DRAFT

Integrative Performance Assessments of Technology

Report of Prototype Assessment Designs for Building a Foundation for a Decade of Rigorous, Systematic, Educational Technology Research

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INTEGRATIVE PERFORMANCE ASSESSMENTS OF TECHNOLOGY (IPAT)

INTRODUCTION

Innovative technologies are transforming schools and classrooms by supporting the conditions that research indicates are conducive for meaningful learning. Technology-supported interventions are fostering new curricula based on real-world problems, providing scaffolds and tools to enhance learning, giving students and teachers more opportunities for feedback and reflection, and building local and global communities. Information and communication technologies (ICT) are being increasingly employed in schools to provide rich sources of information and extensions of human capabilities (Anderson, 2001; Bransford, Brown, & Cocking, 1999, p. 230). In a national survey of teachers conducted by the Center for Research on Information Technology and Organizations, teachers reported widespread use of technologies in U.S. classrooms (Becker & Anderson, 1999). This increase in the educational use of ICT is driven and supported by evidence that new technologies can change schools and improve education (Bracewell, Breuleux, Laferriere, Benoit, & Abdous, 1998; Coley, Cradler, & Engle, 1999; Means & Olson, 1995; Wenglinski, 1998) and by major shifts in policy at both national and multinational levels. Countries such as the United States (U.S. Department of Education, 1996), Chile (Ministerio de Educación, Republica de Chile, 1998), Norway (Ministry of Education, Research, and Church Affairs, Norway, 2000), and Singapore (Ministry of Education, Singapore, 2000) have taken the position that the integration of ICT into classrooms and curricula can improve educational systems and prepare students for the twenty-first Century learning society. Similarly, multinational organizations, such as the Organization for Economic Cooperation and Development (OECD) (1998, 1999) and the European Commission (1995, 2000), have identified the need to prepare students for lifelong learning in the knowledge economy. They assign a central role to ICT in accomplishing this goal. Furthermore, reports issued by UNESCO (Blurton, 1999) and the World Bank (1998) advocate the use of these technologies to promote international socioeconomic progress and educational change in developing countries.

The International Society for Technology and Education (ISTE) recently characterized these new skills in its National Educational Technology Standards (2000). They propose that as a result of ICT integration in the curriculum, students become:

- capable information technology users,
- information seekers, analyzers, and evaluators,
- problem solvers and decision-makers,
- creative and effective users of productivity tools, and
- communicators, collaborators, publishers, and producers.

Similarly, the report, *Being Fluent with Information Technology*,(NRC, 1999) proposes that intellectual capabilities such as organizing and navigating information structures and evaluating and communicating to other audiences are as essential as fluency with technology operation In short, as a result of using ICT, students may develop the complex thinking and knowledge management skills that will be needed in the knowledge society, skills such as formulating research questions, analyzing problems, searching for information, collecting and analyzing data, and designing reports and presentations (Anderson, 2001).

Both the investment in educational ICT and the unique learning opportunities it presents argue for the assessment of the skills that students acquire with its use. However, the most widely administered accountability measures, traditional standardized tests, are judged by most to be inadequate for measuring extended reasoning, communication, or technology use. New assessments are required that use innovative approaches to capture these new skills.

This report describes the development of a set of prototype technology-supported performance assessments designed to test students' use of technology integrated within problem-based reasoning and communication tasks. The prototypes were developed as part of a grant from the U.S. Department of Education to support planning for a major program of rigorous, systematic educational technology research. The Integrative Performance Assessments of Technology (IPAT) prototypes were designed to demonstrate the kinds of assessment approaches that could be used to document the impacts of technology programs on student learning. The goals for the development of the student performance assessment prototypes were:

- to provide common, credible, technically sound measures of standards related to technology use, reasoning with information, and communication outcomes addressed in a wide range of technology programs and classrooms
- to apply and extend an assessment design framework with modular components that could provide "templates" or task models for new or modified assessments addressing similar outcome areas
- to provide preliminary evidence about the technical quality of the general design approach and function of the prototype assessments

The Integrative Performance Assessments of Technology (IPAT) prototypes were designed for potential use as accountability measures for program evaluations and to permit comparisons with low-technology-using programs. The assessments were also designed for use by classroom teachers seeking to monitor their students' progress in technology-rich, inquiry-based curricula.

This report describes the design framework shaping the IPAT prototypes and the results of pilot tests of the assessments with middle school and secondary students. The IPAT design framework is intended to provide templates for modification and development of additional assessments of technology use, reasoning, and communication outcomes. The report also describes pilot test results that provide evidence supporting the technical quality of the assessments and that illustrate how data from the assessments can yield student outcome data for classroom teachers and technology program research and evaluation.

BACKGROUND

The rapid increase of technology-rich programs has not been accompanied by direct assessments that capture the range of their impacts on student learning. The design of assessments sensitive to inquiry-oriented, technology-supported innovations requires identification of intended student outcomes and the types of assessments that will elicit evidence of attainment. Below we overview current testing practice and promising approaches.

Status of Technology Use and Assessment

Although word processing remains the most common application of technology in U.S. schools, Internet research is probably the fastest growing. On the national survey conducted by Becker and Anderson in the spring of 1998, 30% of teachers (and over 70% of those with direct high-speed Internet connections in their own classrooms) said that they had assigned Internet research tasks that school year (Becker, Ravitz, & Wong, 1999). Given the fact that the proportion of U.S. classrooms with Internet connections rose from 51% to 63% between 1998 and 1999 (NCES, 2000), we can extrapolate a commensurate increase in the frequency with which students' teachers are asking them to perform Internet research. Other productivity tools used besides word processors, but to a lesser extent, were graphics programs, spreadsheet or database programs, and presentation programs.

With all the resources expended to put ICT in K-12 schools, a need exists to evaluate what impact ICT has had on student learning. The National Research Council advocates that extensive evaluation research be conducted to determine the goals, assumptions, and uses of technologies in classrooms and the match or mismatch of these uses with the principles of learning and the transfer of learning (Bransford et al., 1999, p. 259).

According to a study of state assessment policies conducted by the Milken Exchange on Educational Technology, in 1998 eight states (California, Illinois, Maine, Minnesota, North Carolina, South Dakota, Tennessee, Virginia) required that student progress be assessed on technology standards. Most state technology tests employ the multiple-choice format. North Carolina also administers a performance assessment to test student skills in using applications for desktop publishing, databases, and spreadsheets.

Performance Assessments of Technology Integration

In several national and international projects, SRI's Center for Technology in Learning (CTL) has developed innovative forms of performance assessments to measure students' ICT skills. From 1998-2001, CTL developed secondary-level performance assessments of ICT for the World Bank's World Links for Development (WorLD) program (Quellmalz & Zalles 1999, 2001). The performance assessment designs employed an innovative, problem-based approach (Quellmalz & Hoskyn, 1997). The approach reflected research and best practice on promoting higher-order reasoning and communication strategies within a project-based learning paradigm (Quellmalz, 1987; Collins, Brown, & Newman, 1989). A modular design approach was developed to allow the technologies, tasks, and questions to be tailored to varying levels of technology implementation and integration. The assessments were also fashioned to be widely applicable across the range of WorLD implementations.

The WorLD assessments provided evidence of secondary students' proficiencies in technology use, reasoning with information, and communication. A field test of one set of the assessment tasks with 200 WorLD and non-WorLD students in Uganda documented the technology proficiency of WorLD students and advantages in reasoning and communication for WorLD students who had opportunities to experience ICT in their schools (Quellmalz & Zalles, 1999, 2001).

The problem-based modular design approach developed for the WorLD program served as a model for the design of the Integrated Performance Assessments of Technology (IPAT) technology-enhanced assessments.

DEVELOPMENT OF THE INTEGRATIVE PERFORMANCE ASSESSMENTS OF TECHNOLOGY (IPAT)

The Integrative Performance Assessments of Technology (IPAT) design addresses three outcome areas: technology use, reasoning with information, and communication, related to the ISTE Standards. The generic IPAT task model presents an engaging, authentic problem and sets of tasks and questions requiring students to conduct research on the Internet to gather relevant information, use reasoning strategies to analyze and interpret the information, use productivity tools (such as graphics programs, word processors, and presentation tools), and communicate findings and recommendations citing Web-based evidence. The current assessment prototypes extend the earlier work by probing students' Internet skills more deeply and exploring issues related to administering the assessments on the Internet and scoring student work online.

IPAT Design

The IPAT design approach provides a framework for structuring key components or modules of the assessment. The IPAT task template incorporates modules specifying the research problem posed, the targeted technology tools (e.g., Web tools and productivity tools), the types of reasoning strategies (e.g., analysis, comparison, inference, evaluation), and the communication form (e.g., report, letter, presentation). The IPAT design includes a problem-based activity flow beginning with posing an authentic problem, gathering relevant information and data, analyzing and interpreting information and data, and communicating findings and conclusions (Quellmalz, 1987). The IPAT assessment prototypes were designed according to templates or authoring shells that could be used or adapted by evaluators and teachers.

Two IPAT prototype assessments were designed for the middle school level. Their templates were intended to be easily adaptable. Modules could be simplified for elementary grades or enhanced for secondary grades. For example, the prototypes could be adapted as elementary versions by asking students to seek research information on fewer Web sites or to use fewer productivity tools in simpler ways. One of the prototypes was slightly modified for secondary students by requiring research for information on an additional topic. The assessments could also be made more challenging by requiring research using Web sites or by using additional technology tools (e.g., spreadsheets) in more sophisticated ways (e.g., create formulas).

Problem Module. To create the prototypes, SRI assessment researchers identified potential problems for which research information could be found on Web sites suitable for middle school students. Since the prototypes were intended to be useful for a wide range of technology programs integrating technology in a range of curricula, we identified problems and topics that met the following criteria: (1) the content would be familiar to most students, (2) the Web directories to be navigated were appropriate for the targeted grade level, (3) Web sites could be found that presented sufficient information to support the reasoning strategies assessed (e.g., making comparisons and drawing conclusions), (4) the relevant Web sites were posted by reputable organizations, and (5) material on the Web sites was written at an appropriate reading level.

For the problem module, the assessments presented realistic problems that students must solve by conducting research on government agency Web sites (e.g., two city sites, and sites maintained by the Environmental Protection Agency, and the National Weather Service). In the first prototype, Choose a City, the problem posed was to help foreign exchange students decide which of two U.S. cities to visit for the summer. In the second prototype, EPA Phoenix, the problem posed was to help a regional soccer league determine whether to hold championship games in Phoenix and the best time of year to hold the games.

The problems specified for the prototypes are but two examples of a range of problem modules that could be tailored to the curriculum emphases of particular technology programs. In addition, the subject areas relevant to the problem situations could vary in familiarity and complexity.

Reasoning Module. In the IPAT reasoning module, component tasks and questions were designed to elicit students' abilities to gather relevant information, compare and interpret information, and draw conclusions and make recommendations. In the prototypes, scaffolding was provided to help students limit and focus their research. The search topic was focused by specifying the categories of information relevant to the problem. In Choose a City the directions specified that the exchange students were interested in the availability of recreational opportunities and public transportation. A slightly more demanding version was developed for secondary level students that added job opportunities as a third selection criterion. In EPA Phoenix, the categories of information specified as relevant to the soccer league's site selection were the extent of air pollution and the air temperature.

The reasoning demands were also varied by identifying Web sites that presented information in different formats. In the Choose a City assessment prototypes, students' Internet research was conducted on Web pages presenting only text. In the EPA Phoenix prototype, the Internet research required searching for information and data in representation formats that included tables, charts, and graphs. Specifications for assessment tasks in the reasoning module can be tailored to the amount and types of information required, the level of reasoning required to analyze and interpret the information, and the extent of scaffolding provided.

Communication Module. In the specifications for the communication module for the IPAT prototypes, students' communication skills were assessed through tasks asking them to synthesize and communicate their research findings and recommendations. In the Choose a City prototype, students were asked to write a letter to the exchange students recommending one city and using evidence from their Internet research to support their recommendation. In the EPA Phoenix prototype, students were asked to support their recommendation in either a written report or a multimedia presentation. The purpose, structure, audience, and presentation modes can be varied to reflect the classroom activities and grade levels of a technology program.

Technology Use Module. The IPAT prototypes targeted sets of Internet search tools (e.g., Web search tools, complex Web directories, and various Web-based data representational formats) and commonly used productivity tools (e.g., word processor, graphics programs, presentation programs). Specifications for the technology use module posed a range of technology use tasks and questions. The tasks posed for the Choose a City prototype focused mainly on navigating complex Web directories to find and sift through information. The city Web sites used in the prototype were selected to differ in the organization of their directories. Students' Internet research skills were elicited by questions asking students to access the cities' home pages using given Web addresses, navigate the directories to find relevant information, and formulate a search query to find additional information related to the research problem.

EPA Phoenix asked students to use phrase-based or attribute-based search tools. Phrase-based searches are commonly used as "simple searches" on popular search sites (e.g., Google, Lycos, etc.). Attribute-based search tools require users to restrict the parameters of their search by making selections on checklists or pull-down menus. Attribute-based search tools are increasingly used for advanced searches and for querying databases at commercial Web sites, government Web sites, and digital libraries. The students were asked to use an EPA-specific simple search tool to find information about the health effects of ozone pollution, conduct two searches using different search phrases, evaluate which phrase got the better results, and explain why. Students were also asked to conduct more advanced searches using pull-down menus and check-boxes to open specific charts on the EPA database showing numbers of unhealthful and healthful days in Phoenix over a given year. In addition, the EPA Phoenix prototype asked students to access, interpret, and manipulate quantitative data available in various Web-based data representations through a directed sequence of tasks.

The prototypes included questions to assess students' ability to evaluate the credibility of information presented on the Web sites. In Choose a City, students were directed to find information that seemed questionable and explain their doubts. In EPA Phoenix, students were asked to explain why a particular map was not useful for their research question (i.e., out-of-date data).

The prototype assessments required students to use technology to communicate their research findings and conclusions. For the Choose a City assessment, students used text editors to compose their letter to the exchange students. In the EPA Phoenix pilot test, students used word processors or presentation software to write their reports.

A range of technologies or "learning tools" could be incorporated into the specifications for a particular IPAT task's technology module. The selection of the technologies students could be asked to use to address the problem posed could represent the technologies integrated into a technology program. For example, additional, more advanced tools, such as database programs or modeling and visualization tools, could be incorporated into assessments designed for technology-supported science or mathematics curricula.

IPAT Prototype Alignment with Technology Standards. For the two prototypes, Table 1 presents the outcome areas addressed, the specific proficiencies tested, and the alignment of the proficiencies with the National Educational Technology Standards of the International Society for Technology Education (ISTE). The complete prototypes, Choose a City and EPA Phoenix, may be examined at http://ipat.sri.com.

Table 1

Alignment of IPAT Prototypes with Technology Standards

Outcome Area	**Proficiency**	**Choose A City Tasks**	**EPA Phoenix Tasks**	**ISTE National Educational Technology Standards**
Technology Use: Web-Based Tools	Locate and cite URL	X	X	Use technology tools to locate, evaluate, and collect information from a variety of sources
	Formulate search query	X	X	
	Use attribute-based search tool	X	X	
	Navigate Web directories	X	X	

	and site structures			
Technology Use: Productivity Tools	Use graphics in a composition	X	X	Use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works
	Use productivity tools (word processor, presentation software)	X	X	
Technology Use: Reasoning with Information/	Find relevant Web-based information	X	X	Use technology tools to locate, evaluate, and collect information from a variety of sources
Reasoning with Information	Evaluate credibility of Web information	X	X	
	Interpret data representations		X	
	Transfer from one data representation (chart) to another (data table)		X	
	Recognize data patterns in tables		X	
	Formulate evidence-based conclusion from chart data		X	Use technology resources for solving problems and making informed decisions
	Formulate a research problem	X		
Reasoning with Information; Communication	Formulate argument	X	X	
Communication	Formulate a research question	X		
	Present clearly organized argument	X	X	Use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works
	Use correct mechanics	X	X	

IPAT Scoring Rubrics. IPAT scoring rubrics build upon the scoring criteria and approaches developed for the WorLD program. Generic rubrics describe criteria for rating student responses to questions related to the three outcome areas: technology use, reasoning with information, and communication. Item-specific criteria were derived from the generic rubrics. The generic and item specific scoring rubrics appear on the IPAT Web site at http://ipat.sri.com.

IPAT Technology Support. Versions of the IPAT prototypes were designed for online administration. The assessment directions were presented online, students accessed Web sites online, recorded their responses to the questions online, and composed and/or saved their letters, reports, and presentations online. A second version of the prototypes presented print directions and student response booklets, although students used the Internet to conduct the research and word processing tools to construct the letters, reports, and presentations. A database was developed to support online presentation of student responses to questions for online rater training and scoring. The scoring database also supported tailored analyses and reporting.

IPAT Student Questionnaires. Two instruments were developed to examine the relationship of the IPAT prototypes to students' prior classroom technology activities and to gather students' reactions to the assessment. On the background questionnaires, students were asked about the frequency with which they had engaged in tasks like those on the assessment. The Student Background Questionnaires and a table comparing the questions administered during the pilot tests appear in the Appendix. On a follow-up questionnaire, students were asked to comment on the difficulty level of the tasks, their preference for Web-based research compared to research with print material, and suggestions they might have for revising the assessment.

IPAT Teacher Interviews. Interview protocols were also developed to question teachers about district technology standards, computer access, technology availability and configurations, and integration of technology into curricula.

IPAT PILOT TESTS

To examine the feasibility, utility, and technical qualities of the IPAT prototypes, the assessments were pilot-tested in schools that were implementing technology programs. The schools that were selected had economically and culturally diverse student populations.

Procedures

Pre-Pilot Testing. The prototypes were first tried out with a few students to confirm that the content, format, and questions were age-appropriate. SRI assessment staff observed each of the students, encouraged him or her to think aloud while responding to each question, and debriefed each student when the tasks were completed. The prototypes were refined based on these "think alouds" and prepared for pilot testing.

Middle School Choose a City Pilot Test. In May 2000, a 6th-grade class of 31 students participated in the Choose a City assessment. The teacher of the pilot students was a participant in the "Project-Based Learning with Multimedia" program, which was part of a Technology Innovation Challenge Grant-funded project known as Challenge 2000. In that technology program, students completed research and design projects designed to draw on real-world information and research methods and developed multimedia presentations to communicate what they had learned. The 6th-graders at the school had done a Web-based project about the seven man-made wonders of the world. Students selected one of the wonders, accessed a Web site about it, and then created a multimedia presentation. The presentation was prepared according to a Web-based template. Students were asked to compare the wonder with constructions of modern civilization. Rubrics were developed to score the presentations. Students had access to several computers in the classroom. In addition, there was a large computer lab at the school with approximately 30 computers of varying ages and configurations.

One purpose of this pilot test was to examine alternative administration conditions that could be used with the prototype assessment. Students were assigned to complete the assessment either individually or in pairs. Three response format conditions were studied. One set of students was assigned to complete the assessment in a newly developed format for online delivery and responding. A second group was assigned to a mixed-format condition in which students used the computer for Web-based research, but entered their answers to the assessment items on a printed response form. A third group referred to print versions of the city Web sites for the research, and recorded their responses and letters of recommendation on the print form. The prototype was designed to require approximately two class periods to complete.

Three SRI researchers participated in the administration of the Choose a City assessment. The research team circulated among the 31 students participating in the various conditions and noted technical and logistical issues. Students in the online condition (4 pairs, 8 solo) completed the Choose a City assessment in the computer lab. Students in the mixed (2 pairs, 2 solo) and print only (8 solo) conditions completed the assessment in their classroom. All students completed the assessment within the two periods allotted.

Secondary-Level Choose a City Pilot Test. A more challenging version of the Choose a City Internet research task was developed and used in an evaluation of a sample of Virtual High School courses. The evaluation sought to determine if students taking the Virtual High School courses online not only learned course content as well as students in the face-to-face version of the courses, but also demonstrated better general technology fluency and information skills. Sixty-two high school students from 26 schools throughout the United States took the Choose a City assessment online. Students were able to complete the task in the 2-hour time frame**.**

EPA Phoenix Pilot Test. Three classes of 8th-graders participated in the EPA Phoenix pilot in June 2001. Students attended two schools in a district that serves grades K-8. The schools were magnet schools with themes of Communication/Technology and Marine Science/Technology. The district technology coordinator recommending the schools characterized School A as high-technology-using and School B as medium-to-low in technology use. School A was in one of the more affluent sections of the district, whereas School B served less affluent students. Each school had a computer lab. Classrooms in the schools had 3-8 computers.

The district required all students to complete a technology project in Grades 4 and 6, and was initiating a similar project in Grade 8. For the 6th-grade project, students chose an ancient civilization. Using various print and electronic resources, they collected information about the civilization, entered it in an electronic notebook, created a storyboard, and created a virtual museum exhibit using linear (slideshow format—like ClarisWorks) or non-linear software tools (hypermedia format—like Hyperstudio or Web pages).

In June 2001, 66 8th-graders from the two schools participated in the pilot test of the EPA Phoenix prototype. Forty-nine of the students were from two classes in the high-technology-using school (School A). Seventeen students were from a class in the low-to-medium technology-using school (School B). Most of the students worked in pairs; a few students worked in groups of three. All students conducted their research online and entered their responses to information-gathering and analysis questions on a print form. For the research report, students at School A created presentations in Hyperstudio; students at School B composed reports using ClarisWorks.

Following the assessment administration, SRI researchers interviewed small groups of students. For each of the three classes, two students identified by their teacher as low-performing and two identified as high-performing were interviewed. An interviewer from the SRI team interviewed the pairs separately. The protocol for the interviews involved asking the students to react to each item on the follow-up questionnaire and solicit overall reactions about the assessments. In addition, the teachers were interviewed about the effectiveness of the assessments and completed questionnaires.

Scoring and Analysis

Scoring. Item-specific scoring criteria were generated based on to the generic scoring rubrics (Quellmalz & Zalles, 2001). The number of possible score points per item varied according to the range of appropriate responses. The item scoring guides present each item, as seen on the student form, along with its rubric or rubrics. Each item-specific rubric presents: (1) outcome area, (2) targeted proficiency, (3) item format, (4) scoring criteria, (5) scale, (6) the proficiency level constituting minimal adequate performance, and (7) illustrative examples of student work. These item-specific rubrics are on the IPAT Web site: http://.ipat.sri.com.

Ratings were converted to a common metric, where 1 = adequate performance and 0 = inadequate performance. The converted scores were then aggregated to build composites for the three outcome areas (e.g., technology use, reasoning with information, and communication).

For rater training, first iterations of the scoring guides were developed using student papers accumulated in pre-piloting. These papers were scored by an expert panel and used as anchor papers in training raters for the pilot study. Raters then scored student work independently.

For the Choose a City middle school assessment, 22 student forms were scored. Twelve were scored jointly by the SRI team through discussions. Of the remaining papers, 3 were scored by 3 raters independently and 7 scored by a single rater. For the secondary version of the Choose a City assessment, 2 raters scored the student responses independently, with agreement levels ranging from 84-96%.

For EPA Phoenix, all papers were scored by 2 raters. Item-by-item scoring proceeded in two phases. First, a set of 8 pre-scored anchor papers were scored separately by each scorer and discussed. Then, the remaining papers were scored independently. Rater agreement level was 93%. Discrepancies were resolved by discussion with the training leader. Minor revisions to the scoring rubric were implemented as necessary.

Analysis. Upon completion of scoring, a database of individual student records was created. Each record contained the student responses to the background questions and their scores on the assessment items. Since most of the assessments were completed by students working in pairs, the scores on a particular form were assigned to all the students who worked together on the form. Results were aggregated by outcome area. In addition, new variables were created for each score that categorized the student performance as adequate or inadequate. For the background questions, a variable was created to categorize the frequency ratings. An average of 1-3 times a month or once a week or more was classified as frequent use and the results were aggregated as such.

RESULTS

In this section we present the student performance from the pilot tests of the IPAT prototypes and their responses to the background questionnaires and follow-up interviews. Results of the varying administration conditions are reported. We also present findings related to the relationship between school categorizations according to level of technology use, and students' reports of frequency of relevant classroom activities.

Student Performance

Student performance on both middle school prototype assessments is presented in Table 2. Level of performance was computed as the percentage of adequate or above-adequate responses on questions testing a proficiency. Numbers in parentheses indicate the number of adequate responses and the total number of responses to the items. The total percentages aggregate the adequate or above-adequate responses on the proficiencies for the entire outcome area.

Table 2

Student Performance on Middle School Prototype Assessments

		Choose A City	EPA Phoenix
Outcome Area	**Proficiency**	**Percent of Responses Scored Adequate and Above**	**Percent of Responses Scored Adequate and Above**
Technology Use	Navigate the Web to find relevant information *	42% (50/120)	
	Cite URL	57% (56/99)	80% (37/46)
	Formulate Web search query	46% (12/26)	38% (23/61)
	Use attribute-based search tool to find targeted information in Web-based data base		91% (60/66)
	Access and find specific information on a complex Web-based data table *		73% (48/66)
	Use graphics in a report composed with word processor		88% (38/43)
	Use presentation tool		100% (55/55)
	Total: All Technology	48% (118/245)	77% (261/337)
Reasoning with Information	Navigate the Web to find relevant information *	42% (50/120)	
	Find relevant information in Web-based text		67% (28/42)
	Evaluate credibility of Web-based textual information	33% (8/24)	
	Evaluate credibility of information on Web-based data representation (map)		80% (47/59)
	Formulate a research question	79% (22/28)	
	Formulate argument (i.e., evidence-based conclusion from data)	21% (6/28)	44% (24/55)
	Interpret information on a chart		97% (64/66)
	Interpret information on a map		93% (56/60)
	Draw conclusion from information on a map		94% (59/63)
	Access and find specific information on a complex Web-based data table *		73% (48/66)
	Transfer appropriate information from one data representation (chart) to another (data table)		86% (57/66)
	Recognize patterns of data in a data table		73% (48/66)
	Draw conclusion from spread of data points on a set of charts		77% (49/64)
	Examine multiple data representations in order to formulate evidence-based conclusion		42% (28/66)
	Total: All Reasoning	47% (108/228)	76% (513/678)
Communication	Formulate a research question	79% (22/28)	
	Present recommendation based on evidence	21% (6/28)	44% (24/55)
	Compose organized letter	61% (17/28)	
	Compose organized report or presentation		33% (18/55)
	Use correct mechanics	29% (8/28)	24% (13/55)
	Total: All Communication	47% (53/112)	33% (55/165)

* Proficiencies that involve two outcome areas

See appendix for items scored on the proficiencies.

On the Choose a City prototype administered to the 6th-grade students, adequate or above responses ranged from 42% to 57% on items testing technology use in the area of Internet research proficiencies. Fifty-seven percent of the responses cited appropriate Web addresses (URL). Navigating to find relevant information was adequately demonstrated on 42% of the test forms, while in 46% of the cases the students were able to formulate an appropriate phrase-based search query. Of the 20 students completing the follow-up questionnaire, most students reported that they relied fully on the directories of links on the city Web sites. Five students reported using a search tool that Fort Collins made available on its Web site; 3 students used a search tool available from Knoxville's Tourism Alliance site; and 2 used a search engine of their choice (e.g., Ask Jeeves). Sixteen students reported that they preferred clicking links and browsing to using a search tool to find information on Web sites.

For the reasoning with information questions in the Choose a City prototype, students performed best on items that required them to generate a research problem (79%) and express it as a question (79%). These questions required students to go beyond the process of looking for relevant information (Items 1 and 3) or interpreting the information (Items 4 and 5). The research questions required students to infer information they might need and formulate a question to find it.

In the outcome area of communication, only 21% of the letters written by the 6th-grade students were rated as formulating an adequately supported recommendation. The organization of the letters was fairly good (61% adequate), but the use of correct mechanics was infrequent (29% adequate).

When the -6th-grade students were asked on the follow-up questionnaire what they would do if they had to research other cities, 10 out of 20 said they'd prefer to read printouts of the Web pages, 6 said they would prefer gathering information from reading Web pages online, and 3 said they would prefer reading information in books, magazines, or encyclopedias. The relatively small number who said they'd prefer the online research is a testimonial to the challenging nature of the assessment for many of the students.

In contrast to the Choose a City task, which engaged students in open-ended research, the EPA Phoenix assessment involved more directed research. For the outcome area of technology use, the strongest performances were on a series of selected-response items that directed students to find specific information on Web-based data representations (e.g., charts, data tables, and a map). Adequate responses to these items were the norm: 91% for using an attribute-based search tool to find targeted information in a Web-based database; 73% for finding information on a Web-based data table; and 80% for citing an appropriate URL. It should be noted that the attribute-based search query question was highly scaffolded.

Only 38% of the responses for formulating a phrase-based search query were judged to be adequate. These items required students to generate search queries, try them out, draw a conclusion about which was better, and defend their conclusions.

In the outcome area of reasoning with information, 97% of the responses were adequate for the item on interpreting information on a chart; 93% for interpreting information on a map; and 95% for drawing a conclusion from information on a map. Students were also successful (86%) on an item requiring transfer of appropriate data from one representation (a chart) to another (a data table template on the test form).

Scores were lower on constructed-response items that required students to examine data and formulate conclusions. For this group of items (Items 4, 5, 6, 11, and 17), students did best when the scope of their analysis was directed at one particular representation or one set of parallel representations (73% on recognizing patterns of data in a table they had just created; 73% on accessing and interpreting data they had to find on complex Web-based tables; 77% on drawing a conclusion from examining spreads of data points on a set of charts). Scores fell considerably when students were challenged to analyze and draw conclusions about data across multiple representations. Only 42% of the responses were adequate when students were asked to decide if Phoenix's air quality was good enough to host the championship games (Item 11).

In the communications outcome area, only 44% of the reports were judged to adequately make a recommendation and support it with evidence from the EPA Web site. In these reports, organization was weak (33% adequate) as was the use of correct mechanics (24%).

The results of the follow-up interviews with students completing the EPA Phoenix assessment revealed that low performers had difficulty making sense of the graphical representations and using data from them in the required ways. Specifically, students reported that understanding which parts of the charts and tables presented the data that they were seeking was a challenge, and they had difficulty figuring out what the different colors represented on a map, despite the map legend and some explanatory text in the directions. A Web-based information task that proved onerous to both high- and-low performing student interviewees required finding specific cells of data (average monthly temperature) at the bottom of tables displaying monthly day-by-day weather readings. The information-gathering task cited as easiest by both the
high- and low-performing students was opening an article they found from their search and summarizing it. Students reported that this was easiest because it most closely resembled the Web research tasks they did in school.

Differences between performance on the Choose a City and EPA Phoenix prototype assessments with regards to evaluating the credibility of information are worth noting. Eighty percent of the EPA Phoenix students recognized that a map about ozone pollution was of limited utility because it was out of date. In contrast, only 33% of the Choose a City students were able to find Web-based text that seemed questionable and explain why. Students may be more sensitive to information currency than to issues of bias. It is likely that the multiple-choice format used in the EPA Phoenix item but not Choose a City helped students to identify the questionable information.

On the quality of argumentation displayed in culminating compositions, only 21% of the Choose a City letters were judged as adequate and only 44% of the EPA Phoenix reports were considered well-supported recommendations. An earlier item on the EPA Phoenix assessment that required formulating an evidence-based conclusion also had low results (42% adequate). The lower performance by students writing letters in the Choose a City assessment was reflected also in their low performance on items asking them to find relevant information (44%).

It is possible that some of the students taking the EPA Phoenix assessment sacrificed time they could have spent on composing and organizing their reports by spending time on cosmetics and meeting the formatting and graphics directions. Students writing letters for the Choose a City assessment used a simple text editor and were not asked to include graphics. Observation of the two classes in School A completing the EPA Phoenix assessment suggested that the use of productivity tools proved to be somewhat of a distraction in a number of cases. Some students ignored the teachers' admonitions that they should focus on the content and not on making their compositions look nice with special fonts, background colors, and other cosmetics. Their presentations bear testimony to a high-level of technical proficiency with the word processing or presentation tool, which for some may have come at the expense of the quality of the report.

Table 3 presents the performance of students completing the Choose a City assessment in the different administration conditions.

Table 3

Choose a City Performance by Groups in Different Administration Conditions

	All Computer-Based	Computer-Based Research, Paper and Pencil Form	All Paper and Pencil
	% Adequate	**% Adequate**	**% Adequate**
Technology Use	59% (92/157)	23% (11/48)	NA
Reasoning with Information	50% (59/119)	38% (17/45)	50% (32/64)
Communication	50% (28/56)	42% (10/24)	47% (15/32)

The data indicate that the sixth grade students were able to handle the online administration of the assessment. The online group performed as well or better than the other groups. It was clear from our observations of the Choose a City pilot, however, that providing students some time to practice manipulation of the online assessment form is worthwhile. Students need an introduction to use of multiple windows and other facets of online assessment forms (e.g., scroll bars, text fields, submitting work to a database, navigating from one page to another). Such orientation would be in accord with the practice on standardized assessments of guiding students through a sample item.

Table 4 presents the performance of students participating in the Choose a City pilot test who worked individually (solo) or in pairs. Solo students appeared to perform somewhat better, but pair administration is usually more feasible given school technology resources.

Table 4

Choose a City
Student Performance Related to Group Size

	Paired	Solo
	% Adequate	**% Adequate**
Technology Use	45% (26/58)	63% (42/67)
Reasoning with Information	40% (38/94)	52% (70/134)
Communication	42% (20/48)	52% (33/64)

Influence of Prior Technology Experience

Although the numbers of students participating in the pilot tests were relatively small, we examined the relationship of students' reports of the frequency of relevant classroom activities over the prior 12 months to the adequacy of their performance in the three outcome areas. Frequency of classroom experience was defined as 1-3 times a month or once a week. Performance was categorized as adequate or inadequate. Due to the relatively small sample sizes in the pilot tests, data were combined from the pilot tests with the 31 6th-grade students on the Choose a City assessment and from the 66 8th-grade students on the EPA Phoenix assessment. For the technology use outcome area, reported frequency of relevant classroom activities was significantly related to adequacy of performance on IPAT prototypes ($\chi^2=6.22$, df=1, $p<.01$). For the outcome areas of reasoning with information ($\chi^2=1.05$, df=1, $p>.05$) and communication ($\chi^2=1.08$, df=1, $p>.05$) students' reports of frequency of related classroom activities were not significantly related to their performance. The relationship of student reports of opportunity to learn to their performance on IPAT assessments would need to be studied for larger numbers of students.

Teacher Follow-Up Responses. In follow-up interviews and responses to questionnaires, all teachers indicated that the assessments were worth their students' time and were at an appropriate level of difficulty. For the EPA Phoenix assessment, School A's technology resource teacher reported that the use of very explicit technical directions in the EPA Phoenix student form mirrored her practice of providing such directions for the hardware and software she has the students use in her lab. The School B science teacher whose students completed the assessment said that the content was well matched because they had been researching the topic of the environment in his curriculum. The teacher of the students who participated in the Choose a City pilot test said that the assessment was more demanding than the typical research assignments for her 6^{th}-graders. Her students were typically directed to Web sites that had been pre-screened and had all the information needed rather than asking students to navigate to find relevant Web pages themselves (an example is the wonders of the world assignment mentioned earlier). The teacher indicated that she felt that the challenges of the Choose a City assessment were worth the effort.

Pilot Test of Choose a City with High School Students. Table 5 displays the performance of the high school students who participated in the pilot test of the Choose a City prototype, which was administered online through Virtual High School (VHS). Secondary students taking the online versions of the courses out-performed students in the face-to-face versions of the classes on the prototype measures of technology use, reasoning, and communication (Kozma et al., 2000**)**. Results indicated that in general, students handled the search and word processing easily. Particularly revealing were the varieties of queries the students generated, the ways they interpreted the request to identify questionable information on the Web sites they visited, and their explanations of why they found the information questionable. Like the middle school students, high school students were more proficient at finding topically appropriate information than at reasoning with the information or communicating conclusions in a well-organized way. Not surprisingly, the most pronounced difference between the face-to-face and VHS students was in the technology use skill area, suggesting that the VHS students had acquired more of the skills needed for an information society than had students taking courses in traditional face-to-face format.

Table 5

Choose a City
Performance by High School Students in Online and Face-to-Face Courses

	Students in Online Courses	**Students in Face-to-Face Versions Courses**
	% Adequate	**% Adequate**
Technology Use	91% (52/57)	75% (38/51)
Reasoning with Information	78% (65/83)	75% (60/80)
Communication	90% ((131/145)	78% ((105/135)

CONCLUSIONS

The goals guiding the development of the Integrative Performance Assessments of Technology (IPAT) prototypes were to: (1) provide common, credible, technically sound measures of standards related to technology use, reasoning with information, and communication; (2) apply and extend an assessment design framework with modular components that could provide templates or task models for new or modified assessments addressing similar outcome areas; and (3) provide preliminary evidence about the technical quality of the general design approach and function of the prototype assessments. Through the development and pilot testing of the IPAT prototypes, the SRI assessment research team has gathered empirical data to support the robustness of the IPAT design templates and modular components for the systematic creation of assessment tasks. The pre-pilot trials and classroom pilot test data support the appropriateness, usability, and utility of the prototypes. Further, the pilot data provide preliminary evidence of the assessments' validity and reliability.

The Potential of the Integrative Performance Assessments of Technology Design. The design template for the Integrative Performance Assessments of Technology is composed of a set of interrelated modules that lay out the problem to be addressed, the reasoning strategies to be elicited, the communication purposes and forms, and the technology tools to be employed to support problem-solving activities. The IPAT problem-based activity flow involves posing an authentic problem, gathering relevant information and data, analyzing and interpreting information and data, and communicating findings and conclusions (Quellmalz, 1987). SRI assessment researchers have used the IPAT framework to develop templates shaping the prototypes for the Choose a City and EPA Phoenix assessments. For the Choose a City assessment, separate middle-school and secondary-level versions were created.

Many variations on these prototype assessments could be generated based on the IPAT framework. For example, the Choose a City and EPA Phoenix prototypes could be modified by changing the cities involved or the technology module for communicating conclusions. The

EPA Phoenix assessment could use different forms of pollution or different years for which data are requested.

IPAT can be extended beyond these specific assessments to produce different templates. In a prior project completed for the WorLD program, for example, SRI assessment researchers employed the evolving IPAT framework in developing problem scenarios involving Chinese culture and endangered species. The assessments asked students to conduct Internet research. The assessment on Chinese culture (e.g., medicine, architecture) had two separate forms that varied the specifications within the reasoning module (compare or predict). The assessment on endangered species had separate forms that varied the reasoning requirements through use of different question formats (multiple-choice or constructed responses).

Technical Quality Information for the IPAT Prototypes. The IPAT prototypes were developed in accordance with established test development standards (AERA/APA/NCME, 1999). Support for the content validity of the assessments was provided by the pre-pilot think-alouds conducted with small samples of middle- and secondary-level students. In addition, the assessments were reviewed by SRI technology researchers, district technology coordinators, and teachers of students participating in the pilot tests. These screening activities supported the appropriateness of the assessments' content and structure. The reviews by the district coordinators and teachers also confirmed that the assessments were at appropriate levels of complexity for the students. Teachers judged that the assessments were appropriate tests for outcomes they address in their technology curricula. The teachers judged that the assessments provided useful information about their students' proficiencies in the outcome areas.

The soundness of the rubrics and scoring methods was demonstrated during the scoring of the prototypes. Rater agreement levels indicated that the scoring criteria can be applied reliably when standard rater training and scoring methods are used. Data yielded by the analytic scoring rubrics can provide teachers with in-depth diagnoses of the elements of students' technology use, reasoning, and communication proficiencies. Analyses of student performance produced results that distinguished among different levels of technology use as reported by teacher interviews and student ratings of the frequency of their classroom technology activities. Further, the performance on the assessments reflected students' reported frequencies of classroom activities related to technology use, reasoning, and communication activities. Therefore, results from the pilot tests suggest that the prototypes could be considered for use in evaluations aiming to measure baseline and growth in the targeted outcome areas or for comparisons of technology programs.

Sound assessment methodology would dictate further field-testing of the prototypes and of assessments developed according to the IPAT templates to confirm the validity of the instruments for future users' intended purposes. At this stage of development, the Integrative Performance Assessments of Technology framework and prototypes hold promise for providing evaluators and teachers with evidence of students' ability to use technology to engage in problem-based inquiry and communication.

The IPAT design framework is currently being employed and extended in a 3-year project funded by the National Science Foundation, "Coordinated, Innovative Designs for International Information Communication Technology Assessment in Science and Mathematics Education." The IPAT prototype assessments are available to the public for print or online administration at http://ipat.sri.com.

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APPENDIX A
Blueprint for IPAT Forms

Outcome Area	Proficiency	Choose a City Item Numbers	EPA Phoenix Item Numbers
Technology Use	Navigate the Web to find relevant information *	1 (a, d, g, j)	
	Cite URL	1(b, c, e, f, h, i, k, l)	16
	Formulate Web search query	3	14 & 15
	Use attribute-based search tool to find targeted information in Web-based data base		1
	Access and find specific information on a complex Web-based data table *		12
	Use graphics in a report composed with word processor		17
	Use presentation tool		17
Reasoning with Information	Navigate the Web to find relevant information *	1 (a, d, g, j)	
	Find relevant information in Web-based text		16
	Evaluate credibility of Web-based textual information	4	
	Evaluate credibility of information on Web-based data representation (map)		10
	Formulate a research question	2	
	Interpret information on a chart		2
	Interpret information on a map		7
	Draw conclusion from information on a map		8 & 9
	Access and find specific information on a complex Web-based data table *		12
	Transfer appropriate information from one data representation (chart) to another (data table)		3
	Recognize patterns of data in a data table		4
	Draw conclusion from spread of data points on a set of charts		5 & 6
	Examine multiple data representations in order to formulate evidence-based conclusion		11
	Formulate argument (i.e., evidence-based conclusion from data) *	5	17
Communication	Formulate a research question	2	
	Formulate argument (i.e., evidence-based conclusion from data) *	5	17
	Compose organized letter	5	
	Compose organized report or presentation		17
	Use correct mechanics	5	17

* = proficiency that addresses two outcome areas

APPENDIX B
Comparison of Student Background Questionnaires

Item	**Used for....**		**Corresponding Outcome Areas**		
	Choose a City	EPA Phoenix	Technology Use	Reasoning with Information	Communication
Finding information on the Internet for class assignments	x	x	x	x	
Using a computer to write or read email	x	x	x		
Using a computer to write reports or other compositions	x	x	x		x
Using a computer to create slide presentations		x	x		x
Using a computer to write computer programs, design Web pages, use spreadsheets or other computer based math tools, or use software that simulated real places or scientific processes	x	x	x	x	
Doing research projects, either with or without computers	x	x	x	x	
Finding Information on the Internet but not for class assignments		x	x	x	
Gathering Information on the Internet to make a decision	x		x	x	
Using computers for any sort of purpose	x	x	x		

APPENDIX C

Choose a City
Student Background Questionnaire

1. How often have you been using a computer to find information on the Internet since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

2. How often have you been using a computer to write or read email since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

3. Not including email, how often have you been using a computer to write reports or other compositions since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

4. How often have you done one or more of the following tasks on computer since the current school year began, either at school or at home?

- Wrote computer programs
- Designed web pages
- Used spreadsheets or other computer-based math tools
- Used software that simulates real places or scientific processes

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

5. How often have you been doing research projects since the current school year began, either with or without computers, at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

6. How often since the current school year began have you turned to the World Wide Web to gather information because you had to make a choice about something, and decided that going to the Web would be a good way to get the information you need to help you make that choice (either at school or at home)?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

7. How often have you been using computers since the current school year began, either at school or at home, for any reason?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more

8. What is your gender?

____ Male
____ Female

APPENDIX D

EPA Phoenix
Student Background Questionnaire

1. How often have you been using computers to find information on the Internet for class assignments, since the current school year began,

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

2. How often have you been using computers to find information on the Internet since the current school year began, and it was not part of a class assignment.

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
___ Average of once a week or more
____ Don't know

3. How often have you been using computers to write reports since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

4. How often have you been using computers to create slide presentations since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
___ Average of once a week or more
____ Don't know

5. How often have you been using computers to <u>write or read email</u> since the current school year began, either at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

6. How often have you been doing <u>one or more of the following tasks</u> on computers since the current school year began, either at school or at home?

- Programming
- Designing web pages
- Using spreadsheets or other computer-based math tools
- Using software that simulates real places or processes

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

7. How often have you been using computers since the current school year began, either at school or at home, <u>for any reason</u>?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

8. How often have you been doing <u>research projects</u> since the current school year began, <u>either with or without computers</u>, at school or at home?

____ Not at all
____ 1-5 times
____ 6-11 times
____ Average of 1-3 times a month
____ Average of once a week or more
____ Don't know

9. What is your gender?
____ Male
____ Female

APPENDIX E

Choose a City
Student Follow-Up Questionnaire for Students Doing Online Research and Letter-Writing (Groups A & B)

1. Fort Collins' Web site has a search tool in it. Did you use this search tool in your research?

___ yes

___ no

How many times? ____

2. The Knoxville Tourism Alliance's Web site has a search tool in it. Did you use this search tool in your research?

___ yes

___ no

How many times? ____

3. Your Web browser comes with various search tools (such as Yahoo or Excite). Did you use any of them in your research?

___ yes

___ no

How many times? ____

4. Generally speaking, which research strategy worked best for finding appropriate information?

____ using the search tools to carry out searches

____ clicking links to browse the various Web pages

5. Which of the two cities was hardest to get information about? (Knoxville or Fort Collins). Why?

6. Which of the two cities was easiest to get information about? (Knoxville or Fort Collins). Why?

7. What was the hardest part of Choose-A-City? Why?

8. What was the easiest part of Choose-A-City? Why?

9. If you had to do a Choose-A-City again, but for different cities, check how you would want to gather the information:

____ I would prefer gathering information by reading books, magazines, or enyclopedias.
____ I would prefer gathering information from reading Web pages online.
____ I would prefer gathering information from reading print-outs of Web pages.

10. Any other comments or reactions?

APPENDIX F

Choose a City
Student Follow-Up Questionnaire for Students Doing Paper and Pencil Research and Letter-Writing (Group C)

1. Which of the two cities was hardest to get information about? (Knoxville or Fort Collins).
   Why?

2. Which of the two cities was easiest to get information about? (Knoxville or Fort Collins).
   Why?

3. What was the hardest part of Choose-A-City? Why?

4. What was the easiest part of Choose-A-City? Why?

5. If you had to do a Choose-A-City again, but for different cities, check how you would want to gather the information:

____ I would prefer gathering information by reading books, magazines, or enyclopedias.
____ I would prefer gathering information from reading Web pages online.
____ I would prefer gathering information from reading print-outs of Web pages.

6. Any other comments or reactions?

APPENDIX G

EPA Phoenix
Student Follow-Up Questionnaire

1. Please CIRCLE THE NUMBER that represents how easy or difficult the different parts of the Phoenix Task were:

	1=very difficult 2=a little difficult 3=kind of easy 4=very easy			
Following the directions (in general, throughout the parts)	1	2	3	4
Generating the PSI charts	1	2	3	4
Filling out the table of unhealthful days	1	2	3	4
Answering the questions about the PSI charts	1	2	3	4
Answering the questions about the ozone map	1	2	3	4
Getting the correct weather information	1	2	3	4
Explaining which Web search worked better	1	2	3	4
Finding information about the effects of ozone on health	1	2	3	4
Writing the report or presentation	1	2	3	4
Using different fonts (if you wrote a report)	1	2	3	4
Creating multiple slides (if you did a presentation)	1	2	3	4
Numbering pages (or slides, if you did a presentation)	1	2	3	4

2. What was the easiest thing you had to do in the Phoenix task?

3. What was the hardest thing you had to do in the Phoenix task?

4. What did you like best about the Phoenix task?

5. What did you like least about the Phoenix task?

6. If you had a chance to change something about the Phoenix task, what would you change (if anything)?

7. Would you like to do more activities like the Phoenix task in school?

8. If you had the chance to put your answers to Parts A-D on the computer instead of on paper, would you prefer that or do your prefer paper?