ISTE Classroom Observation Tool: ICOT v3.1 User Manual

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ISTE Research & Evaluation
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This manual provides basic information on the ISTE Classroom Observation Tool. Use it to get started using the ICOT or to find out if this tool will meet your needs. The ICOT is available at:
http://nets-assessment.iste.wikispaces.net/ICOT+v3.1

About the ICOT

The ISTE Classroom Observation Tool is a computer-based rubric designed to help observers assess the nature and extent of technology integration. It was developed originally for use in program evaluations by ISTE's Research and Evaluation department, but it has other applications. It can be used by administrators for needs assessment, by technology coordinators to assess the effects of professional development, by lesson study groups to gauge changes in pedagogy, or by individual teachers for reflective practice.
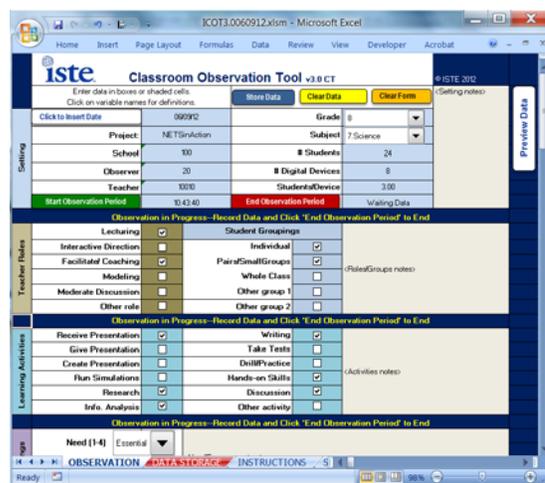
ICOT Assumptions

- Technology integration involves the routine use of digital tools to perform useful work.

- By this definition, technology integration is a function of variety of tasks, frequency of technology use, duration of technology use, and task-appropriateness.

- Technology can be integrated into a variety of instructional approaches and learning activities (e.g., constructivist and direct-instruction approaches are not inherently better or worse in relation to technology integration).

- The NETS for Students provide the best available general framework for effective technology integration.

- The NETS indicators are addressed by teachers creating learning experiences that encourage or require students to use technology appropriately.

History

The ICOT was created in 2008 with funding from the Hewlett-Packard Company. The ICOT was based on a number of classroom observation instruments used in ISTE evaluations dating to 1999. With input from teachers and members of the ISTE NETS team, the ICOT put observation data collection into an electronic format optimized for tablet PCs.

The original ICOT emphasized the *NETS Standards for Teachers, First Edition* (2000). Since 2010, the ICOT has focused on the *NETS Standards for Students, Second Edition* (2007). ICOT v1.0 was programmed in Adobe AIR, required downloading both the application and Adobe AIR, stored its data on an ISTE server, and required each observation to be stored as a separate file. Versions 2.x and following have been based on Microsoft Excel. The ICOT is simply an Excel workbook. Excel tools and macros are used to automate functions. The ICOT workbook is compatible with Excel on PC's and on Macintosh computers running Office 2011. Using third-party software, ICOT rubrics can also be used with small mobile devices such as Apple iPads and Apple or Android smart phones. The development version of the ICOT is available through ISTE's NETS Assessment wiki at http://nets-assessment.iste.wikispaces.net/ICOT+v3.1. If the version has gone through field testing, it will also be available through the ISTE web site at http://www.iste.org/icot.

Changes in ICOT v3.1

- In addition to the NETS for Students, ICOT now includes the Operational Definition of Computational Thinking (http://www.iste.org/learn/computational-thinking.aspx).
- Grade levels have been extended to include adult learning.
- ICOT now continually tracks the duration of classroom events in the background. Duration is reported as percent of the total observation time.
- While the original ICOT only tracked the overall duration of technology use, v3.1 now times the duration of each classroom characteristic and type of technology use.
- The standards checklists have been expanded. Instead of simply marking "present/absent," observers can distinguish between standards that are addressed versus those that are achieved. The distinctions are explained under **Definitions** on page 10.

Security Risk

You have to enable macros to use the ICOT, and that presents a **security risk**. Macros are an easy way for hackers to add malicious code to a file. **Disable macros** when not using ICOT. (Office Button/Excel Options/Trust Center/Settings/Macro Settings). Know where your ICOT comes from to ensure that no one has tampered with it. If you suspect your ICOT may have been compromised, save the data as plain text, discard the ICOT workbook, and contact icot@iste.org for a new copy.

Problems and Bugs

The Excel platform allows the ICOT to be opened on most computers running Microsoft Office. It allows users to modify the instrument. However, this low-cost solution has some drawbacks. The appearance of Excel objects can vary from machine to machine. Buttons may not align precisely with their labels or the cells they control. If the object displacement is great enough to

cause data entry errors, users should activate the **Developer** menu in Excel and use the mouse and arrow keys to nudge objects or change row and column sizes.

Another thing to remember is that the usual Excel operations apply. For example:

- If you are entering text in an ICOT Notes cell, you must press Enter or Escape to complete the operation before using other Excel or ICOT controls.

- If you have clicked on a cell, any typing will replace the cell contents. If you find you have inadvertently overwritten a formula or label that ICOT needs, type Ctrl-Z until you return to the state before you made the change. If your ICOT file becomes corrupted for any reason, save your data as text and download a new copy.

Many of the changes in the ICOT arise from user feedback. If you encounter bugs or have suggestions, there are two options for input:

- **Email** icot@iste.org
- Join the **NETS Assessment** wiki at http://nets-assessment.iste.wikispaces.net/

ISTE encourages users to use the NETS Assessment wiki so that their comments can be shared.

Recording ICOT Data

We describe the ICOT from top to bottom as it appears on the screen. Except for the start and end times, you can enter data in any order and leave out any sections you don't need.

Control Buttons
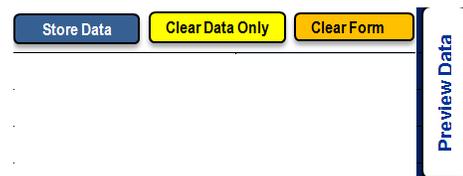
The first buttons you come to are actually the last ones you use. When you have completed an observation, click **End Observation Period**, and then **Store Data**.

| Store Data | Clear Data Only | Clear Form | Preview Data |

Store Data writes your observation onto a single line of the **Data Storage** worksheet. To see what **Store Data** is working with, click **Preview Data.** ICOT writes all its data twice. During the observation, it stores information as you collect it in hidden columns on the **Observation** worksheet. These hidden cells are used as variables in various calculations. The **Store Data** button then writes all the data and calculation results to **Data Storage**. ICOT stores each observation as a new line **Data Storage**, so you can have all observations for one day or one project on a single sheet. (You could collect all observations you ever make on the same sheet, but don't do that. Regularly save your data to storage files in Excel or your favorite statistical package for safekeeping in the event of a computer crash, virus infection, or other catastrophe.)

After—and only after—your data are copied to **Data Storage**, click **Clear Form** to reset ICOT for the next observation. ICOT will make you confirm that your data is stored before letting you clear the form. **Clear Form** is also useful if you inadvertantly erase or otherwise corrupt a formula or label in ICOT. It not only clears the current temporary data, but it refreshes all the permanent labels and formulas. It can't recover from every error, but it goes a long way.

In some cases, you may be conducting multiple observations in the same classroom. In that case, you do not need to re-enter all the classroom information. Use **Clear Data Only** to leave the Setting information intact. The data fields will be cleared, along with the Start and End times. Just click **Start Observation Period** to begin the next observation in the same setting.

Setting

This section is usually filled out before the observation period, but you can fill in or edit the data any time after clicking **Start Observation**.

Clicking **Insert Date** does just that. You can also manually enter the date.

Grade and **Subject** are pull-down menus (shown at right). If the choices are not sufficient, use the **Setting Notes** field to add additional description.

The **Project/School/Observer/Teacher** buttons are self-explanatory. Observers should agree on names or codes entered here. Remember that Excel and statistical packages will treat "Ajax Elementary School," "Ajax Elem.," and "AES" as three different schools.

Enter the numbers of **Students** and **Digital devices** (computers, probes, etc.) as numerals ("5," not "five"). ICOT will calculate the technology density (students per device) in the next field.

Start Observation Period puts the current time into the field to its right. You can also enter the time manually. Buttons in the rest of the form will not permit data entry as long as the "Waiting Data" message is displayed. You have to enter a start time.

End Observation Period will put the current time into the adjacent field. ICOT won't let you Store Data if it finds "Waiting Data" message in this field. This button also signals all other running timers to record their final values and turn off.

Teacher Roles, Student Groupings, Learning Activities

See the **Definitions** section for how to interpret these attributes. Check an attribute any time it occurs in the period. *Uncheck* the box if the attribute is no longer present. ICOT calculates the percent of the class period that each attribute is present.

If you **check a box by mistake**, immediately click it again to clear the check. During analysis, it is easy to screen out any attributes with durations of only a second or two. If you **forget to check or uncheck a box** during an observation, make a note in the Roles and Settings Notes field. We'll talk about how to manually enter corrections in the **Analysis** section on page 7.

Need/Engagement Ratings

See the **Definitions** section for criteria guidelines. **Need** is rated on a four-point scale (Less useful than alternatives /

As useful as alternatives / More useful than alternatives / Essential), with the options selected from a pull-down. **Engagement** percent is calculated by ICOT once you enter the number (numeral, not text) of students who are off-task. This section almost always benefits from some notes about how the observer made the decisions.

Technology Use

Technologies used by students and teachers are recorded with the same kinds of check boxes as other attributes, but ICOT does a little more with data. These buttons also keep a tally of the overall proportion of each period *any* technology is in use. This makes v3.1 data comparable to output from earlier versions.

Hardware used by:	Teacher	Students	Software used by	Teacher	Students
Calculator	☐	☐	Data Analysis	☐	☐
Computer	☐	☐	Email/Chat	☐	☐
Digital Camera	☐	☐	Drill/Test	☐	☐
Digital Sensors/GPS	☐	☐	Graphics	☐	☐
Interactive White Board	☐	☐	Learn. Mgt System	☐	☐
Presentation System	☐	☐	Outline/Concpt Map	☐	☐
Response System	☐	☐	Multimedia Editor	☐	☐
Handheld/Smartphone	☐	☐	Simulation	☐	☐
Interactive Videoconf	☐	☐	Text Editor	☐	☐
Other HW1	☐	☐	Web Browser	☐	☐
Other HW2	☐	☐	Other SW	☐	☐

(Technologies Used)

NETS for Students / Computational Thinking

NETS-S and/or Computational Thinking (CT) are important frameworks for 21st-century skills in a variety of educational contexts. ICOT v3.0 allows observers to rate each NETS indicator as Absent (No Entry), Addressed, or Met. The criteria for marking this section are discussed in the **Definitions** section.

NETS and CT attributes are not timed. Mark the highest level of an attribute exhibited during the observation, regardless of its duration.

	NETS for Students	Level	Computational Thinking	
1. Creativity	1a. apply knowledge to generate new ideas.	No Ent ▼	Formulating problems in a way that enables us to use a computer and other tools to help solve them.	No Ent ▼
	1b. create original works ...	No Ent ▼		
	1c. use models and simulations to explore ...	No Ent ▼		
	1d. identify trends and forecast possibilities	No Ent ▼		
2. Communication	2a. collaborate ... (using) ..digital environments…	No Ent ▼	Logically organizing and analyzing data	No Ent ▼
	2b. communicate (to) ... audiences ...	No Ent ▼		
	2c. develop cultural/global awareness...	No Ent ▼		
	2d. contribute to project teams	No Ent ▼		
3. Info. fluency	3a. plan strategies to guide inquiry	No Ent ▼	Representing data through abstractions such as models and simulations	No Ent ▼
	3b. locate, organize, analyze, ... synthesize info....	No Ent ▼		
	3c. select information sources / digital tools	No Ent ▼		
	3d. process data and report results	No Ent ▼		
4. Thinking	4a. identify authentic problems / questions	No Ent ▼	Automating solutions through algorithmic thinking (a series of ordered steps)	No Ent ▼
	4b. plan/manage activities to develop solution(s)...	No Ent ▼		
	4c. collect and analyze data	No Ent ▼		
	4d. ... explore alternative solutions	No Ent ▼		
5. Citizenship	5a. responsible use of information/technology	No Ent ▼	Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of of steps and resources	No Ent ▼
	5b. positive attitude toward technology	No Ent ▼		
	5c. demonstrate responsibility for learning	No Ent ▼		
	5d. exhibit leadership for digital citizenship	No Ent ▼		
6. Tech. Ops.	6a. understand and use technology systems	No Ent ▼	Generalizing and transferring this problem solving process to a wide variety of problems	No Ent ▼
	6b. select and use applications	No Ent ▼		
	6c. troubleshoot systems and applications	No Ent ▼		
	6d. transfer knowledge to new technologies	No Ent ▼		

Analysis

After conducting a number of evaluations, your **Data Storage** worksheet will look something like the table below:

Seq	Date	Project:	School	Observer	Teacher	Grade	Subject	NoStuds	NoDevices	Density	Start	End	Duration
1	10/01/12	NETSinAction	100	AC	10010	7	4	24	30	0.80	8:03:34	8:43:31	0:39:57
2	10/01/12	NETSinAction	100	AC	10012	8	4	28	5	5.60	9:13:20	9:51:07	0:37:47
3	10/01/12	NETSinAction	100	AC	10020	8	4	24	16	1.50	10:10:00	10:52:12	0:42:12
4	10/01/12	NETSinAction	100	AC	10015	7	4	27	30	0.90	10:55:00	11:31:27	0:36:27
5	10/02/12	NETSinAction	200	AC	20010	7	4	28	16	1.75	9:03:00	9:45:07	0:42:07
6	10/02/12	NETSinAction	200	AC	20013	8	4	27	24	1.13	10:05:00	10:47:33	0:42:33

Several data types are present in the table, including text, dates, and times. **Teacher Roles, Student Groupings, Learning Activities**, and **Technologies Used** will appear as decimals for the proportion of time each attribute was present during the period. **Engagement** will also be decimal for the proportion of students engaged. **Need** will be a rating from 1-4), and the **NETS** and **CT** will appear as rating 0 (absent), 1 (addressed), 2 (met).

The many ways to use evaluation data are beyond the scope of these instructions, but analyses that ISTE's Research & Evaluation team regularly performs with ICOT data include:

- Descriptive Statistics: What percentage of observations use each type of student grouping? What NETS are most likely to be addressed.

- Cross Tabulations: Are teachers in a particular grade more likely to have students meet certain NETS?

- Correlations: Is the amount of time students spend using technology related to the amount of time they spend in certain types of learning activities? Is the level of student engagement related to the level of technology's contribution to the lesson?

These analyses can be conducted without too much trouble within Excel. Copy the **Data Storage** worksheet to its own file so that you can back it up and edit it without losing your original data. This is where you can proofread comments, delete aborted observations, and correct recording errors that you documented in the notes during an observation.The spreadsheet below shows how an observer might summarize the above data within Excel:

Project:	School	Observer	Teacher	Grade	Subject	NoStuds	NoDevices	Density	Start	End	Duration
NETSinAction	100	AC	10010	7	4	24	30	0.80	8:03:34	8:43:31	0:39:57
NETSinAction	100	AC	10012	8	4	28	5	5.60	9:13:20	9:51:07	0:37:47
NETSinAction	100	AC	10020	8	4	24	16	1.50	10:10:00	10:52:12	0:42:12
NETSinAction	100	AC	10015	7	4	27	30	0.90	10:55:00	11:31:27	0:36:27
NETSinAction	200	AC	20010	7	4	28	16	1.75	9:03:00	9:45:07	0:42:07
NETSinAction	200	AC	20013	8	4	27	24	1.13	10:05:00	10:47:33	0:42:33
School 100	67%		Grade 7	50%	Mean	26.33	20.17	1.95			0:40:11
School 200	33%		Grade 8	50%	StDev	1.86	9.72	1.83			0:02:35

More advanced analyses can be conducted by importing the **Data Storage** worksheet data into a statistical package such as SPSS, Stata, or SAS. Procedures such as regression analysis can address more complex questions such as:

- Does a teacher being in a professional development program predict how many NETS their classrooms will address, when controlling for the number of students per device?

- Is there a level of student technology use time at which students are more likely to address a given standard?

The ICOT may also be used primarily as a qualitative tool:

- In the notes on teachers whose classrooms exhibit the highest numbers of NETS addressed, a technology coach might look for examples of effective practice that other teachers could emulate.

- A team of teachers in a lesson study group might look at NETS that their students address, and strategize about how to change a lesson so that students could demonstrate actually meeting the standards.

For an example of using ICOT observations for research, see Bielefeldt, T. (2012). Guidance for technology decisions from classroom observation. *Journal of Research on Technology in Education*, *44*(3), 205─223. (http://www.iste.org/learn/publications/journals/jrte-issues/Guidance_for_Technology_Decisions_from_Classroom_Observation.aspx)

Appropriate Use

Some final notes about responsibilities of observers: Respect confidentiality of teachers and students at all times. ISTE Research & Evaluation strives to meet the program evaluation standards of the Joint Committee for Standards in Educational Evaluation (http://www.jcsee.org/program-evaluation-standards). In addition, observations conducted for research may be covered by specific human-subjects protection regulations. In the United States, this is true for studies conducted under grants from the National Science Foundation (http://www.nsf.gov/bfa/dias/policy/human.jsp), U.S. Department of Education (http://www2.ed.gov/about/offices/list/ocfo/humansub.html), and many other agencies.

Observers also should consider how their data will be stored and retrieved. Observers may want to revisit previous data to establish baselines or to see if their understanding of the NETS or other variables has shifted over time. In formal research settings, funding agencies may require that studies include a data management plan to ensure that research analyses can be independently verified or used in subsequent studies. For an example of policy in the United States, see the National Science Foundation's data management plan requirements at http://www.nsf.gov/bfa/dias/policy/dmp.jsp.

Establishing Observer Reliability

The best way to establish reliability across observers is to have two or more observers watch the same lesson, then compare ratings. Ideally, observers visit classes throughout a school day, leaving enough time at the end of each period to compare data and reach consensus before the next observation. Video archives and narrative scenarios can also be used for paired observations. ISTE's magazine *Learning & Leading with Technology* (http://www.iste.org/learn/publications/learning-and-leading.aspx) is currently publishing a scenario each issue in a column called "Know the NETS" to help readers see NETS in action.

ISTE would like to collect anonymous examples of paired observations to help identify ICOT variables and standards that may need revision and to confirm items that work well. ISTE is interested in the original ICOTs, not a consensus between observers, because it is the original areas of agreement and disagreement that will reveal reliability issues.

If you are willing to share data for reliability analysis, **email icot@iste.org** with output from paired observations with all **personally identifying information deleted** and observers identified **only by number or code**, as in the example below:

Seq	Date	Project:	School	Observer	Teacher	Grade	Subject	NoStuds	NoDevices	Etc.
	10/15/12			1	A			24	30	
	10/15/12			2	A			24	30	
Delete	10/15/12	Delete	Delete	1	B	Delete	Delete	28	8	
column	10/15/12	column	column	2	B	column	column	28	8	
	10/15/12			1	C			27	30	
	10/15/12			2	C			27	30	

This hypothetical Data Storage record would represent two observers visiting three teachers on the same day in consecutive periods. Columns that are irrelevant or that could be used to identify individuals are deleted, and individual's names have been replaced by numbers or letters.

All contributors will receive draft copies of analyses as they become available.

Definitions

These definitions that begin on the next page are accessible within the ICOT by clicking on the variable label on the **Observation** form. The label links to the definition on the ICOT **Definitions** worksheet. Clicking on the definition label returns you to the point you left on the **Observation** form.

The definitions of ICOT variables presented here are those used by ISTE Research & Evaluation in recent program evaluations. The "unpacking" of the NETS standards and Operational Definition of Computational Thinking is an ongoing effort involving the NETS team, ISTE's Seal of Alignment program, ISTE Professional Development Services, the Computer Science Teachers Association, and ISTE members who use the standards in their work. For more information on these initiatives, including classroom examples of lessons and activities, see http://www.iste.org/standards.aspx (NETS) and http://www.iste.org/learn/computational-thinking.aspx (Computational Thinking).

ICOT Section	Variable	Definition or Criteria
Setting	Grade	This pull down lists grades as 1—12, with additional adult learning options.
	Subject	This pull down lists all major K—12 content areas. Explain "other" choices in the notes field.
	No. Students	If the composition of the student group is important, record subgroups in the notes.
	No. Computing Devices	Computing devices refers to those relevant to the lesson. If the lesson depends only on science probes, don't bother counting unused computers. If the unused computers are important for other reasons, explain in the notes.
	Students/Device	The student/device ratio is the classic measure of 'computer density.' In ICOT, it refers to classroom density, not (as is traditional) school density.
	Start Time	The field is updated to the current time when the Start Observation Period button is clicked. After the Clear Form button is clicked, the data field will display 'Waiting Data.' If the 'Waiting Data' message is displayed, ICOT will not accept input on any checkboxes. The time field can also be cleared and the time entered manually.
	End Time	The field is updated to the current time when the End Observation Period button is clicked. After the Clear Form button is clicked, the data field will display 'Waiting Data.' If the 'Waiting Data' message is displayed, ICOT will not allow the form to be stored or cleared. The time field can also be cleared and the time entered manually.
Teacher Roles	Lecturing	Teacher conveying information to the students with little or no interaction during the presentation.
	Interactive Direction	Teacher presenting material while asking questions and eliciting prior knowledge or critical thinking.
	Facilitate/ Coaching	Teacher providing advice to learning activities undertaken by the students outside of teacher presentation.
	Modeling	Teacher explicitly demonstrating behavior or procedures. Distinguished from lecturing by the emphasis on demonstration rather than explication.
	Moderate Discussion	Group facilitation, where the teacher advises a dialog conducted among students. Distinguished from Interactive direction by the emphasis on student interaction with one another rather than response to the teacher.
Student Groupings	Individual	Students doing academic work by themselves, whether or not the room is set up for groups.
	Pairs/Small Groups	Almost any instance of students working together. An exception might be the sharing of a computer device for individual work, where taking turns requires no communication or collaboration.
	Whole Class	Almost any situation where students receive instruction or direction as a whole.
Learning Activities	Receive Presentation	Almost any passive attendance to information being conveyed by students or teachers.
	Give Presentation	Any conveying of academic content to an audience, in person or virtually (e.g., a slide show, web page, or publication.)
	Create Presentation	Any work on preparing information for communication to an audience in person, virtually, or in graphic formats.
	Run Simulations	Engaging in online visualization or multimedia tutorials. Distinguished from Drill & Practice by an emphasis on learning complex material, rather than eliciting and correcting multiple responses.
	Research	Almost any student pursuit of information that involves some degree of information literacy. Research might range from looking up items in a text to formal experiments.
	Info. Analysis	Any critical processing of information provided by the teacher or obtained through research. This might range from organization and categorization to analysis, synthesis, and evaluation.
	Writing	Any activity that involves students in narrative, dramatic, or poetic composition. The technology medium may be a word processor, web editor, presentation software, wiki, blog, email, or any other text processing application. Do not include simple labels or other text that does not involve aspects of composition.
	Take Tests	Any formal assessment, including short quizzes. Distinguished from Drill & Practice and Simulations by emphasis on evaluation rather than on learning.
	Drill & Practice	Repetitive exercises used for training in operations or concepts. Distinguished from Testing by emphasis on learning; distinguished from simulation-based tutorials by its emphasis on repetition.
	Hands-on Skills	Physical manipulation of materials or technology.
	Student Discussion	Students engaging with academic content through discussion with one another. It may be spontaneous or instigated by the teacher, but it involves primarily student-to-student interaction rather than responses to the teacher.

ICOT Section	Variable	Definition or Criteria
Ratings	Need (1─4)	Need is compared to alternatives: 4 = technology is essential; 3 = technology is better than alternatives; 2 = technology is as good as alternatives; 1 = alternatives would be superior. Need is useful to consider when evaluating NETS standards. The more essential technology is to a lesson, the more likely the NETS indicators will be addressed or met. This indicator should also be used in relation to the technologies recorded. The presence if a technology should be recorded whether or not the application is appropriate or well-designed. The Need rating and its note field should represent the quality of technology use.
	Students Unengaged	The ICOT convention is that every student gets to be off-task once in every period. If a student's distraction lasts three minutes or more, or if it is repeated, then mark the student as 'unengaged.' Note that engagement is rated in relation to the lesson, not to general behavior. Students may be disruptive (rude, loud, etc.) but still engaged in the content.
	Engaged %	(Students Not Engaged) / (No. Students)
Hardware Used by Students or Teachers	Calculator	Any calculator function whether a separate device or utility within another application.
	Computer	Any desktop, laptop, or tablet PC.
	Digital Camera	May be still or video, a separate device, or a function within another device such as a phone.
	Digital Sensors/GPS	Any digital device that gathers data from the physical world, including via satellite.
	Interactive White Board	Any system that allows projected displays to interact with a computer.
	Presentation System	A digital system with a data source and projector. The former may include computers, document cameras, digital cameras, or instruments such as electronic microscopes.
	Response System	Any system that allows a group to interact simultaneously with data collection software in real time. Usually used with an interactive white board or other projection system.
	Handheld/Smartphone	Small mobile wireless devices without the general computing capabilities of a computer. Tablet PCs with full laptop capabilities should be classified as computers.
	Interactive Videoconf	Any real-time desktop or display system that connects remote users by voice and video.
Software Used by Students or Teachers	Data Analysis	Any application used for the quantifying of information. Includes database managers, spreadsheets, interactive web calculators, graphing utilities, and dedicated math packages.
	Email/Chat	Any synchronous or asynchronous text communication over a network. Includes applications such as Twitter and other text-using social media.
	Drill/Test	Any application that allows practice or assessment of content. May be incorporated into simulations or tutorials. May be installed as a separate application or delivered via the web.
	Graphics	Any application or utility within another program that allows the digital manipulation of images.
	Learn. Mgt System	Any system that facilitates communication and organization of learning materials and records for students and teachers. Includes products such as Moodle and Blackboard.
	Outline/Concept Map	Any application or web utility that allows the graphical or hierarchical organization of information. Includes dedicated products such as Inspiration as well as graphics programs used for the same purpose.
	Multimedia Editor	Any application used to create electronic presentations that include text, images, and/or sound. Includes web editors, presentation authoring software, or multimedia features of a word processor.
	Simulation	A dynamic digital model that represents a complex relationship. It may be interactive, as with a computer-based lab, or it may be a demonstration only.
	Text Editor	Any text processing application, whether a dedicated word processor or a utility within another application.
	Web Browser	Any browsing software on any platform. If any browser-dependent application is checked, this software should be checked as well.

ICOT Section	Variable	Definition or Criteria
Creativity and Innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.	1a. apply existing knowledge to generate new ideas, products, or processes	"Addressed" indicates systematic inventory of relevant information applied to help determine what is needed next. Meeting the standard would involve students also engaging in activities around standards 3b, 3c, and 4c. That is, the existing knowledge would need to be selected and evaluated.
	1b. create original works as a means of personal or group expression	Any student generation of ideas, products, or processes where students make some unique contribution (i.e., more than filling out a worksheet). Meeting the standard would involve students in other creativity indicators as well, such that actually applied these processes to create their works.
	1c. use models and simulations to explore complex systems and issues	Systematic use of technology to represent one entity by another. Addressing the standard typically involves using the model or simulation as a consumer, as when logging on to an online visualization tool that depicts complex relationships in math or science. Meeting the standard involves students as the developers of the model.
	1d. identify trends and forecast possibilities	Addressing this indicator typically involves students completing lab reports or answering open-ended questions specified in an assignment. Meeting the indicator involves the other creativity indicators, as well as planning for inquiry and data analysis. That is, the predictions are part of a systematic student response to a problem, not simply a guess or application of a teacher-provided algorithm.
Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.	2a. interact, collaborate, publish w/peers, experts, others employing digital environment	This indicator is addressed by almost any interactive activity that involves students cooperating in or around a digital environment. That might be as simple as sharing computers in a lab. Meeting the standard involves using technology to jointly solve problems or create solutions that would be otherwise difficult to achieve. Examples might include collaborative online editing, active participation in distance learning, or real-time data collection with a remote peer group.
	2b. communicate information/ideas to audiences using a variety of media and formats	Any technology-enhanced communication within a learning activity that involves preparation and/or presentation of information addresses this standard. Meeting the standard involves explicit identification of the audience and selection of media and format to meet audience needs.
	2c. develop cultural understanding/global awareness engaging with learners of other cultures	This indicator is addressed with any use of technology to access information from or about other cultures (foreign or domestic). Think of a geography report using web research. Meeting the indicator involves true engagement, as when a language class goes online with students from another country.
	2d. contribute to project teams to produce original works or solve problems	Any form of cooperative learning addresses this indicator. Meeting the indicator involves activities where the team process (see indicator 2a) is essential to the outcome.
Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.	3a. plan strategies to guide inquiry	This indicator is addressed by any student planning activity related to 3b, 3c, or 3d, even if the planning details are dictated by the teacher or a worksheet. Meeting the standard involves student independence and other indicators such as student selection of technology tools and review of information. See indicator 4b.
	3b. locate, organize, analyze, evaluate, synthesize, ethically use information	Any systematic information gathering and analysis related to a question or problem addresses this indicator. Often this takes the form of a teacher assignment to visit a particular website and locate certain facts. Meeting the indicator involves the higher order criteria (analysis, synthesis, evaluation) and would be part of a research process (3a–3d) that would also involve critical thinking (Standard 4).
	3c. evaluate/select information sources/digital tools based on appropriateness to tasks	Any learning situation addresses this indicator when students exercise choice in information sources and tools and experience the consequences of their choices. A simple example might have students choosing to create a report as either text paper or multimedia presentation. Meeting the indicator involves more complex choices as part of an inquiry process (3a–3d).
	3d. process data and report results	Any interaction with information that produces a report addresses this indicator. Meeting the standard involves more than completing a lab worksheet. The data processing and reporting would be part of an inquiry process and would involve deeper analysis (4c–4d), as well as selection of tools (Standard 6) and communication targeted to an audience (Standard 2).

ICOT Section	Variable	Definition or Criteria
Critical Thinking, Problem Solving, and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	4a. identify and define authentic problems and significant questions for investigation	Any engagement of students in problem posing addresses the indicator. Meeting the standard would involve students choosing their own significant questions and using data and technology to support the importance of their inquiry.
	4b. plan and manage activities to develop a solution or complete a project	Any independent student planning activity related to 4a, 4b, or 4d addresses this indicator. Meeting the standard involves student independent planning (not just following specific instructions) and other indicators such as student selection of technology tools and review of information. See indicator 4b.
	4c. collect and analyze data to identify solutions and/or make informed decisions	Any systematic information gathering and analysis related to a question or problem addresses this indicator. Meeting the indicator involves the data collection/analysis as part of a sequence (4a–4d) and using the information to make complex decisions.
	4d. use multiple processes and diverse perspectives to explore alternative solutions	Any pursuit (even teacher-directed) to reframe a problem or question to develop new solutions addresses this indicator. Meeting the standard would involve student selection of tools (6b) and perspectives as part of an inquiry process (4a–4d).
Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.	5a. advocate and practice safe, legal, and responsible use of information and technology	This indicator is addressed with any examples of appropriate source citation, defense against viruses or intrusions, power conservation, ergonomic consciousness, or other socially aware practices. Meeting the standard involves evidence of student initiative to promote appropriate use, as well as an understanding of the underlying facts and values. Meeting the indicator is likely to be observed in only a few students in a given class period.
	5b. exhibit positive attitude toward technology that supports collaboration, learning, productivity	Full participation in learning activities with technology addresses this standard. Meeting the standard involves taking the initiative to improve individual or group activities by learning new procedures or approaches. Meeting the indicator is likely to be observed in only a few students in a given class period.
	5c. demonstrate personal responsibility for lifelong learning	Any example of students seeking learning beyond the classroom addresses this indicator. Meeting the indicator involves taking the initiative to conduct supplementary inquiry, engage in content-related discussions, or planning for future learning. Meeting the indicator is likely to be observed in only a few students in a given class period.
	5d. exhibit leadership for digital citizenship	Any example of students encouraging others in the positive and appropriate use of technology addresses the standard. Meeting the standard would involve initiative to educate peers or the community on issues of technology safety or ethics.
Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations.	6a. understand and use technology systems	This indicator is addressed with almost any technology use for learning. Meeting the standard involves learning new technology systems or developing a deeper understanding of previously learned tools. Automated use of a wiki would address the indicator. Learning a script a new website would meet the indicator.
	6b. select and use applications effectively and productively	This indicator is addressed by any example of student judgment in employing applications (or features of applications). Meeting the standard involves more than a forced choice between similar alternatives (e.g., one or another website on the same topic). Students having responsibility and the means to make independent decisions that involve weighing multiple attributes.
	6c. troubleshoot systems and applications	Any example of students solving technology operation issues addresses the standard. Meeting the standard involves demonstrating of systems (6a) and options (6b). This indicator is often not observable. If no technology problems occur during an observation, students have no opportunity to demonstrate troubleshooting skills.
	6d. transfer current knowledge to learning of new technologies	Any opportunity to learn a new technology tool may address this indicator. Meeting the indicator involves students independently applying understanding of technology systems (6a) to new contexts.

ICOT Section	Variable	Definition or Criteria
Operational Definition of Computational Thinking http://www.iste.org/computational-thinking	Formulating problems in a way that enables us to use a computer and other tools to help solve them.	Addressing this aspect of CT involves activities that teach or encourage students to break problems into smaller parts for solution. Meeting the criterion would involve students selecting and applying problem decomposition in a novel task. (cf. NETS 3a, 4b).
	Logically organizing and analyzing data	Addressing this aspect of CT involves activities that teach or encourage students to collect appropriate data in a systematic way and to make sense of the information, finding patterns, and drawing conclusions. Typical examples are worksheets and lab reports. Meeting the criterion would involve students selecting and applying data organization/analysis skills in a novel task. (cf. NETS 1d, 3b, 4c).
	Representing data through abstractions such as models and simulations	Addressing this aspect of CT involves activities that teach or encourage students to represent or model processes, or to run experiments that use modeling, in order to simplify complexity and identify key constructs. Typical examples are web-based simulations of complex physical or social interactions. Meeting the criteria would involve students selecting and applying data modeling in a novel task.(cf. NETS 1c).
	Automating solutions through algorithmic thinking (a series of ordered steps)	Addressing this aspect of CT involves activities that teach or encourage students to solve problems through a series of ordered steps, and to have computers or machines do repetitive or tedious tasks. Robotics is a common example, but algorithmic solutions can be applied in any subject involving digital systems. Meeting the criteria would involve students being able to automate solutions to a novel task. (cf. NETS 3a, 4b).
	Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources	Addressing this aspect of CT involves activities that teach or encourage students to consider multiple solutions as well as integrative strategies such as parallelization (tackling two or more parts of a solution at once). Meeting the criteria would involve students being able consider multiple or parallel solutions to a novel task. (cf. NETS 3a, 4b, 4d).
	Generalizing and transferring this problem solving process to a wide variety of problems	Addressing this aspect of CT involves activities that teach or encourage students to consider and apply previous knowledge and processes to current problems. Meeting the criteria would involve students demonstrating recall, analysis, and application in a novel context. (cf. NETS 1a).
Technology Use Time	% Teacher Use	These variables are included to make ICOT v3.1 data compatible with v1.0 and v2.x data sets. ICOT actually keeps track of all the time when no technology is in use, then subtracts that figure from the total observation time to get the total proportion of the period when technology was in use by teachers and by students.
	% Student Use	