ITEST Management Information System 2010: Final Report Describing Active ITEST Projects

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Introduction

In 2003, the ITEST Learning Resource Center (LRC) at Education Development Center, Inc. (EDC), was funded to provide technical assistance and support to ITEST projects. The LRC's approach to technical assistance was to develop a community of practice among ITEST project teams who would share expertise and lessons learned with their peers to continuously improve practice across the ITEST portfolio. As the program matured, questions about ITEST projects increased in both frequency and number, and it became apparent that the rapid response of the ITEST community to each set of questions was insufficient to meet the informational needs of a mature National Science Foundation (NSF) program. It was clear that ITEST would benefit from a comprehensive information system that contained accurate data describing ITEST projects.

In coordination with NSF program officers, the LRC defined the following goal for the ITEST Management Information System (MIS):

To inform NSF, the LRC, the ITEST projects, the field and other stakeholders as to the state of ITEST: who participates, how often, when, and in what kind of activities.

In the fall of 2009, the MIS survey was administered to newly awarded and active projects, covering four years of funding. In 2010, these same projects completed their second MIS, and newly funded projects were asked to complete it as well.

Format of MIS

Three versions of the MIS were developed for administration in fall 2010. The baseline version asks projects to describe their targets for the project—populations, technologies, etc. The annual version includes all the same questions but asks principal investigators (PIs) to include the *actual* results for the previous year. The final version asks projects for a summative report over the entire project life cycle.

In addition to administering three different versions of the MIS, revisions were made to the 2009 version to improve the quality and accuracy of the results. Open-ended responses from the first year of data were used to expand the selection options for certain items. The skip logic for questions was improved so that PIs would have to answer only questions that were relevant to their project design, and several questions were reordered accordingly. The 2010 version included a new section of questions regarding research design and measurement of youth interest in science, technology, engineering, and mathematics STEM and/or STEM careers. A new section was added to ask specific questions about scale-up studies, research studies, and conferences and workshops.

The MIS survey administered in 2010 was divided into several areas covering the components of ITEST projects: project background and activities; youth and teacher project components; teacher participants; youth participants; student interest in STEM and/or STEM careers; research and evaluation activities; and a section for scale-up studies, research studies, and conference and workshops. The survey was administered to all currently active projects from the five most recently funded cohorts. The first three cohorts of ITEST projects (a total of 52 projects) were not included in the MIS because they are no longer active. Thus, the MIS describes the characteristics of five years of ITEST projects rather than the entire portfolio, at a

single data entry point. The survey was administered from mid-September through December 2010. The data were also compared to existing data submitted by each project to the LRC website of project profiles. This detailed process resulted in high quality and reliable data, with few missing variables.

Purpose and organization of this report

This report provides descriptive analysis of the aggregated data, which can give us a bird's-eye view of five years of ITEST projects. The report provides a program-wide summary of ITEST projects: populations the projects serve, how many people they serve, the structure of the projects, their intended outcomes, and the ways in which those outcomes are measured.

This report of the 2010 MIS presents a selection of the results collected. The report covers four principal areas: (1) a description of ITEST projects and what they do, (2) a description of who participates in ITEST projects, (2) a summary of dissemination practices, and (4) a summary of research and evaluation practices. Where information is available, this report compares the aggregated results from the 2009 MIS to the 2010 MIS. Project-level changes across years will be examined with the third year of data collection in 2011.

Description of ITEST projects

In the first year of administering the MIS (2009–2010), 108 projects from the four cohorts were invited to complete the MIS, and of that number, 89 projects (82%) completed it by the deadline. This year 119 projects from five cohorts were asked to complete the MIS (Table 1); 95 projects completed it by the deadline (80%). Cohort 4 (whose projects ended in 2009 unless they got a no-cost-extension) was asked to complete the final version of the MIS describing outcomes over the life of the project. Cohorts 5–7 completed the annual version describing activities in the previous year, and Cohort 8 completed the baseline version describing planned activities.

For most of the data in this report, we report on all five cohorts together. When the data on actual vs. targeted results are particularly relevant (e.g., number of participants served), we report separately for each of the three versions of the MIS.

Table 1. ITEST projects that completed 2010 MIS

Cohort	Years	# completed 2010 MIS	Total projects in cohort	% completed 2010 MIS
4	2006–2009	14	22*	64
5	2007/2008–2010/2011	20	27**	74
6	2008/2009–2011/2012	30	31***	97
7	2009/2010–2012/2013	20	25****	80
8	2010/2011–2013/2014	11	14	79
Total		95	119	80

*C4: Excluding one originally funded, whose organization went out of business in their second year and was not asked to complete, and two whose PIs were unreachable or no longer had access to data.
**C5: Excluding a one-year WGBH media resources project not asked to complete and one whose PI was unreachable.

***C6: In 2010, we have counted one project twice to reflect two collaborating institutional partners.
****C7: Excluding two one-year conferences that will complete final MIS in Spring 2011.

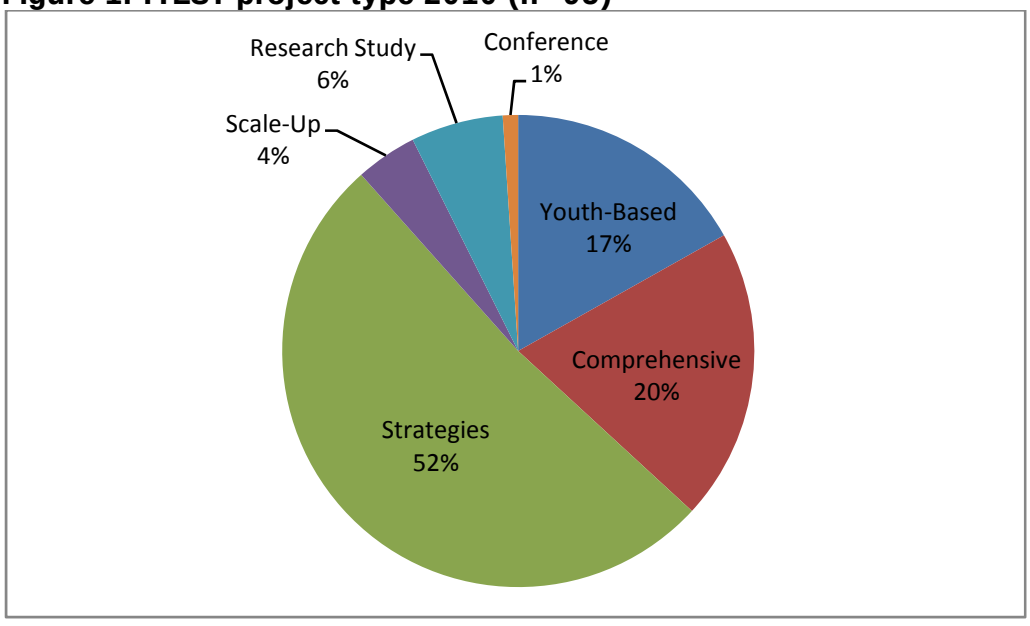
As seen in Table 2, of the 105 projects that were asked to complete the MIS in both years, 71 did so (68%). Only eight projects did not complete in either year.

Table 2. ITEST projects completing MIS by year (Cohorts 4–7)

	Did not complete 2009	Completed 2009	Total
Did not complete 2010	8	13	21
Completed 2010	13	71	84
Total	21	84	105

For the first five years of ITEST, projects were defined as either youth-based or comprehensive (focused on teacher professional development). Beginning in 2008, the program was revised, and projects were placed into one of four categories: (1) strategies, (2) scale-up projects, (2) research studies, or (4) conferences and workshops. Of the five cohorts included in the 2010 MIS, two were funded under the old definitions, and three under the new. The strategies and scale-up categories encompass both youth-based and comprehensive projects, keeping ITEST's dual focus on both informal and formal education. As shown in Figure 1, 52% of the projects that completed the MIS are identified as strategies.

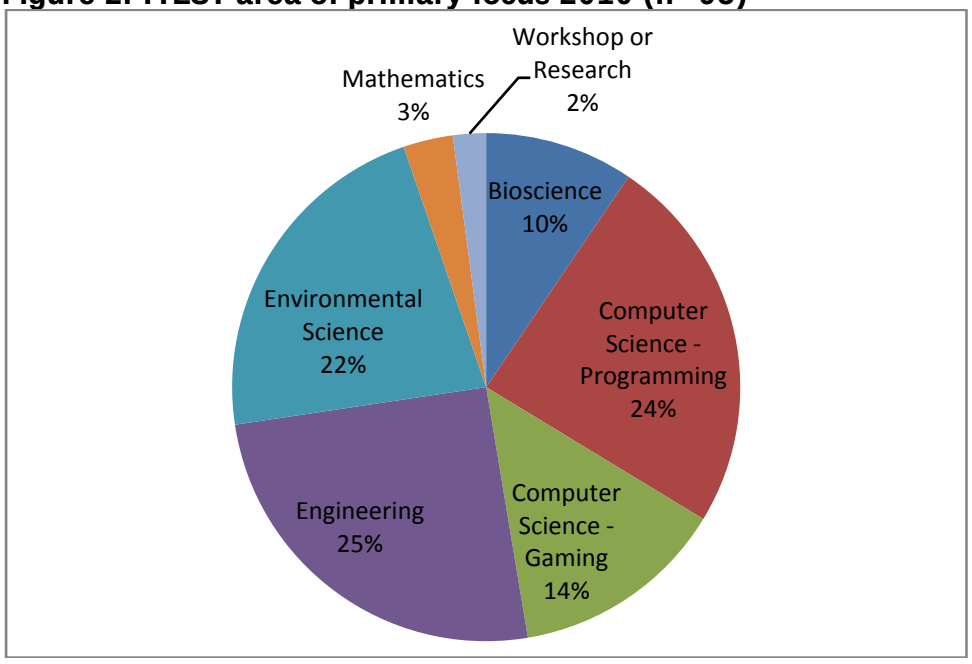
Figure 1. ITEST project type 2010 (n=95)



ITEST projects can also be classified by their content focus, as shown in Figure 2. The three most common areas of primary focus are computer science (38%), engineering (25%), and environmental science (22%), followed by bioscience (10%) and mathematics (3%). The division of content focus is basically unchanged from 2009.

A breakdown of focus areas by cohort can be found in Appendix A, Table A1.

Figure 2. ITEST area of primary focus 2010 (n=95)



What happens in ITEST projects?

ITEST projects use technologies in innovative ways. The kinds of technologies they use are ever changing as the technologies themselves change. Table 3 shows the percentages of projects that used particular technologies, comparing results from 2009 and 2010. The length of the list shows the diversity of technologies. The five most commonly used technologies in both years are the same (visualization and computer modeling tools, programming tools, data analysis and computation tools, multimedia tools, and communication tools), although the order has changed. Other notable changes include the increases in the percentage of projects using hand-held devices and imaging technologies, and the drop in the percentage of projects using social networking tools, game development, and geospatial technologies.

Table 3. Technology tools used in projects in 2009 and 2010

	% projects using in 2009 (n=88)	% projects as primary component in 2010 (n=92)
Communication tools (e-mail, messaging, blogs, video conferencing)	33	44
Multimedia tools	34	41
Data analysis/computation tools	36	38
Visualization/computer modeling tools	38	35
Programming tools	37	29
Hand-held devices	16	22
Electronics/robotics tools	21	22
Engineering/design tools	22	20
Game development	24	19
Imaging technologies	12	16
Social networking tools	21	14
Geospatial technologies (GIS/GPS/RS)	20	12
Virtual reality	11	10
Other	14	9

In addition to specific technology tools, ITEST projects promote different technology skills. A comparison between the technology skills reported in 2009 and 2010 reveals that skills most frequently cited in both years remain similar; these skills include computing and data analysis, visualization and modeling, and computational thinking (Table 4).

Table 4. Technology skills promoted in projects in 2009 and 2010

	% projects using in 2009 (n=88)	% projects as primary component in 2010 (n=92)
Computing/data analysis skills	39	35
Visualization/modeling skills	41	35
Computational thinking skills	29	33
Programming skills	34	28
Communication/social networking skills	31	28
Digital media skills (photos, imovie, music)	31	27
Computer driven equipment skills (e.g., CAM, Robotics)	24	26
Data management skills	21	21
Web development skills	17	5
Other	14	7

Table 5 describes the different focus areas of ITEST projects. Projects were allowed to choose more than one focus area. (They were requested to limit their choice to three, but some projects chose more.) For 65 projects, a focus on technology-based learning was one of the primary emphases of the project.[1]

Table 5. Focus areas of ITEST projects 2010 (n=92)

	# projects as primary component	% projects as primary component
Technology-based learning (computer-based, game-based)	65	71
Career skills development (lab work, engineering or science lab; using tools, equipment, and instruments found in STEM careers)	43	47
Classroom work (academic content learning, in-class projects, guest speakers)	41	45
Participation of scientists/engineers/technologists	33	36
Mentoring of participants	31	34
Field work (internships/externships, experiential learning, out-of-school projects, skills training)	28	30
Engagement of STEM researchers	26	28
Career development (creating a career plan, providing information about career pathways)	19	21
Engagement of parents/caregivers	13	14

The MIS provided space to describe three strengths and three challenges. ITEST projects' activities, content, models, and methods of instruction appear to be the most valued assets of the program (Table 6). Sixty-eight percent of projects cited one or all of these as their greatest strengths. Other notable areas mentioned by projects include partnerships, staff, and uses of technology.

No single challenge emerged as common among all the projects. The most frequently mentioned challenge was the lack of technological resources, but this was only identified by 18 projects (See Table 7). Other commonly cited challenges include working with partnering organizations or individuals, recruitment, retention, time conflicts, and internal project communication or collaboration.

[1] This table does not include data from 2009 because in 2009 the MIS asked the question separately of youth- vs. teacher-focused projects. However, in 2010, the question was asked of all projects working with participants.

Table 6. Project strengths (n=95)

	# of projects	% of projects
Project activities, content, models, method of instruction	65	68%
Partnerships	41	43%
Project staff	19	20%
Use of technology	19	20%
Research/Evaluation efforts, design, methods, or findings	11	12%
Dissemination efforts	10	11%
Recruitment	9	9%
Retention	9	9%
Developed curriculum, software, other products	9	9%
Dedicated/Engaged participants (teachers, youth, mentors, etc.)	8	8%
Expansion/Growth in number of participants	8	8%
Positive change in attitudes, interest	6	6%
Reaching underrepresented participants	6	6%
Other*	54	57%

*Grouping for categories with less than five common responses.

Table 7. Project challenges (n=95)

	# of projects	% of projects
Difficulty with/Lack of technological resources	17	18%
Recruitment	16	17%
Working with partnering organizations/individuals	16	17%
Retention	15	16%
Time conflicts/limitations	14	15%
Internal project communication/collaboration	11	12%
Engaging participants	10	11%
Developing pedagogical content of the project	8	8%
Project staff turnover	7	7%
Post-project follow through	7	7%
Transportation	7	7%
Limited resources	7	7%
Testing or curriculum standards	7	7%
Data collection	6	6%
Research/Evaluation activities (setting objectives, instrument development, data collection, general planning)	6	6%
Other*	35	37%

*Grouping for categories with less than five common responses.

2010 ITEST Project Participants

Most ITEST projects work with both youth and teachers; two projects—one research study and one workshop—said they do not work directly with either youth or teachers. Of the projects that completed the MIS in 2010, 70% work with both youth and teachers in some component of the project; 18% work only with youth; and 12% work only with teachers (Figure 3).[2]

Figure 3. Targeted population of ITEST projects 2010 (n=92)

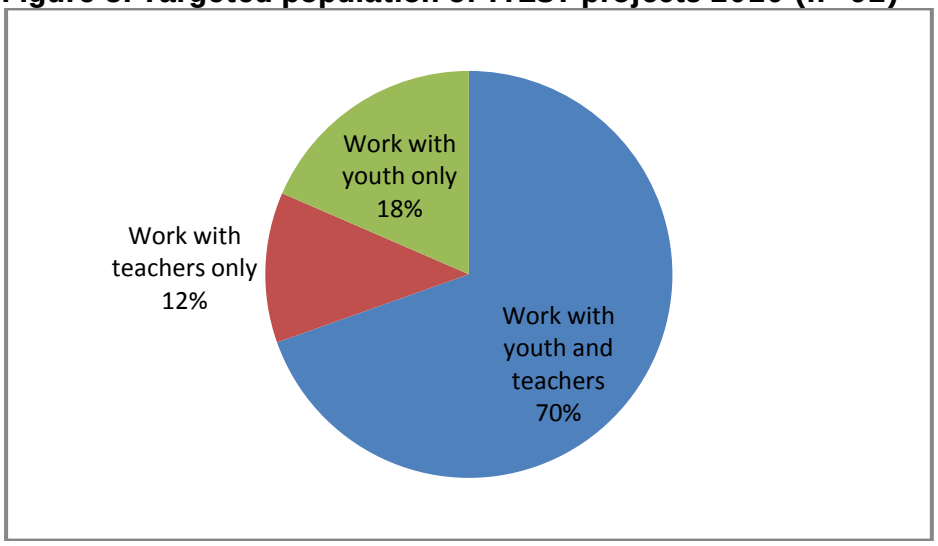


Table 8 describes the geographic locations of ITEST projects. More than 80% of projects work in urban areas, and of those, 19 projects (30%) are exclusively focused on urban areas. Of the 60 projects that work in rural areas, 9 projects (15%) are exclusively focused on rural areas.

Table 8. Number of projects targeting specific geographic areas 2010 (n=92)

	# of projects	% of projects*
Urban	77	83.7
Suburban	56	60.9
Rural	60	65.2

*Sixty-three projects work in more than one geographic area.

More than 70% of projects work at the high school level (Table 9), and 64% of projects work in middle schools. Eleven projects work in grades 3–5, and only two projects work in grades K–2. Although the ITEST program began with a focus on middle and high school, and only in the last two years has it broadened the target groups to include elementary school, 4 of the 11 projects targeting youth at the elementary level are in cohorts that were funded before this change in focus occurred.

[2] In 2009, only 2% of projects reported working only with teachers, but the change may be a result of changes in reporting formats. Some projects count the students who are taught by their teachers as part of the project, while others do not.

Table 9. Grade spans served in ITEST projects 2010 (n=92)*

	# of projects	% of projects
K–2	2	2.2
3–5	11	12.0
6–8	59	64.1
9–12	67	72.8

*Total is more than 92 because some projects work with more than one grade span.

**A breakdown of projects by cohort can be found in Appendix A, Table A2.

In order to collect the most accurate information about the number of participants served in ITEST projects, each version of the MIS asked the question differently. For the cohort of projects that has completed its work, the MIS asked about the number of participants for the entire life of the project. For the three cohorts that have completed one, two, or three years of implementation, the MIS asked for the number of participants served in the previous year. Finally, for newly funded projects, the MIS asked for the number of participants projected to be served in the coming year. Each of these results is reported separately in Tables 10 and 11. The youth participants are further divided into youth served in in-school settings, those served in out-of-school settings, and those served in both settings. The most difficult group to quantify is the numbers of students served in schools as a result of participating in classrooms of ITEST teachers. In the 2010 MIS, analysis suggests that some project PIs included an estimate of the number of students in their teachers' classrooms, while other project PIs included only those students who were directly involved in ITEST projects. Therefore, we believe that the number of students reached via ITEST teachers is far greater than the numbers here indicate. Future MIS revisions will work to address this inconsistency in reporting.

Among *completed projects* (Cohort 4), 6 projects worked with youth in in-school settings, and 11 projects worked with youth in out-of-school settings; none of the projects in this cohort reported working with youth in both settings. Below are the *cumulative* numbers reported for these projects. The number of youth who participated in:

- In-school settings ranges from 30 to 2,000, and totals 6,080
- Out-of-school settings ranges from 74 to 907, and totals 3,190

Among *active projects* (Cohorts 5–7), 27 projects work with youth in in-school settings, 43 projects work with youth in out-of-school settings, and 13 projects work with youth in both settings. Below are the numbers of youth reported for the *previous project year*. The number of youth who participated in:

- In-school settings ranges from 5 to 5,600, and totals 17,276
- Out-of-school settings ranges from 8 to 907, and totals 5,048
- Both settings ranges from 16 to 173, and totals 1,006

Among *new projects* (Cohort 8), 6 projects work with youth in in-school settings, 5 projects work with youth in out-of-school settings, and 3 projects work with youth in both settings. Below are the anticipated totals for the *first project year*. The number of youth who will participate in:

- In-school settings ranges from 30 to 2,300, and totals 4,550
- Out-of-school settings ranges from 50 to 200, and totals 510
- Both settings ranges from 30 to 120, and totals 210

Not surprisingly, the mean number of youth served varies greatly between those focused on in-school settings and those focused on out-of-school settings. For projects in in-school settings, the mean ranges from 640 to 758 per year, while in out-of-school settings, the mean number served ranges from 102 to 117 youth per year. (Because the completed projects report on the life of the project, and some work with youth over multiple years, the mean number served is larger, but not necessarily three times that of the annual numbers). The larger mean served in in-school settings probably reflects working in multiple classrooms, and includes youth reached through teacher professional development.

Table 10. Number of youth served in ITEST projects 2010

		Number of projects	Total youth	Range	Mean youth per project (SD)
Among completed projects (C4), number of youth served over life of project (n=12)	In-school settings	6	6,080	30–2,000	1013.3 (876.6)
	Out-of-school settings	11	3,190	74–907	290.0 (257.3)
	Both settings	0	-	-	-
Among active projects (C5, C6, C7), number of youth served in previous year (n=60)	In-school settings	27	17,276	5–5600	639.9 (1030.6)
	Out-of-school settings	43	5,048	8–907	117.4 (178.1)
	Both settings	13	1,006	16–173	77.4 (55.7)
Among new projects (C8), number of youth projected to serve in first project year (n=10)	In-school settings	6	4,550	30–2,300	758.3 (829.8)
	Out-of-school settings	5	510	50–200	102.0 (59.3)
	Both settings	3	210	30–120	70.0 (45.8)

As noted above, the numbers of teacher participants were reported based on whether the project has completed its work, is still active, or has just started. Totals for teacher participants were not broken down by whether teachers participated in in-school and/or out-of-school settings.

- The 9 *completed projects* that provided *cumulative numbers* reported teacher totals that range from 5 to 90, with an overall total of 484. The mean number of teachers per project is 53.8.
- The 56 *active projects* that provided *previous-year numbers* reported teacher totals that range from 5 to 170, with an overall total of 1,501. The mean number of teachers per project is 26.8.
- The 8 *new projects* that provided *first-year projections* reported teacher totals that range from 2 to 45, with an overall total of 215. The mean number of teachers per project is 26.9.

As with the youth, the mean number of teachers served per year has remained fairly constant at 26–27 teachers per year.

Table 11. Number of teachers served in ITEST projects 2010

	Number of projects	Total teachers	Range	Mean teachers per project (SD)
Among completed projects (C4), number of teachers served over life of project (n=9)	9	484	5–90	53.8 (28.7)
Among active projects (C5, C6, C7), number of teachers served in previous year (n=56)	56	1,501	5–170	26.8 (25.7)
Among new projects (C8), number of teachers to serve in first project year (n=8)	8	215	2–45	26.9 (16.3)

Youth participants

ITEST projects, as part of their mission, target youth who have generally been underrepresented in the STEM fields. Tables 12 and 13 show the projects' target populations by race/ethnicity and other subgroups. In 2010, more than 80% of projects continue to target either African American or Hispanic students, or both. A smaller portion of projects target American Indians (49%) and Pacific Islanders (23%). These percentages are higher than the percentages reported in 2009 for all but African American and Hispanic youth.[3] No project exclusively targets Native Hawaiians, Alaska Natives, or Pacific Islanders. Three projects exclusively target American Indians.

Table 12. Number of projects targeting youth populations by race/ethnicity 2009 and 2010

	% of projects 2009 (n=85)	% of projects 2010 (n=81)
African American	84	85
Hispanics	83	85
American Indian	25	49
Pacific Islanders	13	23
Alaska Natives	7	20
Native Hawaiians	1	18

[3] The 2010 MIS added an option to the question, allowing respondents to say that they target a group but do not collect data on it. This may have contributed to the numbers of respondents who said they target youth who are American Indian, Pacific Islander, Alaska Native, or Native Hawaiians, although some projects also changed from not targeting at all to targeting and collecting data. Five projects which said they did not target these populations in 2009 said they target but do not collect data for each of the four following race/ethnicities: American Indian, Pacific Islander, Alaska Native, or Native Hawaiians. In addition, from 3 to 10 projects that said they did not target these populations in 2009 said they target and *do* collect data on them in 2010.

More than 80% of the projects target students who qualify for free/reduced price lunch, in sync with the ITEST mission to reach underrepresented groups (Table 13), and an increase from 2009. Ten projects are specifically designed to work with girls. The 22 projects working with students with disabilities (27%) and the 26 projects working with students participating in gifted/talented programs (32%) work with these groups as part of their overall population, rather than designing the projects to meet specific needs of the two groups.

Table 13. Number of projects targeting specific youth populations 2009 and 2010

	% of projects 2009 (n=85)	% of projects 2010 (n=81)
Students qualifying for free/reduced price lunch	73	82
English language learners (ELL)	34	48
Students with disabilities	23	27
Students participating in gifted/talented programs	16	32
Only girls	10	12

When asked to identify the various settings in which they work with students (Table 14), projects most frequently cited the following: 1- to 2-week summer sessions (64%), afterschool programs (53%), and in-school programs (51%). While nearly half of projects reported the use of short summer sessions with youth, only 21% indicated they hold summer sessions lasting more than two weeks.

Table 14. Formats of working with youth 2009 and 2010

	% projects 2009 (n=84)	% of projects 2010 (n=81)
Summer program: 1- to 2-week sessions	49	64
After school program	46	53
In-school program	45	51
Weekend program	32	38
Online/social networking	25	37
Distance learning	7	23
Summer program: more than 2 weeks per session	20	21
Youth employment/internship component	11	20
Other	6	2

ITEST projects face a number of barriers to youth participation (Table 15), with time being chief among them (56% of projects). Other barriers identified by projects include transportation, competing programs, resources, and students' other commitments.

Table 15. Number of projects identifying barriers to youth/student participation 2010 (n=81)

	# of projects	% of projects
Time	45	56
Other commitments	43	53
Transportation	42	52
Competing programs	37	46
Resources	27	33
Interest of participants	26	32
Peer pressure	18	22
Participant/family language barrier	18	22
Other	4	5

When asked how they addressed their barriers to youth participation, projects cited a number of strategies. To address time constrains, projects adjusted the times for scheduled activities or offered flexible options for attendance or activities. Many projects solved their problems with transportation by providing or coordinating transportation and carpooling. To attract and maintain students' interest, several projects also mentioned that they used engaging activities, offered incentives, or provided more support and resources. Only a few projects (4) stated that they had to scale back their recruitment efforts or reduce the number of youth participants from what was originally planned. Below are a few quotes in response to this question:

> "We provide stipends for those who deal with transportation challenges, have meetings with students and parents about the importance of committing to the full experience, keep parents informed about the program activities, solicit their support and integrate engaging activities to pique and support students' interests."

> "We provided after school and during school regular weekly clubs/sessions, provided food/snacks, provided coaching sessions and allotted specific full day times at the end of the project for the students to work solely on the project and nothing else."

> "We gave the participants more options when choosing their after school day because of competing programs/commitments. We allowed for makeup hours and posted projects online for teams to collaborate online. We raised additional funds for transportation to summer academies, but weekly transportation was an issue. We relied on volunteers, family members and friends to carpool."

Teacher participants

Of the 75 projects that reported working with teachers in 2010, 11 projects said they work exclusively with teachers, and 64 projects said they work with youth and teachers.

When asked to identify the various settings in which they work with teachers, projects most frequently cited summer programs (81%), professional development days during the academic year (55%), afterschool settings (53%), and summer youth institutes (53%). Between 2009

and 2010, the projects using social networking increased from 32% to 41%, and distance learning from 22% to 33% (Table 16).

Table 16. Formats of working with teachers 2009 and 2010

	% of projects 2009	% of projects 2010
Summer program	68	81
Professional development day(s) during the academic year	NA*	55
Academic year program – afterschool	44	53
Summer institute with youth participants	44	53
Academic year program – during school hours	NA*	52
Online social networking	32	41
Academic year program – Weekends	29	39
Distance learning	22	33
Other	34	9

*Not asked in 2009.

ITEST projects face a number of barriers to teacher participation, with time being chief among them (81% of projects). Additional barriers identified by projects include other commitments, competing programs, and curriculum constraints (Table 17).

Table 17. Number of projects identifying barriers to teacher participation 2010 (n=75)

	# of projects	% of projects
Time	61	81.3
Other commitments	57	76.0
Competing programs	43	57.3
Curriculum constraints	41	54.7
Budget cuts (loss of teachers, uncertainty of employment, reduced project funding)	36	48.0
Resources	27	36.0
Interest of participants	26	34.7
Transportation	17	22.7
Other	7	9.3

In response to the question about how they addressed these barriers, projects most often stated that they were flexible with program requirements, offered more support or resources, and adjusted the time for scheduled activities. Several projects also mentioned that they made explicit connections to content standards. Only a couple of projects (2) stated that they scaled back recruitment or reduced the number of teacher participants in response to the barriers that they face. A sample of responses is included below:

> "We always try to make the project fit within standards and curriculum that teachers already are responsible for. We stress not creating add-ons, but finding new and

exciting way[s] to teach what teachers have to teach. We often times arrange and pay for special travel arrangements such as lodgings, water taxis, etc."

"[We] tried to accommodate needs of teachers and be flexible in time spent during summer program and during academic year; provided resources for schools in need; tried to be flexible in when and how the project was incorporated in the schools (class or club setting)."

"Developing extra curriculum materials and allowing for a variety of implementation methods. Conducting PD sessions in which teachers who had successfully implemented shared best practices and advice with those having issues. Classroom visits by project staff, and occasionally meetings with school administration."

"We personalized our communication to recruit, worked with administrators and district office personnel to partner and support teachers. We offered incentives, resources, materials and flexibility for participants. Our program integrates into regular standards-based curriculum and engages learners. We recruited additional partners to provide teachers access to equipment, resources and incentives. We offered classroom support and technical advice."

Dissemination

The most common target audience for dissemination in both 2009 and 2010 was educators (82% and 94%). However, the percentage of projects identifying a broad range of target audiences increased from 2009 to 2010. In 2010, more than 50% of projects identified target audiences of researchers, youth, the public, and parents in addition to educators (Table 18).

Table 18. Target audience of dissemination 2009 and 2010

	% projects 2009 (n=88)	% projects 2010 (n=92)
Educators	82	94
Researchers	53	74
Youth	48	71
Public	38	61
Parents	40	54
IT/STEM Industry professionals	NA	46
Policymakers	35	45

*Not asked in 2009.
** A breakdown by cohort can be found in Appendix A, Table A3.

Tables 19, 20, and 21 include only those projects that are currently implementing activities (Cohorts 5, 6, and 7). They do not include the 11 newly funded projects that have not yet begun to work with participants or the 14 projects that have completed their projects. As shown in Table 19, there has been a general increase in the percentages of projects for all dissemination activities. Whether this is because projects actually did more dissemination in 2010 than in 2009, or only because they are reporting differently, is not clear.

Table 19. Dissemination activities of active projects 2009 and 2010

	% active projects 2009 (n=64)	% active projects 2010 (n=70)
Website	81	84
Media (newspaper, TV, video, radio)	33	67
Invited presentations	39	63
Meetings/topical convenings	28	60
Social networking	23	44
Journal articles	28	36
Blogs	22	27
Book chapters	11	14
Books	2	6
Other	6	14

* A breakdown by cohort can be found in Appendix A, Table A4.

The actual dissemination products that have been produced also increased from 2009 to 2010 (Table 20). While curriculum and instructional materials were the most common dissemination products in both years, there was an increase in the percentage of instruments produced, from 48% in 2009 to 77% in 2010.

Table 20. Dissemination products produced by active projects 2009 and 2010

	% active projects 2009 (n=64)	% active projects 2010 (n=70)
Curriculum/instructional materials	69	80
Instruments (e.g., to assess interest, engagement, persistence, motivation, skills, knowledge of dispositions)	48	77
Professional development materials/teacher training, etc.	58	71
Evaluation strategies	31	59
Implementation models	27	49
Research findings	33	47
Videos	31	39
Theoretical constructs	8	29
Software	20	27
Virtual environments	5	21
Technology designs	6	20
Games	23	19
Textbooks	2	0
Other	5	7

* A breakdown by cohort can be found in Appendix A, Table A5.

The 2010 MIS included a number of new items, one of which was to gather information about conference presentations. As can be seen in Table 21, ITEST PIs present at many different

conferences. Besides the conferences listed in the table, 44 PIs presented at conferences not listed in the table. In addition, 40% of PIs presented at least once with another ITEST project, indicating a high level of collaboration across projects.

Table 21. Number and percentage of projects presenting at conferences 2010

	Frequency	Percent
National Science Teachers Association (NSTA)	33	35
American Educational Research Association (AERA)	26	27
Society for Information Technology and Teacher Education (SITE)	25	26
International Society for Technology in Education (ISTE)	21	22
American Evaluation Association (AEA)	8	8
Association for Science Teacher Education (ASTE)	7	7
International Technology and Engineering Educators Association (ITEEA)	6	6
American Society for Engineering Education (ASEE)	5	5
Association of Science-Technology Centers (ASTC)	5	5
National AftersSchool Association (NAA)	5	5
League for Innovation Science, Technology, Engineering and Math (STEMtech)	5	5
Serious Games	3	3
National Education Association (NEA)	1	1

*Forty-four projects (46%) presented at conferences not in this table.
** A breakdown by cohort can be found in Appendix A, Table A6.

Project research and evaluation

One section of the MIS focused on the way in which projects are measuring changes in youth interest in STEM and/or STEM careers. In this report, we include results about changes in youth interest in STEM. Of the 95 projects that completed the MIS, 85 projects affirmed that they will measure, or are measuring, changes in youth interest in STEM and/or STEM careers. Table 22 shows the study designs that projects are using. Projects were allowed to choose as many designs as were applicable. More than 50% of projects use some form of mixed methods, while 6 projects are using experimental design, and 30 projects are using quasi-experimental design.

Table 22. Study design used to measure changes in student interest in STEM and/or STEM careers 2010 (n=85)

	# of projects	% of projects
Mixed methods	46	54
Qualitative, no comparison group	45	53
Quantitative, no comparison group	43	51
Quasi-experimental (with comparison group)	30	35
Experimental	6	7
Qualitative, comparison group	6	7
Other	3	4

Of the 85 projects, 28 projects reported outcomes on the MIS; the rest are currently in the data collection phase, have not yet begun to collect data, or do not collect data in the format requested for the MIS. Because ITEST projects work with youth in many different ways, they also collect data in many different ways. The MIS questions and responses are at best an approximation of the actual outcomes in each project. We present the findings here while reminding readers they represent data from only 28 projects, which is only a third of the 85 projects that measure or will measure changes in youth interest in STEM. Furthermore, since the data are collected in many different formats, combining results across projects must be done cautiously.

As shown in Table 23, 49% of youth across the 28 projects demonstrated an increase in STEM interest in the previous year, 44% showed no change, and only 7% showed a decrease in STEM interest.

Table 23. Increases in STEM interest across active and recently completed ITEST projects as of Fall 2010 (n=28 projects)

	Cohort 4	Cohort 5	Cohort 6	Cohort 7	Total
Number of projects reporting on impact question of STEM interest	6	10	9	3	28
Number of projects demonstrating increase in STEM interest	6	10	9	3	28
Number of projects with more than 50% of students demonstrating increase in STEM interest	3	8	4	1	16
Total participants in projects measuring STEM interest	743	2,452	1,424	275	4,894
Total participants demonstrating increase in STEM interest	478	1,141	668	112	2,399
Percent of participants in all projects demonstrating increase in STEM interest*	64.3	46.5	46.9	40.7	49.0
Average percent increase in STEM interest across all projects reporting**	47.4	64.5	44.2	66.8	54.6

*Denominator = total participants in the 28 projects reporting data.

**Denominator = 28, the number of projects reporting data.

While only 28 projects were able to report on the specific outcome of youth changes in STEM interest, many more projects are increasing the amount of research and evaluation in their projects. As noted earlier, 85 projects measure or will measure changes in youth interest in STEM and/or STEM careers. Of those, 72 projects plan to measure the statistical significance of their findings. Forty-one projects are using a scale developed through statistical procedures to measure youth changes in STEM and/or STEM career interest.

Table 24 describes the youth outcomes that the projects targeted in 2009 and 2010. Notable changes took place between 2009 and 2010, particularly an increase in the percentage of projects targeting the two most common youth outcomes of changes in interest in STEM and STEM careers.

Table 24. Targeted youth outcomes 2009 and 2010

	% of projects 2009 (n=85)	% of projects 2010 (n=81)
Changes in youth interest in STEM	81	96
Changes in youth interest in STEM careers	75	90
Changes in youth STEM content knowledge	74	75
Changes in youth engagement in STEM	59	74
Changes in youth skills applying STEM concepts	48	68
Changes in youth skills using technology tools	64	66
Changes in youth knowledge of STEM careers, preparation, and/or workplace demands	58	62
Changes in youth participation in STEM-related activities	41	61
Changes in youth ways of thinking and problem solving	NA	56
Changes in youth preparation for STEM careers (technical training related to a specific career)	22	40
Youth entry into STEM career paths	16	19
Other	12	4
We have not collected data yet	–	4
Does not apply	–	3

NA=Not asked in 2009

* A breakdown by cohort can be found in Appendix A, Table A7.

Table 25 shows the target teacher outcomes of ITEST projects in 2009 and 2010. The most common outcome in both years is changes in teacher practice and/or pedagogy, reflecting the concrete desires of ITEST project teams to see direct changes in classroom practice.

Table 25. Targeted teacher outcomes 2009 and 2010

	% of projects 2009 (n=69)	% of projects 2010 (n=75)
Changes in teacher practice/pedagogy	59	68
Changes in teacher STEM content knowledge	49	59
Changes in teacher knowledge of how to use cyberinfrastructure/technology tools in STEM teaching	55	55
Changes in teacher implementation of ITEST materials	48	53
Changes in teacher use of cyberinfrastructure/ technology tools	48	52
Changes in teacher knowledge of STEM career information and/or workplace demands	43	44
Does not apply	–	11
Other (includes self-efficacy, attitudes toward technology, perceptions regarding STEM teaching)	15	9
We have not collected data yet	–	8

* A breakdown by cohort can be found in Appendix A, Table A8.

Table 26 shows the different data collection methods used to measure youth outcomes. Percentages of reported data collection methods have generally increased from 2009 to 2010. Pre- and post-assessments of both attitudes and skills are still among the most common data

collection methods, used by 75% to 85% of projects. Interestingly, observations are now as common as pre- and post-assessments of youth content skills.

Table 26. Data collection methods for youth 2009 and 2010

	% of projects 2009 (n=85)	% of projects 2010 (n=81)
Pre-assessment of youth attitudes	79	85
Post-assessment of youth attitudes	78	85
ITEST project observations (summer institutes, youth activities)	62	78
Post-assessment of youth content/skills	70	77
Pre-assessment of youth content/skills	71	75
Performance-based assessments	31	49
Student/youth interviews	45	49
Youth focus groups	39	46
Embedded assessments	29	44
Youth self-reports (journals)	25	43
Youth Web-based data (blogging, e-mails, posts)	28	38
Other	13	16
Does not apply	-	2.5
We have not collected data yet	-	2.5

* A breakdown by cohort can be found in Appendix A, Table A9.

As for the youth, the most common forms of data collection for teachers are pre- and post-assessments of content and attitudes and observations (Table 27). In general, projects use more data collection methods in their work with youth than with teachers.

Table 27. Data collection methods for teachers 2009 and 2010

	% of projects 2009 (n=71)	% of projects 2010 (n=75)
Post-assessment of teacher content/skills	56	71
Pre-assessment of teacher content/skills	59	69
ITEST project observations (summer institutes)	NA	69
Post-assessment of teacher attitudes	54	67
Pre-assessment of teacher attitudes	59	63
Teacher interviews	45	61
Teacher focus groups	45	49
Classroom observations	45	49
Teacher survey of implementation practices	NA	49
Teacher Web-based data (blogging, e-mails, posts)	31	45
Teacher self-reports (journals)	31	43
Embedded assessments	NA	24
Other	17	9

Does not apply	–	5
We have not collected data yet	–	3

* A breakdown by cohort can be found in Appendix A, Table A10.

Twelve projects (8 research, 1 strategies, and 3 scale-up) provided their research questions in an optional open response item (Table 28). The questions fall into three categories: (1) measuring the impact of the intervention on teacher participants, (2) measuring the impact of the intervention on youth participants, and (3) describing intervention characteristics. Not surprisingly, the majority of the questions focus on the impact on youth participants; however, the intermediary outcomes of impacts on teachers and the descriptive questions about intervention characteristics are also important areas of focus for the projects.

Table 28. Research question topics for 12 ITEST projects 2010

Impact of intervention on teacher participants
Confidence in implementing curriculum
Teacher ability to meet needs of diverse learners
Teacher ability to engage students in learning and research
Implementation of innovative applications of technology in classroom
Impact of intervention on youth
STEM interest
STEM career interest
STEM coursetaking in HS
Student engagement
Entry into STEM workforce
College readiness
Student content skills
Student inquiry skills
Motivation
Computer interest
Use of technology-based STEM tools
STEM coursetaking post-secondary/college matriculation
Impact on student learning
Intervention characteristics
Identifying best dosage of intervention for youth outcome
Identifying best inquiry activities to promote 21st century skills
Measuring fidelity of intervention by teachers

Conclusion

The response rate for the MIS continues to be strong, with 80% of PIs completing the MIS in each of the two years that the survey has been administered. Of eligible projects, 68% have completed both years; the longitudinal data collected are an important source of information about ITEST projects.

The information in this report provides a snapshot of active ITEST projects in 2010 as well as a comparison with 2009 results. The report shows the consistency in ITEST project participants and activities, as well as some shifts in focus. The five most commonly used technologies in both years are the same (visualization and computer modeling tools, programming tools, data analysis and computation tools, multimedia tools, and communication tools), although the order has changed. Other notable changes include the increase in the percentage of projects using hand-held devices and imaging technologies, and the drop in the percentage of projects using game development and geospatial technologies. A comparison between the technology skills reported in 2009 and 2010 reveals that skills most frequently cited in both years remain similar; these skills include computing and data analysis, visualization and modeling, and computational thinking. Interestingly, while the development of social networking skills was identified as a target skill by fewer projects in 2010 than in 2009, it was identified by more projects as a tool for working with both youth and teachers, indicating that social networking has been integrated into project designs rather than presented as an isolated tool.

The 2010 MIS collected more information about project dissemination and research and evaluation practices. When asked about dissemination, more than 50% of projects in 2010 identified target audiences of educators, researchers, youth, the public, and parents. More than 200 conference presentations were given in 2010; of those, 40% of PIs presented at least once with another ITEST project, indicating a high level of collaboration across projects. The data reveal that the great majority of ITEST projects are measuring project impact on youth interest in STEM and STEM careers, and that rigorous methods are being employed, ranging from qualitative studies to experimental design.

The initial development of the MIS incorporated feedback from many different stakeholders at every stage of the process: ITEST PIs, evaluators, NSF program officers, and others developing similar systems. This second round of data collection has provided more accurate results compared to the previous year, though room remains for improvement. Feedback on this report, together with ongoing feedback that we have been collecting during the data collection process, will be used to revise the MIS for the next round of data collection. Revisions for 2011 will consider ways to increase participation, improve the online interface, and improve data accuracy.

Appendix A. Findings by Cohort

Table A1. Primary focus area of ITEST projects by cohort (2010)

	Cohort 4	Cohort 5	Cohort 6	Cohort 7	Cohort 8	Total
Bioscience	1	2	3	2	1	9
Computer science – programming & other	5	6	7	3	2	23
Computer science – gaming & simulations	3	1	6	3	0	13
Engineering	3	5	8	6	2	24
Environmental science	2	6	5	4	4	21
Mathematics	0	0	0	2	1	3
Convening	na	na	0	0	1	1
Research	na	na	1	0	0	1
Total	14	20	30	20	11	95

Table A2. Grade spans served in ITEST projects by cohort (2010) (n=92)*

	Cohort 4	Cohort 5	Cohort 6	Cohort 7	Cohort 8	Total
K–2	0	0	0	2	0	2
3–5	1	3	2	4	1	11
6–8	11	14	19	7	8	59
9–12	11	17	18	17	4	67

*Does not include two projects that don't work directly with any population.
Total is more than 92 because some projects work with more than one grade span.

Table A3. Target audience of dissemination by cohort (2010) (n=95)

	Cohort 4	Cohort 5	Cohort 6	Cohort 7	Cohort 8	Total
Educators	13	19	27	19	11	89
Researchers	10	16	23	11	10	70
Policymakers	5	8	17	7	6	43
IT/STEM industry professionals	4	10	15	10	5	44
General public	11	14	17	11	5	58
Parents	7	13	14	11	6	51
Youth	10	14	20	15	8	67
Other	1	0	1	1	0	3

Table A4. Dissemination activities of active projects 2010 by cohort

	Cohort 5 (n=20)	Cohort 6 (n=30)	Cohort 7 (n=20)
Journal articles	8	14	3
Website	20	26	13
Book chapters	5	4	1
Books	2	2	0
Invited presentations	15	19	10
Media (newspaper, TV, video, radio)	14	21	12
Meetings/topical convenings	12	21	9
Blogs	6	8	5
Social networking	13	11	7
Other	3	6	1
Total	98	132	61
Average per project	4.9	4.4	3.05

*Only cohorts that reported on one year of activities.

Table A5. Dissemination products produced by active projects by cohort (2010)

	Cohort 5 (n=20)	Cohort 6 (n=30)	Cohort 7 (n=20)
Software	7	8	4
Curriculum/instructional materials	17	25	14
Games	3	9	1
Professional development materials, teacher training, etc.	14	23	13
Instruments (e.g., to assess interest, engagement, persistence, motivation, skills, knowledge of dispositions)	15	24	15
Implementation models	10	17	7
Theoretical constructs	9	10	1
Videos	9	11	7
Research findings	14	17	2
Technology designs	4	7	3
Virtual environments	3	9	3
Evaluation strategies	13	17	11
Other	1	0	4
Total	119	177	85
Average per project	5.95	5.9	4.25

*Only cohorts that reported on one year of activities.

Table A6. Number of projects presenting at conferences by cohort (2010)

	Cohort 5	Cohort 6	Cohort 7
American Evaluation Association (AEA)	2	3	1
American Educational Research Association (AERA)	6	9	2
American Society for Engineering Education (ASEE)	1	1	1
Association for Science Teacher Education (ASTE)	1	2	0
Association of Science-Technology Centers (ASTC)	0	1	1
International Society for Technology in Education (ISTE)	0	7	2
International Technology and Engineering Educators Association (ITEEA)	0	1	1
National Afterschool Association (NAA)	0	1	2
National Education Association (NEA)	0	1	0
National Science Teachers Association (NSTA)	9	9	4
Serious Games	0	2	1
Society for Information Technology and Teacher Education (SITE)	4	9	2
League for Innovation Science, Technology, Engineering and Math (STEMtech)	0	2	1
Other	9	17	5
Total	32	65	23
Average conferences per project	1.6	2.2	1.2

*Only cohorts that reported on one year of activities.

Table A7. Targeted youth outcomes by cohort (2010)

	Cohort 4 (n=12)	Cohort 5 (n=19)	Cohort 6 (n=27)	Cohort 7 (n=14)	Cohort 8 (n=9)	Total (n=81)
Changes in youth participation in STEM-related activities	7	13	16	5	8	49
Changes in youth interest in STEM	12	19	25	13	9	78
Changes in youth engagement in STEM	9	15	18	9	9	60
Changes in youth STEM content knowledge	10	16	16	11	8	61
Changes in youth knowledge of STEM careers, preparation and/or workplace demands	5	14	16	8	7	50
Changes in youth interest in STEM careers	11	18	24	11	9	73
Changes in youth skills using	10	15	14	6	8	53

technology tools						
Changes in youth skills applying science, technology, engineering and/or math concepts	8	15	16	8	8	55
Changes in youth ways of thinking and problem solving	5	14	13	5	8	45
Changes in youth preparation for STEM careers (technical/scientific training related to a specific career)	3	11	10	3	5	32
Youth entry into STEM career paths	4	6	1	1	3	15
Other	0	1	0	0	2	3
Does not apply	0	0	1	1	0	2
We have not collected data yet	-	1	1	1	-	3

Table A8. Target teacher outcomes by cohort (2010)

	Cohort 4 (n=10)	Cohort 5 (n=17)	Cohort 6 (n=24)	Cohort 7 (n=16)	Cohort 8 (n=8)	Total (n=75)
Changes in teacher implementation of ITEST materials	5	10	12	6	7	40
Changes in teacher knowledge of how to use cyberinfrastructure and/or technology tools in the context of STEM teaching	4	12	12	7	6	41
Changes in teacher use of cyberinfrastructure/technology tools	5	11	11	6	6	39
Changes in teacher STEM content knowledge	6	10	13	8	7	44
Changes in teacher practice/pedagogy	7	14	16	7	7	51
Changes in teacher knowledge of STEM career information and/or workplace demands	5	5	12	6	5	33
Other	0	1	2	2	2	7
Does not apply	0	1	4	2	1	8
We have not collected data yet	-	1	0	5	-	6

Table A9. Data collection methods for youth by cohort (2010)

	Cohort 4 (n=12)	Cohort 5 (n=19)	Cohort 6 (n=27)	Cohort 7 (n=14)	Cohort 8 (n=9)	Total (n=81)
Pre-assessment of youth content/skills	11	18	19	5	8	61
Post-assessment of youth content/skills	11	18	19	6	8	62
Pre-assessment of youth attitudes	12	16	22	10	9	69
Post-assessment of youth attitudes	12	16	22	10	9	69
Youth focus groups	6	9	11	7	4	37
ITEST project observations (summer institutes, youth activities)	11	17	18	9	8	63
Youth Web-based data (blogging, emails, posts)	5	10	6	5	5	31
Youth self-reports (journals)	7	9	9	5	5	35
Performance-based assessments	6	13	10	4	7	40
Embedded assessments	5	11	10	2	8	36
Student/youth interviews	8	12	11	3	6	40
Other	0	2	5	2	4	13
Does not apply	0	0	1	1	0	2
We have not collected data yet	-	1	1	0	-	2

Table A10. Data collection methods for teachers by cohort (2010)

	Cohort 4 (n=10)	Cohort 5 (n=17)	Cohort 6 (n=24)	Cohort 7 (n=16)	Cohort 8 (n=8)	Total (n=75)
Pre-assessment of teacher content/skills	6	13	18	9	6	52
Post-assessment of teacher content/skills	7	13	18	9	6	53
Pre-assessment of teacher attitudes	9	11	14	6	7	47
Post-assessment of teacher attitudes	9	12	15	7	7	50
ITEST project observations (summer institutes, youth activities)	8	15	14	8	7	52
Teacher focus groups	3	9	15	4	6	37
Classroom observations	6	9	12	5	5	37

Teacher self-reports (journals)	4	9	10	4	5	32
Teacher Web-based data (blogging, emails, posts)	6	7	10	6	5	34
Teacher interviews	6	10	15	8	7	46
Embedded assessments	1	8	1	3	5	18
Other	0	2	3	2	0	7
Does not apply	0	1	1	2	0	4
We have not collected data yet	-	0	0	2	-	2