Technical Notes
Educational Technology in Public School Districts, Fall 2008

Data Disclosure Warning

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Data perturbations were conducted on some background data to preclude identification of individuals and institutions.

Fast Response Survey System

The Fast Response Survey System (FRSS) was established in 1975 by the National Center for Education Statistics (NCES), U.S. Department of Education. FRSS is designed to collect issue-oriented data within a relatively short time frame. FRSS collects data from state education agencies, local education agencies, public and private elementary and secondary schools, public school teachers, and public libraries. To ensure minimal burden on respondents, the surveys are generally limited to three pages of questions, with a response burden of about 30 minutes per respondent. Sample sizes are relatively small (usually about 1,000 to 1,500 respondents per survey) so that data collection can be completed quickly. Data are weighted to produce national estimates of the sampled education sector. The sample size permits limited breakouts by classification variables. However, as the number of categories within the classification variables increases, the sample size within categories decreases, which results in larger sampling errors for the breakouts by classification variables.

Sample and Response Rates

The sample for the FRSS 2008 district survey on educational technology consisted of 1,589 public school districts in the 50 states and the District of Columbia. This survey was one of three related FRSS surveys conducted under a nested design involving a sample of schools, districts that administered the sampled schools, and teachers within the sampled schools. The selection of districts included two stages.

For the first stage, a nationally representative sample of regular U.S. public schools was selected from the 2005–06 NCES Common Core of Data (CCD) Public School Universe file, which was the most current file available at the time of selection. The sampling frame included 85,719 regular schools. Excluded from the sampling frame were schools with a high grade of prekindergarten or kindergarten and ungraded schools, along with special education, vocational, and alternative/other schools; schools outside the 50 states and the District of Columbia; and schools with zero or missing enrollment. To select the sample, the public school sampling frame was stratified by level (elementary or secondary/combined), categories of enrollment size, and categories for percent of students eligible for free/reduced-price lunch. To improve the representativeness of the sample, an implicit stratification was induced by sorting the schools within each stratum by type of locale and region prior to sampling. Within each stratum, schools were sampled systematically and with equal probabilities at predetermined rates that varied from stratum to stratum.

For the second stage, the public school districts that contained at least one sampled school were identified using the 2005–06 CCD Local Education Agency file. The sample for the district survey was comprised of these districts. The district sample is representative of all public school districts in the nation that administer at least one regular school as described above.

Questionnaires and cover letters for the study were mailed to the superintendent of each sampled school district in early August 2008. The letter introduced the study and requested that the questionnaire be completed by the person most knowledgeable about educational technology in the district. Respondents were offered the option of completing the survey via the web or by mail. Telephone follow-up for survey nonresponse and data clarification was initiated in late August 2008 and completed in January 2009.

Of the 1,589 school districts in the sample, 60 were found to be ineligible for the survey because the district had closed or merged with another district. For the eligible districts, the response rate was 92 percent (1,408 responding districts divided by the 1,529 eligible school districts in the sample). The weighted response rate was 90 percent. Of the districts that completed the survey, 75 percent completed it by web, 21 percent completed it by mail, 4 percent completed it by fax, and less than 1 percent completed it by telephone.

Although item nonresponse for key items was very low, missing data were imputed for the items with a response rate of less than 100 percent. The missing items included both numerical data such as the number of schools with Digital Subscriber Line (DSL) connections to the district, as well as categorical data such as whether the district had written policies on student use of cell phones. The missing data were imputed using a “hot-deck” approach to obtain a “donor” district from which the imputed values were derived. Under the hot-deck approach, a donor district that matched selected characteristics of the district with missing data (the recipient district) was identified. The matching characteristics included metropolitan status, geographic region, district enrollment size, district type code, and agency charter code (indicating the presence of charter schools in the district). In addition, relevant questionnaire items were used to form appropriate imputation groupings. Once a donor was found, it was used to obtain the imputed values for the district with missing data. For categorical items, the imputed value was simply the

corresponding value from the donor district. For numerical items, the imputed value was calculated by taking the donor's response for that item (e.g., number of schools with DSL connections to the district network) and dividing that number by the total number of schools connected to the district network. This ratio was then multiplied by the total number of schools connected to the district network in the recipient district to provide an imputed value. Imputation flags are included in the data.

Weighting Procedures and Sampling Errors

The response data were weighted to produce national estimates (see table 1). The weights were designed to adjust for the variable probabilities of selection and differential nonresponse. FRSS survey data are based on complex sample designs that require the use of weights to compensate for variable probabilities of selection, differential response rates, and possible deficiencies in the sampling frame. The reciprocal of the probability of selection, referred to as the "base weight," will produce unbiased (or consistent) estimates of population totals and ratios if there is no nonresponse in the survey. Since the sample of districts was selected through the selection of a stratified sample of schools, the base weight for the *i*-th district was computed as $w_{hi}=1/f_h$ where f_h is the overall probability of selecting the district for the study. Note that f_h depends on number of schools in the district and the strata to which the associated schools were assigned for sampling.

Table 1. Number and percent of responding public school districts in the study sample, and estimated number and percent of public school districts the sample represents, by district characteristics: Fall 2008

District characteristic	Respondent sample (unweighted)		National estimate (weighted)	
	Number	Percent	Number	Percent
All public school districts	1,408	100	13,600	100
District enrollment size				
Less than 2,500	457	32	9,600	70
2,500 to 9,999	512	36	3,200	23
10,000 or more	439	31	900	6
Community type				
City	277	20	800	6
Suburban	457	32	3,100	23
Town	225	16	2,500	18
Rural	449	32	7,200	53
Region				
Northeast	284	20	3,200	24
Southeast	312	22	1,600	11
Central	398	28	5,100	37
West	414	29	3,700	28
Poverty concentration				
Less than 10 percent	413	29	4,100	30
10 to 19 percent	574	41	5,600	41
20 percent or more	419	30	3,900	29

NOTE: There were a small number of cases for which poverty concentration was missing. Detail may not sum to totals because of rounding or missing data for poverty concentration.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System (FRSS), "Educational Technology in Public School Districts," FRSS 93, 2008.

Although the survey had a high response rate, adjustment of the base weights was necessary to compensate for the survey nonrespondents (i.e., whole questionnaire or unit nonresponse). To compensate for unit nonresponse, an adjustment factor was computed as the inverse of the base-weighted response rate within selected weighting classes. This factor was then used to inflate the base weights of the districts in the weighting class to obtain the final nonresponse-adjusted weight.

The survey findings were presented in a *First Look* report titled *Educational Technology in Public School Districts: Fall 2008* (NCES 2010-003). The reported findings are estimates based on the sample selected and, consequently, are subject to sampling variability. The standard error is a measure of the variability of an estimate due to sampling. It indicates the variability of a sample estimate that would be obtained from all possible samples of a given design and size. Standard errors are used as a measure of the precision expected from a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.96 standard errors below to 1.96 standard errors above a particular statistic would include the true population parameter being estimated in about 95 percent of the samples. This is a 95 percent confidence interval. For example, the estimated percentage of public school districts with a district network is 84.0 percent, and the standard error is 2.0 percent. The 95 percent confidence interval for the statistic extends from 84.0 – (2.0 x 1.96) to 84.0 + (2.0 x 1.96), or from 80.1 to 87.9 percent. The coefficient of variation ("c.v.," also referred to as the "relative standard error") of an estimate (y) is defined as c.v. = (s.e. / y) x 100, where s.e. is the standard error of the estimate y.

Because the data from the FRSS educational technology survey were collected using a complex sampling design, the variances of the estimates from this survey (e.g., estimates of proportions) are typically different from what would be expected from data collected with a simple random sample. Not taking the complex sample design into account can lead to an underestimation of the standard errors associated with such estimates. Estimates of standard errors were computed using a technique known as jackknife replication. As with any replication method, jackknife replication involves constructing a number of subsamples (replicates) from the full sample and computing the statistic of interest for each replicate. The mean square error of the replicate estimates around the full sample estimate provides an estimate of the variance of the statistic. To construct the replications, 50 stratified subsamples of the full sample were created and then dropped one at a time to define 50 jackknife replicates. A computer program (WesVar) was used to calculate the estimates of standard errors using the JK1 option.

Nonsampling Errors, Coding, and Editing

The survey estimates are also subject to nonsampling errors that can arise because of nonobservation (nonresponse or noncoverage) errors, errors of reporting, and errors made in data collection. These errors can sometimes bias the data. Nonsampling errors may include such problems as misrecording of responses; incorrect editing, coding, and data entry; differences related to the particular time the survey was conducted; or errors in data preparation. While general sampling theory can be used to determine how to estimate the sampling variability of a statistic, nonsampling errors are not easy to measure and, for measurement purposes, usually require that an experiment be conducted as part of the data collection procedures or that data external to the study be used.

To minimize the potential for nonsampling error, the questionnaire was pretested with school district respondents. During the design of the survey and the survey pretest, an effort was made to check for consistency of interpretation of questions and definitions and to eliminate ambiguous items. The questionnaire and instructions were extensively reviewed by NCES and the data requester at the Office of Educational Technology.

Editing of the questionnaire responses was conducted to check the data for accuracy and consistency. Cases with missing or inconsistent items were recontacted by telephone. A coding source file and editing specifications were used to produce the codebook. The codebook served as the main tool for coding, editing, and processing completed questionnaires. Coders used the codebook to identify cases requiring data retrieval or clarification and prepare cases for entry into the web application. The source file served as a data dictionary and included the data file layout, a description of each data item, a list of valid response codes or range formats with codes for nonresponse and inapplicable, and defined skip patterns.

Logics, ranges, and validation checks were prepared prior to data collection and included online edit checks, manual logic checks, and automated checks using SAS. Online checks were incorporated into the web application and manual edits were conducted to process cases received by mail, fax, or telephone. Steps were taken to ensure that the method of entering data from web and hardcopy questionnaires was the same, regardless of mode. For example, to enter survey data received by mail, fax, or telephone, the data processing staff accessed the survey website as "respondents" and "completed" the survey using the responses on the hardcopy survey. Subjecting all survey responses to the same set of built-in logics, ranges, and validation checks helps to ensure that data entry does not produce systematic differences in the survey data. In addition, all hardcopy data were subject to 100 percent verification using "doublekeying."

Definitions of Selected Analysis Variables

Many of the district characteristics, described below, may be related to each other. For example, district enrollment size and community type are related, with city districts typically being larger than rural districts. Other relationships between these analysis variables may exist.

District Enrollment Size (SIZE)—This variable indicates the total number of students enrolled in the district based on data from the 2005–06 CCD. The variable was collapsed into the following three categories:

Less than 2,500 students
2,500 to 9,999 students
10,000 or more students

Community Type (URBAN)—This variable indicates the type of community in which the district is located based on data from the 2005–06 CCD Local Education Agency (School District) Locale Code files. The 12 category urban-centric district locale code that was assigned using the 2000 Decennial Census data was collapsed into the following four categories:

City—Includes large, midsize, and small principal cities
Suburban—Includes large, midsize, and small urbanized territories outside principal cities
Town—Includes fringe, distant, and remote territories that are inside an urban cluster
Rural—Includes fringe, distant, and remote territories that are outside of urbanized areas and urban clusters

Region (OEREG)—This variable classifies districts into one of the four geographic regions used by the Bureau of Economic Analysis of the U.S. Department of Commerce. Data were obtained from the 2005–06 CCD Local Education Agency Universe file. The geographic regions are as follows:

Northeast—Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

Southeast—Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia

Central—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin

West—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming

Poverty Concentration (POVST)—This variable indicates the percentage of children in the district ages 5–17 in families living below the poverty level, based on the Title I data provided to the U.S. Department of Education by the U.S. Census Bureau, "Small Area Income and Poverty Estimates." For detailed information on the methodology used to create these estimates, please refer to http://www.census.gov/did/www/saipe/index.html.

Data on this variable were missing (not ascertained) for a small number of responding districts. The variable was collapsed into the following categories:

Not ascertained
Less than 10 percent
10 to 19 percent
20 percent or more

Definitions of Terms

Definitions included on the questionnaire:

Technology: Information technology such as computers, devices that can be attached to computers (e.g., LCD projector, interactive whiteboard, digital camera), networks (e.g., Internet, local networks), and computer software. We specifically are not including non-computer technologies such as overhead projectors and VCRs.

Asset recovery program: Asset recovery programs provide third-party disposal services for owned or leased computers, which are then usually refurbished or recycled.

Blogs: Websites where an individual or group creates a running log of entries that can be read by other users, such as in a journal.

Wikis: Collaborative websites that allow users to freely create and edit web page content (e.g., Wikipedia).

Social networking websites: Online social networks for communities of people who share interests and activities or who are interested in exploring the interests and activities of others (e.g., Facebook, MySpace).

Definitions for types of network connections (these definitions were not included on the questionnaire):

Dial-up connection: Data transmission through a normal telephone line upon command, at the maximum speed of 56 KB per second.

ISDN (Integrated Services Digital Network): Sends voice and data over digital telephone lines or normal telephone wires at the speed of up to 128 KB per second.

DSL (Digital Subscriber Line): Refers collectively to a group of digital subscriber lines, including ADSL (Asymmetric Digital Subscriber Line), SDSL (Symmetric Digital Subscriber Line), HDSL (High Data Rate Digital Subscriber Line), and SHDSL (Single-Pair High-Speed Digital Subscriber Line). Available transmission speeds vary according to provider and geographic area.

Broadband cable: Dedicated transmission of data through cable TV lines. Available transmission speeds vary according to provider and geographic area.

T1 or DS1: Dedicated digital transmission of data and voice at a speed up to 1.5 MB per second; composed of 24 channels.

T3 or DS3: Dedicated digital transmission of data and voice at a speed up to 45 MB per second; composed of 672 channels.

Direct fiber: Transmission of data by sending pulses of light through an optical fiber. With direct fiber architecture, each fiber leaving the central location goes to exactly one customer. Available transmission speeds vary according to provider and geographic area.

Wireless: Transmission of data without the use of physical wires or cables. Generally uses electromagnetic waves, such as radio waves, microwaves, or laser beams. Available transmission speeds vary according to provider and geographic area.