is most commonly offered as an in-service program and 93.4% of the respondents took it as in-service.

The study respondents were both classroom and non-classroom educators: the bulk of respondents work directly with students - 77.7% were classroom teachers (and another 3.2% were technology coordinators or oversaw computer labs. The remaining respondents were divided between 15.9% teacher-trainers and 2.7% school administrators. The respondents are evenly distributed across teachers at all levels of the school system from primary to secondary with only a slightly lower share in lower primary (16.8%).

In addition, the sample includes educators who have substantial teaching experience with nearly half (43.8%) of teachers having 10 to 20 years of teaching experience.

Most of the respondents are in the core subject areas of language arts (16.2%), math (15,6%), science (17.9%) and social studies (11.3%). Also, 14.4% taught computers.

Table 3: Description of sample respondents

Respondent Description		Percentage
Professional Role (n=2,473)	Classroom teacher	77.7%
	Teacher trainer	15.9%
	Administrator	2.7%
	Technology coordinator	3.2%
	Other	.4%
Subject area (n=2,473)	All	18.2%
	English/ Language Arts	16.2%
	Math	15.6%
	Social Studies/ Geography/ History	11.3%
	Science	17.9%
	Computer Science/ Technology Education	14.4%
	Foreign Languages	6.3%
	Arts/ Music	3.2%
	Health/ Physical Education	2.1%
	Other	1.7%
Grade Level (n=2,473)	Lower primary	16.8%
	Upper primary	29%
	Lower secondary or middle school	34.8%
	Upper secondary	29%
	Other	.3%
Teaching Experience (n=2,415)	Less than 3 years	8.7%
	3 to 9 years	28.1%
	10 to 20 years	43.8%
	Over 20 years	19.4%

Respondent population used for analysis

The goal of the survey study was to explore how Essentials participants were using technology with their students. Therefore, the sample for the bulk of the analysis was restricted to only classroom teachers who work directly with students. School administrators, teacher-trainers and technology coordinators were removed from the sample. This limited sample has 1,922 respondents.

Findings

The findings are divided into three sections: the four key Outcome Indicators; the influence of the program on teachers' technology use with students; and the influence of school-level contextual factors on the success of the program.

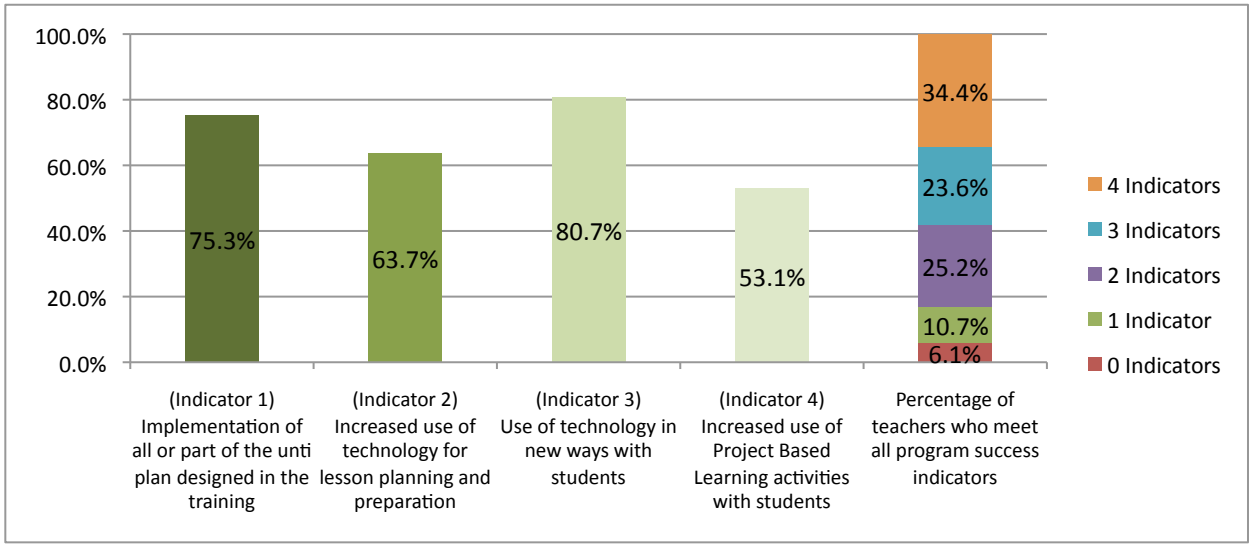
Four key Outcome Indicators

Over years of evaluation results, Intel has established four key indicators that provide a general measure of program quality. These indicators were chosen because previous evaluations suggest that they can be indicators of longer-term influence on how teachers integrate ICT into their teaching practice and use project-based teaching approaches. EDC created four Outcome Indicators for teachers' participation in the Essentials Course using items embedded in the common follow-up survey that is used internationally.

Figure 1 reports the percentage of teachers meeting on the following indicators:

1. Implementation of teachers' unit plans;
2. Increased use of technology for lesson planning and preparation;
3. Integration of new technology activities with students; and
4. Increased use of project-based learning activities with students.

Figure 1: Percent of teachers meeting each of the four Indicators of Success (n≈1,922)



Indicator 1: Implementation of the Unit Plan Designed during the Essentials Course

Indicator 1 captures a key element in supporting the quality of the program. At the core of the Essentials Course is the creation of a unit plan, including model student work samples, support materials, and an implementation plan. This structure allows teachers to expand their technical skills in the context of a curriculum development process. Asking teachers to develop a real unit plan and then encouraging them to use it in their classroom plays two

important roles in the professional development process. First, the process of designing the unit plan is intended to give participants a chance to think deeply about the issues involved in integrating ICT into their teaching. By requiring the creation of relevant materials, the curriculum puts the teachers' interests and concerns at the center of the training experience. Second, using the unit plan in their classroom creates an opportunity for teachers to experiment with these new practices and tools in action and to come to their own understanding of whether and how these practices support student learning. Across all 13 countries, 75% of the respondents reported using all or part of the unit plan they designed in the training.

Indicator 2: Teacher Use of Technology for Lesson Planning and Preparation

Technology can also be valuable to help teachers plan and create new learning activities by allowing them to easily create materials, as well as opening up access to a wide variety of resources via the Internet and Web2.0 tools. The Essentials Course supports teachers in using technology for lesson planning and preparation. In the Essentials Course, teachers learn how to use the Internet to find information and classroom resources, and create teacher support materials.

EDC combined responses on multiple variables to create an indicator of increased use of technology for lesson planning and preparation. According to this indicator, 63.7% of participants in these countries reported an increased use of technology for administration and planning since participating in the training. (See Figure 4) This suggests that the teachers are leaving the training program with the skills necessary to use technology to support their teaching. However, one country reported extremely low results on Indicators 2 and 4, which suggests that teachers there face unique constraints in using ICT for planning. Without this country the international results would be 73.4%.

Indicator 3: Teacher Integration of New Technology Activities with Students

As mentioned in the discussion about Indicator 1, creating the unit plan is a way to engage teachers in technology integration, but the expectation is that they can build on this initial experience and, over time, apply this knowledge to other activities. Beyond the implementation of the unit plan, the Essentials Course is intended to influence teachers' approaches to integrating technology across their teaching more broadly. The survey asks teachers if they have used technology in new ways with their students since they completed the program. A large majority (80.7%) of teachers indicate that they are integrating technology in new ways upon completion of the training program.

Indicator 4: Increased use of project-based learning activities with students

In addition to integration of technology activities, the Essentials Course also seeks to promote the use of project-based teaching approaches into classrooms. The process of developing a unit plan is designed to engage teachers in reflecting on these pedagogical ideas and create an opportunity to experiment with them in the classroom with the hope that teachers will increase the use of project-based approaches to teaching.

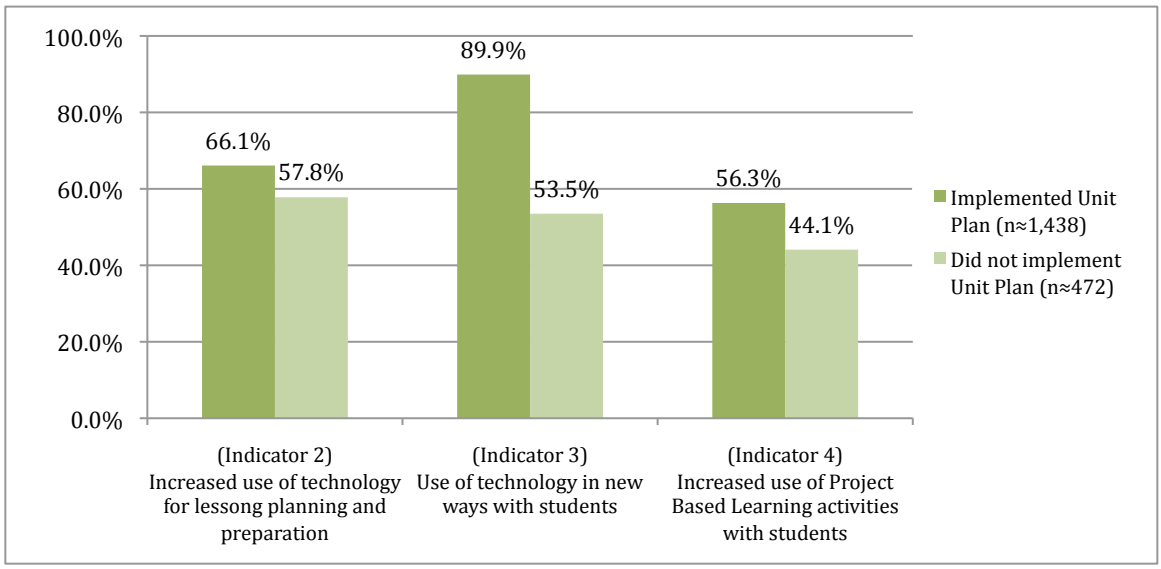
Indicator 4 attempts to measure the impact of the Essentials Course on the use of project-based approaches. Indicator 4 has been significantly revised since the last international survey.[15] The new international survey asked teachers about the use of three different types of learning activities that are related to project-based teaching: engaging students in extended investigations; in-depth research into a topic; and problem-solving activities.[16] The Indicator 4 identifies teachers who reported increasing their use of at least one of these activities since the training.

Previous evaluation has always found that moving teachers towards the student-centered pedagogy that is represented by project-based approaches is the most challenging long-term goal of the Essentials Course. The survey results suggest that this is still challenging. Overall, 53.1% of the teachers reported increasing their use of project-based approaches. Again, without the one country reporting substantially lower results on this Indicator, the mean would be 59.8%.

Influence of the Unit Plan on other indicators

The bar to the right of Figure 1 above shows how many Outcome Indicators were met by teachers across the sample. Well over 90% of respondents met at least one indicator and only a small portion of teachers failed to meet any indicators (6.1%). More than one-third of teachers report meeting all four of the success indicators (34.4%).

Figure 2: Implementation of Indicators of Success based on use of the Unit Plan



[15] Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."

[16] Jason Ravitz, "Project Based Learning as a Catalyst in Reforming High Schools," in *American Educational Research Association* (New York2008).

As mentioned above, the unit plan is designed create a bridge between the course and actual classroom practice, so EDC examined the effect of using the unit plan (i.e. meeting Indicator 1) on whether teachers also met the other indicators. The data suggest a connection: teachers who met Indicator 1 were more likely to meet the other indicators, as well. Figure 2 shows the percentage of teachers who implemented their unit plan and also met each of the other three indicators. A Chi-Squared analysis reveals that classroom teachers who report using their Intel Unit plan (Indicator 1) are more likely to report that they are more frequently using technology to plan and prepare their lessons (Indicator 2), that they have used new technology with their students (Indicator 3), and that they are using project- based learning strategies with their students (Indicator 4).

Influence of the program on teachers' technology use with students

The Essentials Course is intended to promote more ICT use with students. The course encourages teachers to put students in control of technology in the classroom, using technology to gather and analyze information, make presentations, and share their interpretations with others. Research suggests that these types of technology activities, when combined with effective instructional approaches and rich curricular content, can have a positive impact on a variety of indicators of student achievement, such as the ability to engage in scientific inquiry, higher-order thinking skills,[17] motivation and organization skills[18], and critical thinking and collaboration skills.[19]

In order to explore the relationship between the course and ICT use, the survey first sought to establish what technologies teachers used with students and to what degree. The teachers were surveyed on their use of 21 unique technology resources and activities with their students. The items surveyed ranged from productivity software to Internet research to social networking. EDC analyzed the teachers' responses along two dimensions: do teachers use the tools with their students or not; and to what degree (frequency) do teachers use the tools with their students. For analysis, EDC grouped the tools and strategies into three categories:

- *Productivity and traditional ICT tools*: Teachers were asked about the use of 6 common productivity tools or other non-web-based ICT tools - word processing

---

[17] E. Hunt and J. Minstrell, "A cognitive approach to the teaching of physics," in *Classroom Lessons: Integration Cognitive Theory and Classroom Practice*, ed. K. McGilly (Cambridge, MA: MIT Press, 1994); B. Y. White and J. R. Frederiksen, "Inquiry, modeling, and metacognition: Making science accessible to all students," *Cognition and Instruction* 16, no. 1 (1998).

[18] R. Cradler and J. Cradler, "Just in time: Technology innovation challenge grant year 2 evaluation report," (San Mateo, CA: Blackfoot School District No. 55, Educational Support Systems., 1999).

[19] B. Means and K. Olson, "Technology and education reform. Studies of Education Reform," (Washington DC: US Government Printing Office, 1997); Judith Sandholtz, Cathy Ringstaff, and David C. Dwyer, *Teaching with technology : creating student-centered classrooms* (New York: Teachers College Press, 1997); M. Scardamilia and C. Bereiter, "Computer support for knowledge-building communities," in *CSCL: Theory and practice of an emerging paradigm*, ed. T. Kaschmann (Mahwah, NJ: Erlbaum, 1996).

software, presentation software, spreadsheet software, computer-based educational games, graphic software, and movie or video software.

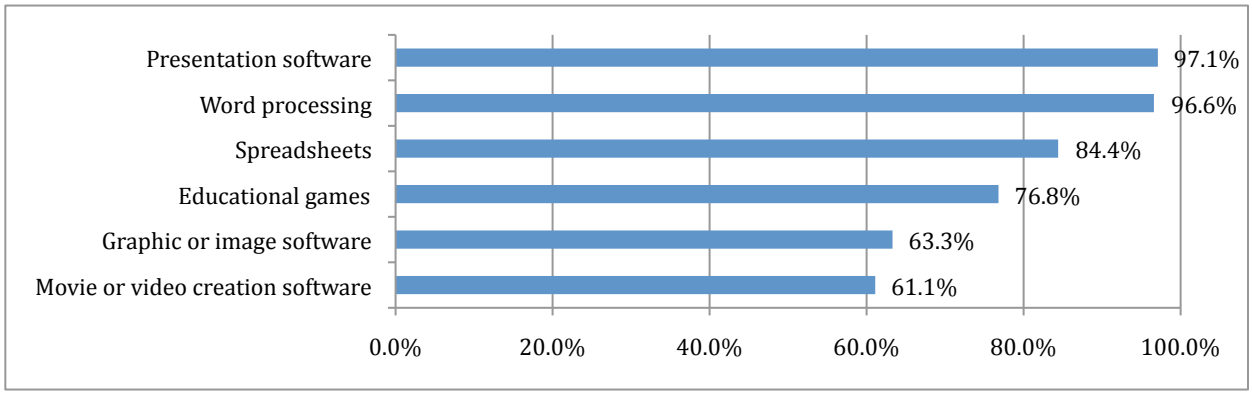
- *Web2.0 tools and applications*: Teachers were asked about their use of 11 web-based tools, websites and development tools including document sharing tools, online mapping tools, online surveys or polls, online simulation or visualization tools, video-sharing sites, podcasts, audiocasts or streaming audio, photo-sharing sites, webpage development tools, social networking sites, blogs or Wikis, and finally, online posts in a place other than a blog or wiki.
- *Internet research activities*: The survey asked teachers about how they used the Internet for four types of research: use of pre-selected websites as reference material, independent student Internet research, or structured Internet research (i.e. WebQuests), and the Internet for access to primary data (i.e. online quantitative databases, historic documents and artifacts).

The ICT Tools that teachers use with students[20]

This sub-section reports on the responses about which ICT tools and applications teachers actually use with students, regardless of the degree of use. Teachers' responses on the survey were coded into a "yes/no" variable.

Figures 3 through 5 show the percent of teachers using each ICT tool with their students. The most frequently used ICT tools are presentation software at 97.1% and Word processing at 96.6%, which are both from the productivity tools category (see Figure 3), followed by Internet research with 92.3% (see Figure 5). The most commonly used Web2.0 tools are document-sharing sites with 83.5% of teachers using that tool with students (see Figure 4). Looking across the three categories of ICT tools and activities, the productivity tools and the Internet research activities are more commonly used by teachers than the Web2.0 tools.

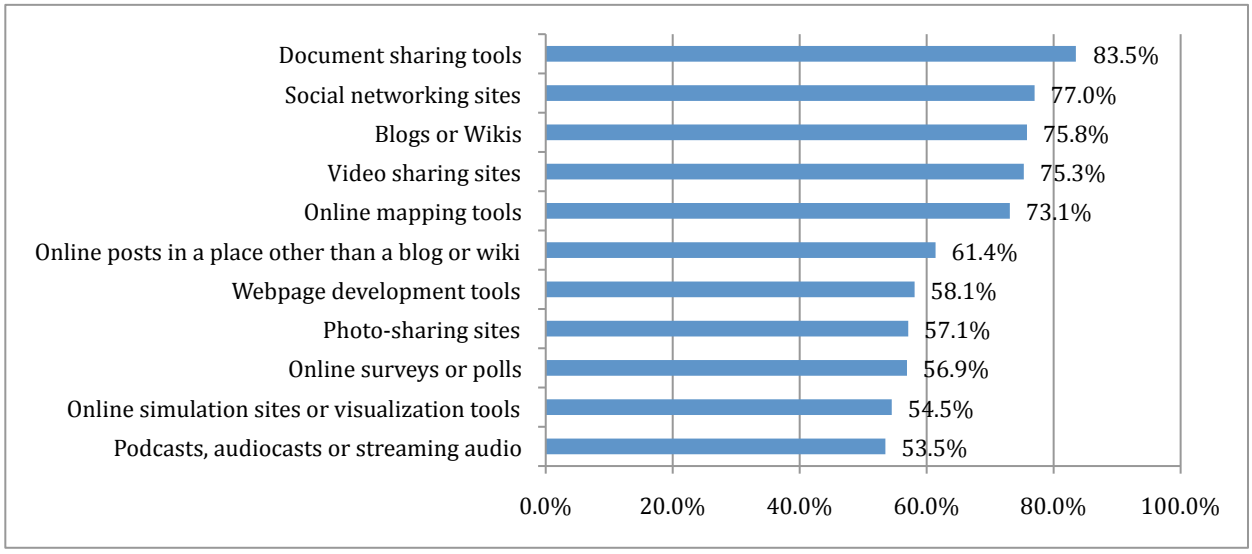
Figure 3: Teacher use of productivity software and traditional ICT tools with students*



* This graph depicts teachers who report using these tools regardless of frequency.

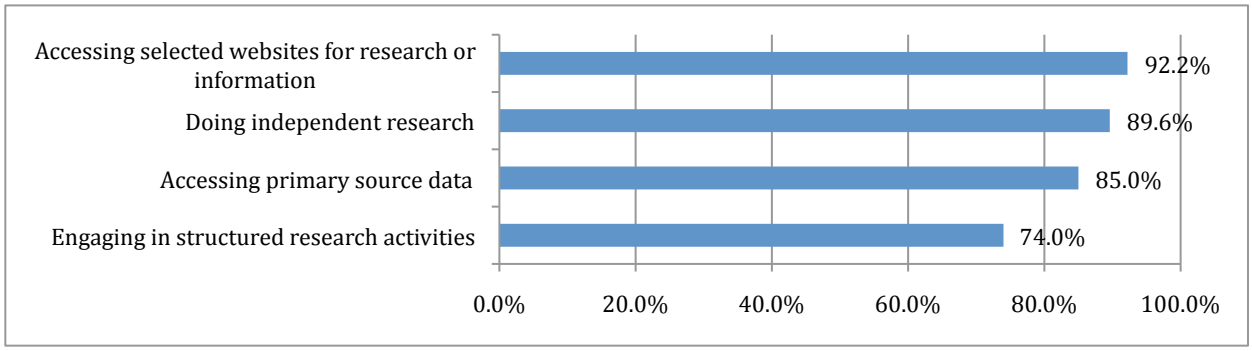
[20] Data from Costa Rican teachers was removed from this section because of a local variation in these survey items.

Figure 4: Teacher use of Web 2.0 activities with students *



* This graph depicts teachers who report using these tools regardless of frequency.

Figure 5: Teacher use of Internet Research activities with students *



* This graph depicts teachers who report using these tools regardless of frequency.

Degree of technology use with students[21]

In addition to calculating what percentage of teachers are using particular technology tools and software, EDC researchers created two indices measuring frequency of use for the productivity tool and Web2.0 tool categories. The first index is a continuous measure of the variety and frequency of technology use. The teachers' responses on the 6 productivity tools and the 11 Web2.0 tools were combined to create a single indicator for each category

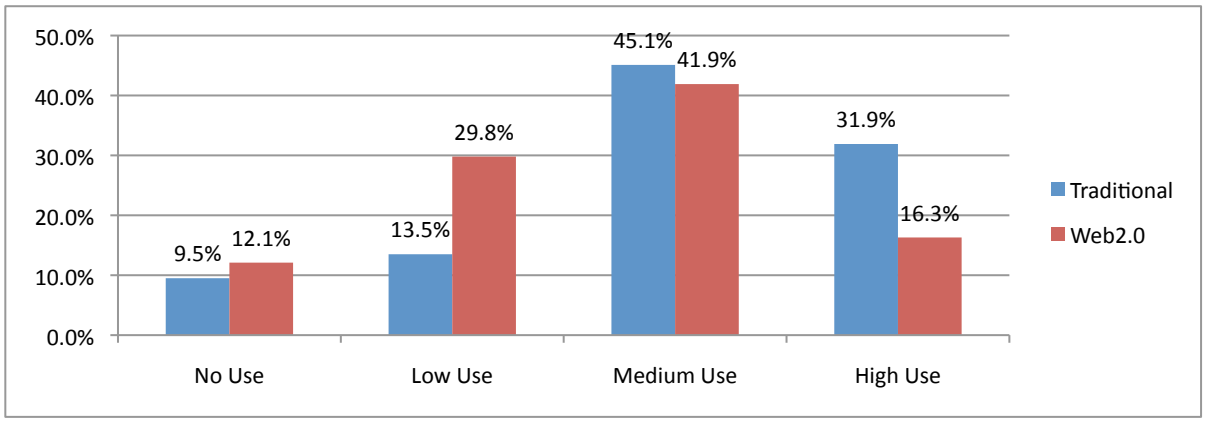
[21] Data from Costa Rican teachers was removed from this section because of a local variation in these survey items.

to capture some aspect of the frequency and variety of tool use. On average, teachers scored a 7.41 on the traditional tool scale and a 9.09 on the Web2.0 scale.[22]

The second index uses the continuous measure to place respondents into one of four groups: No Use, Low, Medium and High Use categories. Teachers who received a 0 were placed in the "No Use" category and the other scores were divided as evenly as possible across the three groups.[23]

Figure 6 shows that, as a category, the productivity tools are used more intensively by these teachers than the Web2.0 tools: 45.1% of teachers are medium users of productivity tools and 31.9% are high users. Larger portions of respondents, 41.9%, were medium users of Web2.0 tools, but only 16.3% were high-degree users. These findings are not surprising given that the most commonly used tools are in the productivity category (see above) and that integrating Web2.0 tools requires more in depth knowledge of various ICT resources and a more advanced understanding of student centered pedagogy.

Figure 6: Degree of technology use with students



Impact of program on the Degree of Technology Use with Students[24]

EDC examined the impact of the program on the quantity and frequency of ICT tool use using the continuous measure of technology as an outcome variable and the four Outcome Indicators. The findings show a clear pattern between the number of Outcome Indicators that teachers have met and a higher degree of technology use. Teachers who have met all four Outcome Indicators were likely to have a higher degree of use of both productivity

[22] Responses were recoded where "Not at all" was equivalent to a 0, "A little" was given a 1," and "A lot" was allocated a 2. Respondents' scores were summed across both of the groups to give them one score for each index. The scores on the traditional technology tool indicator ranged from 0 to 12, and scores on the Web2.0 indicator ranged from 0 to 22.

[23] For the Traditional Technology index, teachers were placed in the *Low* use category if they scored from 1 to 7, *Medium* if they scored from 8 to 13, and *High* if they scored from 14 to 20. The Web2.0 variable's cut points were slightly different, *Low* was 1 to 7, *Medium* 8 to 15, and *High* was any score from 16 to 22.

[24] Data from Costa Rican teachers was removed from this section because of a local variation in these survey items.

tools and web2.0 tools. In an ANOVA, teachers' use of both traditional and Web2.0 technology tools is significantly related to the number of success indicators that a teacher meets (p< .001). (See Figures 7a and 7b.)

Figure 7a: Degree of traditional technology use with students by number of Success Indicators met

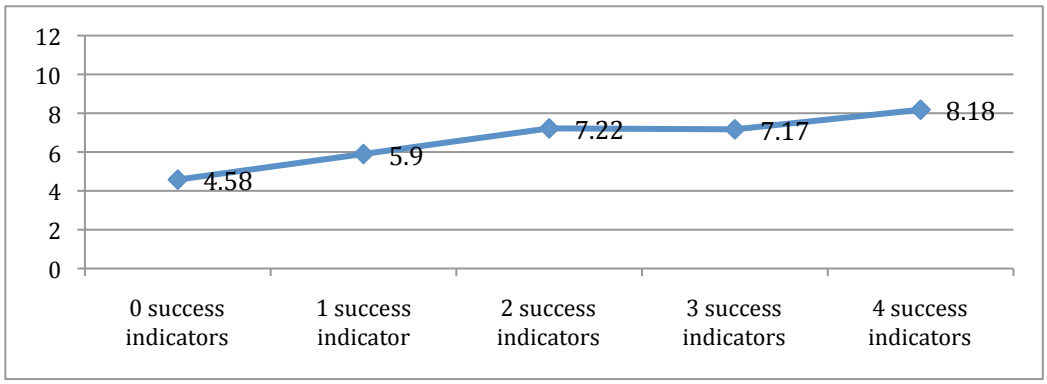
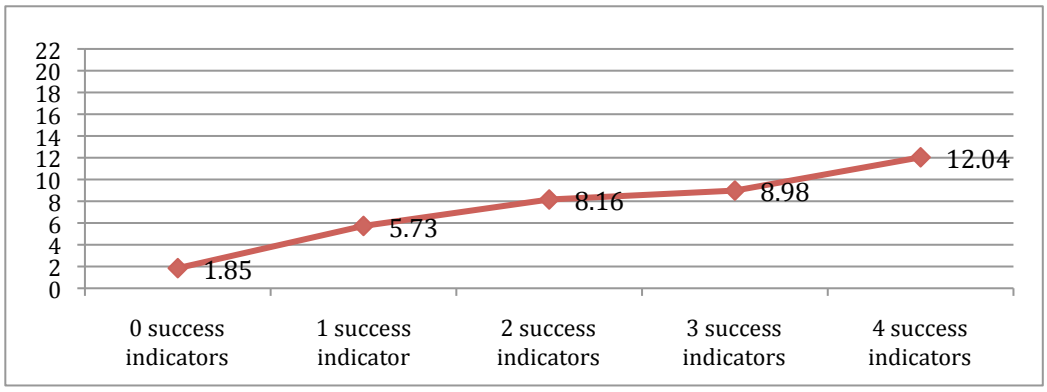


Figure 7b: Degree of Web2.0 technology use with students by number of Success Indicators met



Influence of school-level contextual factors on the success of the program

Previous research on Essentials found that the availability of ICT infrastructure and follow-up support at the school are both important factors to program success.[25] In order to

[25] Daniel Light et al., "Preparing teachers for the 21st Century classroom: Current findings from evaluations of the Intel Teach to the Future Essentials Course," (New York: EDC/Center for Children and Technology, 2006); Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."; Martin and Shulman, "Intel Teach Essentials Instructional Practices and Classroom Use of Technology Survey Report."; Daniel Light, "Multiple factors

understand how these factors might influence the long- term goals of increasing student use of ICT and project-based approaches, EDC explored the influence of school support on the completion of Outcome Indicators, as well as the influence of ICT access on the degree of use with students.

Influence of the availability of ICT infrastructure on program success

Not surprisingly, evaluation data on the Essentials Course has consistently demonstrated that individual teachers' access to ICT resources plays a significant role in shaping the depth and persistence of the program's impact on those teachers. This impact is not simply a function of the *number* of computers available, but of accessibility to the teacher and reliability. The survey asked respondents a variety of questions about where and how they can access ICT resources for themselves and for work with their students. The following sections review the data on teachers' and students' access to ICT resources and then examine the relationship of access to the Outcome Indicators.

Teachers access to ICT infrastructure

If teachers are expected to use ICT with their students, they need to have access to ICT for planning and developing lessons. In fact, previous survey studies demonstrated that in-classroom computer access (as opposed to lab access only) made it significantly easier for teachers to increase their use of technology with students.[26] To explore this issue, the survey asked teachers a number of questions about where they accessed ICT resources for their own professional use. Responses on a variety of items were recoded to produce the following four teacher access points: home computer, *official* teacher laptop (i.e. provided by Ministry of Education), classroom computer, shared computer in teacher's room. Teachers who reported no dedicated teacher computer at their school were coded as such, though these teachers might still have computer access at home.

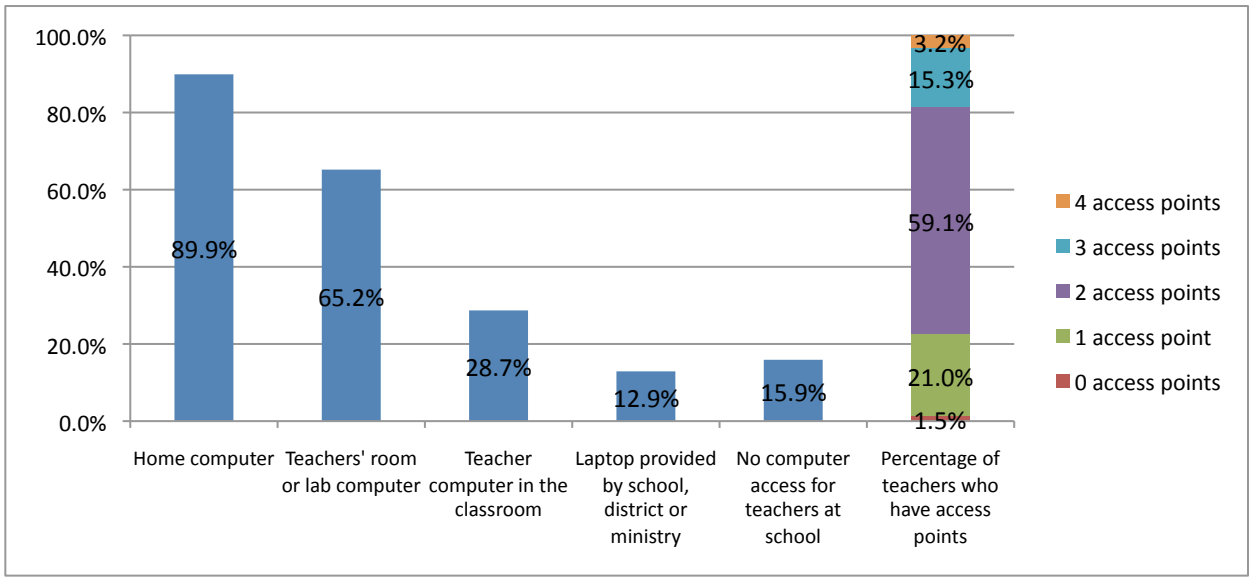
Teachers across the sample reported having access to computers through a variety of access points. Figure 8 shows the percentage of teachers who report each access point, as well as the percent of the sample that has multiple ways to access ICT for professional use. For example, although 15.9% of teachers report no dedicated teacher computer in their school, only 1.5% of the respondents report no access at all to ICT for planning and preparation. As the figure depicts, the majority of teachers (59.1%) have access to a computer through at least two ways, while a smaller amount have access to three (15.3%) and four (3.2%) points. Most of the Intel participant teachers who responded to the survey have a computer at home (89.9%), but the second most common access point is a shared, dedicated teacher computer in the teachers' lounge or media center (65.2%).

---

supporting the transition to ICT-rich learning environments in India, Turkey, and Chile," *International Journal of Education and Development using ICT [Online]* 6, no. 4 (2010).

[26] Light et al., "Preparing teachers for the 21st Century classroom: Current findings from evaluations of the Intel Teach to the Future Essentials Course."; Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."

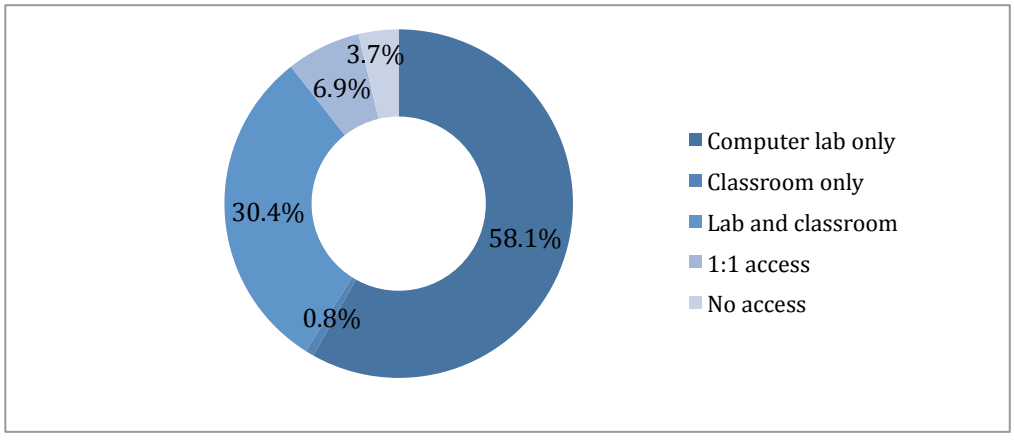
Figure 8: Teachers' multiple access points to ICT resources to support planning and preparation (n≈1,922)



Student access to ICT infrastructure in school

The survey also asked various questions about where students could access ICT resources in school. The results were compiled into a five-level index of student access. Each response is mutually exclusive. The four school-based student access points are: 1 to 1 access (i.e. laptop program); classroom access only (*but not 1 to 1*); computer lab access only; and classroom and lab access.

Figure 9: Teachers' access to school-based ICT resources for students (n=1,886)



Classroom teachers report that their students have access to computers through a variety of channels. As depicted in Figure 9, a majority of teachers report that the students in their school have access to computers only through a computer lab (58.1%) and nearly a third of teachers report that their students have access to computers in both a lab and classroom

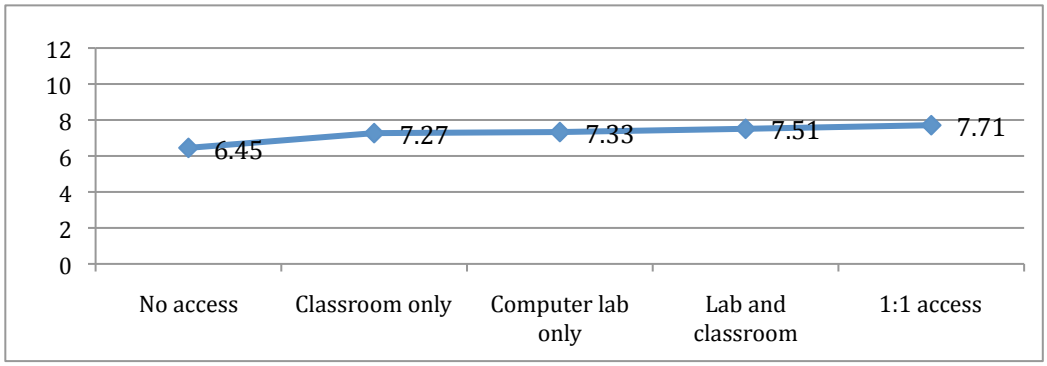
setting (30.4%). Only a small percentage of teachers in the sample report working in a 1:1 laptop environment (3.7%).

Influence of multiple access points to school-based ICT resources on program outcomes

Finally, EDC ran an ANOVA to look at the effect of the type of school-based access to ICT that students have on the teacher's degree of technology use with students. Figures 10a and 10b show the average degree of use for both productivity and Web2.0 tools for the five types of school-based access. The first notable finding is that even teachers in schools with no student-level technology access are doing some ICT activities with their students. Most likely this is through community access points like cybercafés. Both the use of productivity tools and Web2.0 tools trend up, suggesting that having some flexibility in where students can access the Internet enables teachers to use more ICT with their students.

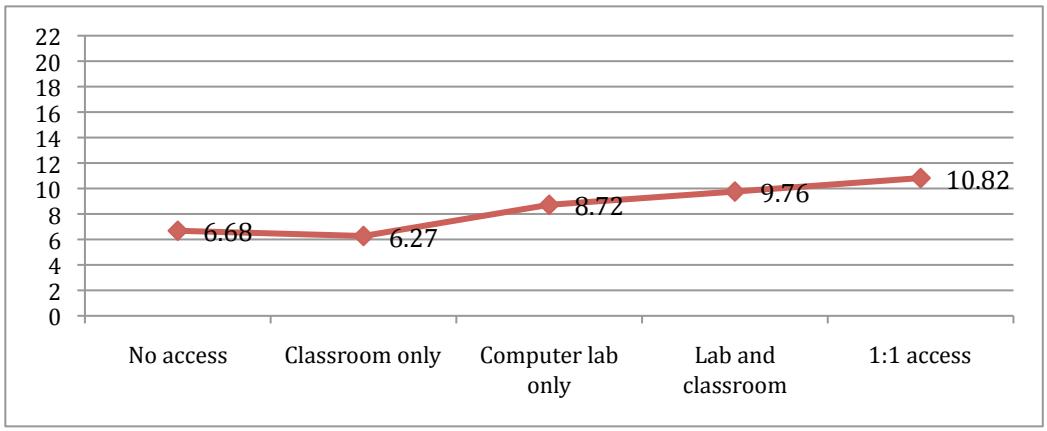
The ANOVA found that teachers who have lab and classroom access to ICT, or have a 1 to 1 environment, were both significantly more likely to use ICT than their peers who only have access to a computer lab. However, 1 to 1 environment or lab and classroom access were not significantly different from each other either in terms of productivity or Web2.0 tools. These findings suggest that both of those strategies for distributing ICT resources are roughly equivalent in supporting Essentials-trained teachers to use ICT with their students.

Figure 10a: Degree of traditional technology use with students by access to school-based ICT resources for students [27]



[27] Data from Costa Rican teachers was removed from this section because of a local variation in these survey items.

Figure 10b: Degree of Web2.0 technology use with students by access to school-based ICT resources for students



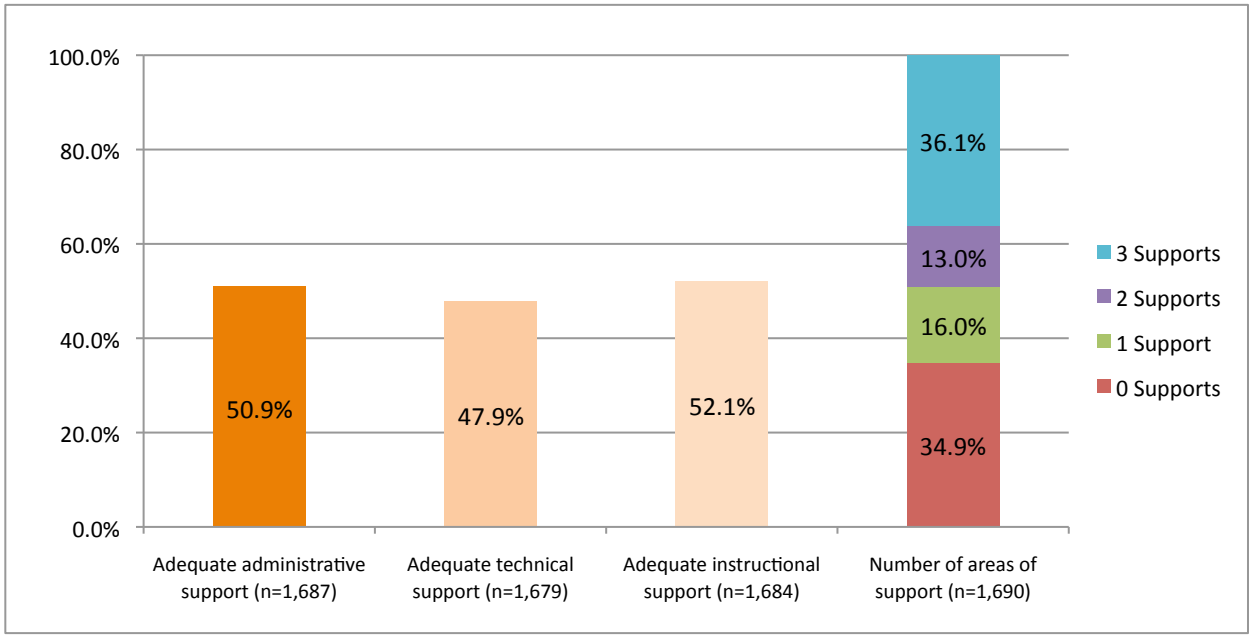
Influence of school-level support on program success [28]

The school-level leadership can also play an important role in ensuring that the school premises and classroom conditions allow teachers to experiment and innovate. Previous evaluations have highlighted the role of school-based support, but found that it is often lacking. For example, a study on the Essentials program in Argentina,[29] found that teachers who had made the most progress in changing their practice were in schools with supportive leadership. The Argentine study considered that "the institutional support does a lot to strengthen the training's processes from supporting innovative lesson plans to facilitating the infrastructure resources, but also in school organization and incentivizing teachers."

[28] Data from Costa Rican and Argentine teachers was removed from this section because of a local variation in these survey items.

[29] Margarita Schweizer, "Evaluación de impacto pedagógico-didáctico de los cursos Intel ® Educar para el Futuro (Argentina)," (Cordoba, Argentina: Universidad de Cordoba, 2005).

Figure 11: Percent of teachers receiving adequate school-level support[30]



More recent research on the role of school leadership and support in promoting the success of the Essentials Course confirmed the Argentina findings, and identified three strands of support —administrative, technical and instructional (or pedagogical).[31] On the international survey, program participants were asked whether they received adequate support in those three areas: administrative support, technical support and instructional support. Figure 11 shows that follow-up support at the school level continues to be a challenge for the program participants. Slightly more than half of the Essentials participants surveyed felt they had adequate instructional and administrative support while implementing technology activities, and the results are below 50% for technical support.

Impact of school-level support on Outcome Indicators

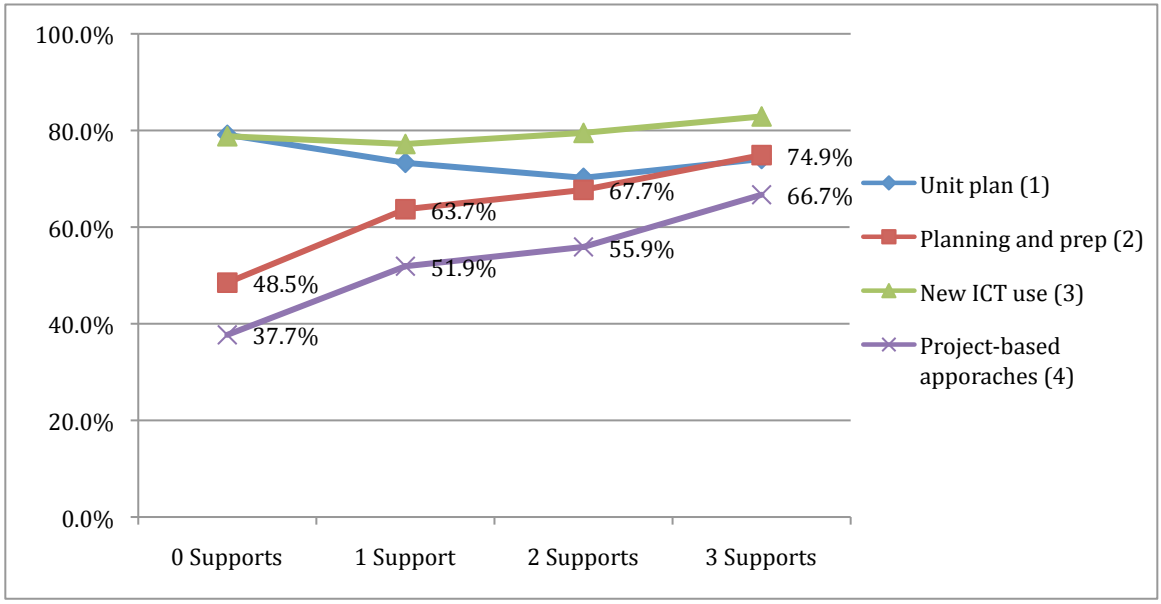
Using a Chi-Squared analysis, EDC looked at how the number of school-level supports impacts the completion rate of each of the four Outcome Indicators. Figure 12 graphs the percentage of teachers who met each indicator based on how many supports they reported having at school. The data suggest that school-level support is less important for encouraging teachers to use the unit plan or to integrate some new ICT activities; however, school support appears to play an important role in getting teachers to adapt project-based

[30] Teachers were asked about the types of support they receive at their schools. On a scale of 1 to 4 with 1 being *strongly disagree* and 4 being *strongly agree*, teachers indicated whether they were receiving adequate administrative, technical and instructional support. The percentage of teachers who marked "agree" or "strongly agree" is included in the graph.

[31] Light, "Multiple factors supporting the transition to ICT-rich learning environments in India, Turkey, and Chile."

approaches (Indicator 4). Indicators 2 and 4 are most significantly impacted by the number of school supports a teacher receives. Of teachers who report no supports at school, only 37.7% meet Indicator 4 and 48.5% meet Indicator 2. In contrast, when teachers have all three supports in place, 66.7% report meeting Indicator 4 and 74.9% meet Indicator 2. This finding reiterates similar findings in many of the previous qualitative and quantitative reports that highlight how important it is for MOEs and local education authorities to put in place adequate support structures so that teachers can take fuller advantage of the Essentials Course.

Figure 12: Percent achieving each indicator by number of school-level supports



Conclusion

The Intel has a firm commitment to the evaluation of the Essentials Course worldwide, both to inform the continuous improvement of the program and its implementation model, and to document and demonstrate the impact of the program on its teacher participants. The findings from this international survey are consistent with the previous international survey studies[32] in that survey respondents continue report they are changing their practice to integrate more ICT and project-based approaches. Overall, the survey data indicate that the program is providing teachers with very positive experiences which help them rethink their practice, take the first steps towards reforming their practice, and eventually integrate technology into their teaching. Across the four indicators that the evaluation tracks, the results are positive.

[32] Light et al., "Preparing teachers for the 21st Century classroom: Current findings from evaluations of the Intel Teach to the Future Essentials Course."; Light, Menon, and Shulman, "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006."

The current study also highlights the importance of certain contextual factors that make that enable teachers to be more successful with the program: easy access to ICT resources for their students and receiving adequate support. These findings reiterate similar observations from previous qualitative and quantitative reports that highlight the importance for MOEs and local education authorities to provide adequate access to ICT and to put in place adequate support structures to ensure that the Essentials Course will help the MOE meet their own objectives of promoting student-centered learning and ICT use for students.

Akbaba-Altun, Sadegül. "Complexity of Integrating Computer Technologies into Education in Turkey." *Journal of Educational Technology and Society* 9, no. 1 (2006): 176-87.
Aydin, Cengiz Hakan, Murat Ataizi, and Hasan Çalişkan. "The Intel® Teach Essentials Course Turkey Evaluations: October 1, 2006 – March 30, 2007." 17. Eskisehir, Turkey: GLOKAL, 2007.
Cancino, Victor Cancino, and Sebastián Donoso Díaz. "El Programa De Informática Edcuativa De La Reforma Educativa Chilena: Análisis Crítico." *Revista Iberoamericana de Educación* 36 (2004): 129-54.
Cohen, David, Stephen Raudenbush, and Deborah Ball. "Resources, Instruction and Research." Seattle: Center for the Study of Teaching and Policy, 2000.
Comenius. "Informe Final - Enlaces Portátil: Abriendo Camino Para Un País Digital." 59. Santiago: Centro para el desarrollo de innovaciones en educación, Universidad de Santiago Chile, 2008.
Cradler, R., and J. Cradler. "Just in Time: Technology Innovation Challenge Grant Year 2 Evaluation Report." San Mateo, CA: Blackfoot School District No. 55, Educational Support Systems., 1999.
Educational Computer Institute. "Final Report: Intel® Teach to the Future Project Evaluation." 12. Temuco, Chile: University of La Frontera, 2003.
Garet, Michael, Andrew C. Porter, Laura Desimone, Beatrice Birman, and Kwang Suk Yoon. "What Makes Professional Development Effective? Results from a National Sample of Teachers." *American Educational Research Journal* 38, no. 4 (Winter 2001): 915-45.
Grant, Michael M., Steven M. Ross, Wang Weiping, and Allison Potter. "Computers on Wheels: An Alternative to "Each One Has One"." *British Journal of Educational Technology* 36, no. 6 (2005): 1017-34.
Guskey, Thomas R. "Professional Development and Teacher Change." *Teachers & Teaching* 8, no. 3/4 (2002): 381-91.
Hunt, E., and J. Minstrell. "A Cognitive Approach to the Teaching of Physics." In *Classroom Lessons: Integration Cognitive Theory and Classroom Practice*, edited by K. McGilly. Cambridge, MA: MIT Press, 1994.
Kanaya, Tomoe, Daniel Light, and Kathrine McMillan Culp. "Factors Influencing Outcomes from a Technology-Focused Professional Development Program." *Journal for Research in Technology Education* 37, no. 3 (2005): 313-29.
Kennedy, Mary. "Form and Substance in Mathematics and Science Professional Development." *NISE Brief* 3, no. 2 (November 1999): 7.
Light, Daniel. "Multiple Factors Supporting the Transition to Ict-Rich Learning Environments in India, Turkey, and Chile." *International Journal of Education and Development using ICT [Online]* 6, no. 4 (2010): 39-51.
Light, Daniel, Kathrine McMillan Culp, Roshni Menon, and Simon Shulman. "Intel® Teach to the Future Essentials Course: Impact Survey Results for 2005." 50. New York: EDC/Center for Children and Technology, 2006.
Light, Daniel, Kathrine McMillan Culp, Roshni Menon, and Simon Shulman. "Preparing Teachers for the 21st Century Classroom: Current Findings from Evaluations of the

Intel Teach to the Future Essentials Course." 44. New York: EDC/Center for Children and Technology, 2006.
Light, Daniel, Roshni Menon, and Simon Shulman. "Training Teachers across a Diversity of Contexts: An Analysis of International Evaluation Data on the Intel® Teach Essentials Course, 2006." New York: EDC/Center for Children and Technology, 2007.
Light, Daniel, and Charles Rockman. "The Emerging Paradigm of Teaching and Learning in Discovery Schools." In *Evaluation of the Jordan Education Initiative*, 57. Washington, D.C.: Education Development Center, 2008.
Loucks-Horsley, Susan, Katherine Stiles, and Peter Hewson. "Principles of Effective Professional Development for Mathematics and Science Education: A Synthesis of Standards." *NISE Brief* 1, no. 1 (May 1996): 7.
Martin, Wendy, and Simon Shulman. "Intel Teach Essentials Instructional Practices and Classroom Use of Technology Survey Report." New York: EDC/Center for Children and Technology, 2006.
Means, B., and K. Olson. "Technology and Education Reform. Studies of Education Reform." Washington DC: US Government Printing Office, 1997.
Oakley, Carol. "Intel® Teach Program (Australia) Evaluation Report on the Impact of the Essentials Course ", 27. Melbourne: Deakin University, 2006.
Ravitz, Jason. "Project Based Learning as a Catalyst in Reforming High Schools." In *American Educational Research Association*, 14. New York, 2008.
Sandholtz, Judith, Cathy Ringstaff, and David C. Dwyer. *Teaching with Technology : Creating Student-Centered Classrooms*. New York: Teachers College Press, 1997.
Scardamilia, M. , and C. Bereiter. "Computer Support for Knowledge-Building Communities." In *Cscl: Theory and Practice of an Emerging Paradigm*, edited by T. Kaschmann. Mahwah, NJ: Erlbaum, 1996.
"Schoolnet Toolkit." 252. Bangkok: UNESCO Bangkok; Commonwealth of Learning, 2004.
Schweizer, Margarita. "Evaluación De Impacto Pedagógico-Didáctico De Los Cursos Intel ® Educar Para El Futuro (Argentina)." 55. Cordoba, Argentina: Universidad de Cordoba, 2005.
Smith, Marshall. "Drawing Inferences for National Policy from Large-Scale Cross-National Education Surveys." In *Methodological Advances in Cross-National Surveys of Educational Achievement*, edited by Andrew C. Porter and Adam Gamoran. 295-317. Washington, DC: National Research Council, 2002.
Somekh, Bridget, Cathy Lewin, Di Mavers, Tony Fisher, Colin Harrison, Kaye Haw, Eric Lunzet, Angela McFarlane, and Peter Scrimshaw. "Impact2 - Pupils' and Teachers' Perceptions of Ict in the Home, School and Community." London: British Educational Communications and Technology Agency, 2003.
Teacher Foundation. "A Comparative Study of Ict Leadership in Schools: A Case Study of 4 Government-Aided Schools in Gujarat." 143. Bangalore, India: Teacher Foundation, 2005.
Vyasulu Reddi, Usha, and Vineeta Sinha. "India: Ict Use in Education." In *Metasurvey on the Use of Technologies in Education in Asia and the Pacific*, edited by Glen Farrell and Cédric Wachholz. 245-52. Bangkok, Thailand: UNESCO-Bangkok, 2003.

Webb, Mary, and Margaret Cox. "A Review of Pedagogy Related to Information and Communications Technology." *Technology, Pedagogy and Education* 13, no. 3 (2004): 235-86.
White, B. Y., and J. R. Frederiksen. "Inquiry, Modeling, and Metacognition: Making Science Accessible to All Students." *Cognition and Instruction* 16, no. 1 (1998): 3-118.