Chapter 4
Data Collection Methodology and Results

4.1   Data Collection Overview

This chapter describes the data collection procedures for students for the base year of the Education Longitudinal Study of 2002 (ELS:2002). Data collection procedures for sources of contextual data (i.e., school administrators, librarians, teachers, parents, and facilities) are also discussed. Student data collection began in schools on January 21, 2002, and ended in the schools in June 2002. Telephone interviews with nonresponding students ended on August 4, 2002. Data collection from school administrators, library media center coordinators, and teachers ended in September 2002. Parent data collection ended on October 17, 2002. Results are summarized in table 42 and in figure 6 and provided in detail later in the chapter.

Table 42.   Summary of ELS:2002 base year completion and coverage rates: 2002

| Instrument	Selected	Participated	Weighted percent	Unweighted percent
Student questionnaire	17,591	15,362	87.28	87.33
Student assessment[1]	15,362	14,543	95.08	94.67
Parent questionnaire[2]	15,362	13,488	87.45	87.80
Teacher ratings of students[3]	15,362	14,081	91.64	91.66
School administrator questionnaire	752	743	98.53	98.80
Library media center questionnaire	752	718	95.93	95.48
Facilities checklist	752	752	100.00	100.00

[1]Percentage of cases for which a student questionnaire was obtained for which a cognitive test was also obtained. When a test was not obtained, test results were imputed.
[2]Indicates a coverage rate, the proportion of participating students with a parent report. More parents participated; completed case numbers reflect the records in the public-use data file, where parent (and teacher) data were excluded for students who did not complete a base year student questionnaire.
[3]Indicates a coverage rate: ratings obtained from at least one teacher.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Figure 6. Completion and coverage rates for ELS:2002 base year: 2002

Percent

Instruments
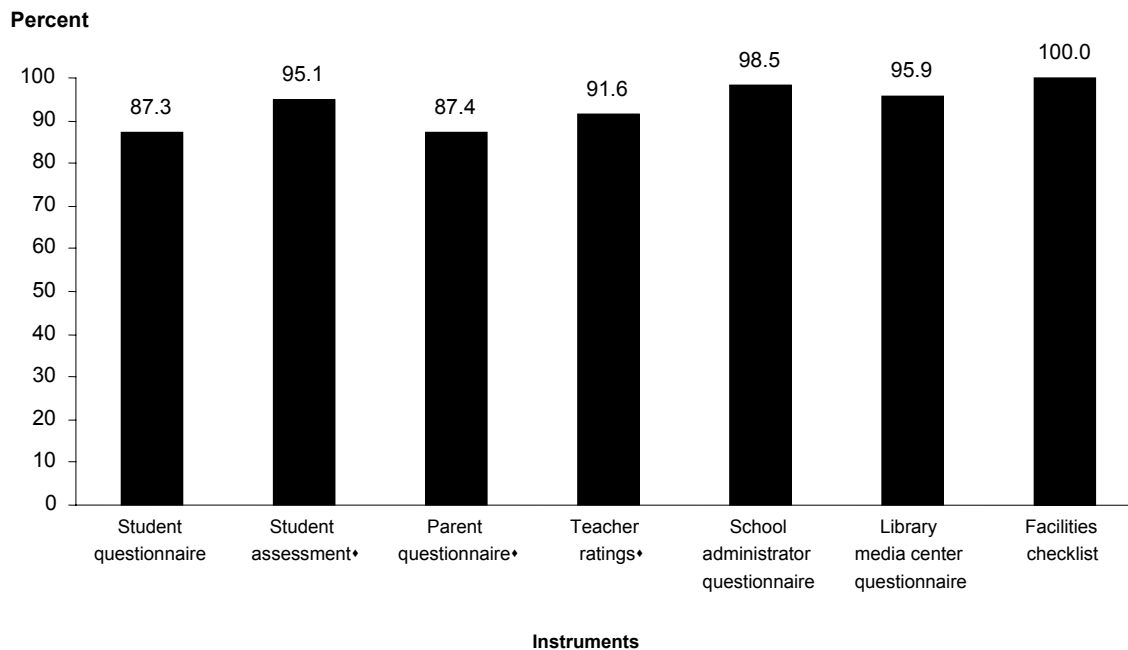
♦Denotes a coverage rate.
NOTE: All completion rates are weighted.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

4.2 Study Endorsements, School Recruitment, and Pre-data Collection Activities

4.2.1 Study Endorsements

During the field test of the base year study, endorsements were secured from organizations felt to be influential in the eyes of the various entities being asked to participate in the study (school administrators, librarians, teachers, students, and parents). The following organizations provided endorsements:

American Association of School Administrators
American Association of School Librarians
American Federation of Teachers
Council of Chief State School Officers
Council of the Great City Schools
National Association of Independent Schools
National Association of Secondary School Principals
National Catholic Educational Association, Department of Secondary Schools
National Education Association
National PTA
National Resource Center for Safe Schools
National School Boards Association

National School Safety Center
Seventh-Day Adventist Church

The list of endorsing organizations was included on the ELS:2002 letterhead for the lead letters that were sent at the state, district, and school levels. Endorsing agencies were also listed in an informational brochure and on the ELS:2002 public web site. Some organizations gave additional help in refusal conversion efforts with principals or headmasters.

4.2.2 School Recruitment

Before school recruitment could begin, it was necessary to obtain permission to contact the schools. The Chief State School Officers (CSSOs) of each state (as well as the District of Columbia) were contacted to begin the approval process. Each CSSO was sent an information package. The package was addressed to the CSSO and contained a lead letter from the National Center for Education Statistics (NCES) project officer, a letter from the RTI project director, a study brochure, and a sample endorsement letter. The packages were sent by Federal Express so that it would be possible to track receipt.

About 1 week after sending the information package, the CSSOs were contacted by telephone. Project staff contacted CSSOs in states with particularly large numbers of schools or states in which there was reason to believe that the environment might make cooperation less likely; the staff of institutional recruiters contacted the remaining CSSOs. At that time, it was confirmed that the package had been received and it was determined who had been given responsibility for approving the study for the state. That person was then contacted to answer any questions and discuss participation. When asked, the state officials were provided with the number of schools and districts selected from their state, but for reasons of confidentiality, no districts or schools were named.

Permission to proceed to the district level was obtained in all 50 states as well as the District of Columbia. At the time permission was obtained at the state level, a person at the state level was identified to serve as a point of contact to address any questions from the districts about the state's participation. States were asked to provide a letter of endorsement from the state. A sample letter was provided as a template that the states could follow, if desired. A postage-paid envelope addressed to RTI was included to facilitate return of an endorsement letter. Endorsement letters were received from 40 states and the District of Columbia.

Once state approval was obtained, an information package was sent to each district/diocese that had sampled schools in the state. The package was addressed to the superintendent and sent by Federal Express. The package contained a lead letter from the NCES project officer, a letter from the RTI project director, a study brochure, a list of endorsing agencies, the state endorsement letter (if provided), and a sample endorsement letter.

Several days after sending the information package, the superintendents were contacted by telephone. The staff of institutional recruiters conducted telephone contacts with the districts. At the time of the call, it was confirmed that the package had been received and it was determined who had been given responsibility for approving the study for the district/diocese. That person was then contacted to answer any questions and discuss participation.

Permission to proceed to the school level was received from 693 of the 829 districts/ dioceses having eligible sampled schools (83.6 percent).[47] This represented a total of 891 eligible schools that had district/diocese permission to contact, among 1,059 eligible schools affiliated with districts/dioceses (84.1 percent).[48] As at the state level, approving districts/ dioceses were asked to identify a contact person at that level and to send a letter of endorsement. Endorsement letters were received from 148 districts/dioceses.

For public and Catholic schools, school-level contact was begun as soon as district/diocese approval was obtained. For private non-Catholic schools, it was not necessary to wait for higher approvals, though endorsements from various private school organizations were sought.

As at the state and district levels, each school was sent an informational package by Federal Express. The package was addressed to the principal and contained a letter from the NCES project officer, an informational brochure, any relevant endorsement letters from the National Catholic Educational Association (NCEA) or the National Association of Independent Schools (NAIS), and a publication entitled "Uses of Data for the Education Longitudinal Study of 2002 (ELS:2002). It also contained a state and/or district endorsement letter, if provided.

Several days after the package was sent, the school was contacted by telephone. After determining the appropriate person with whom to speak, the recruiter provided details about the study and answered any questions. If the school agreed to participate, a school coordinator was identified. This person served as a point of contact at the school and was responsible for handling the logistical arrangements. Dates for a Survey Day and two make-up days were scheduled. At the same time, staff members were designated to receive the school administrator and library media center questionnaires. It was determined whether the type of parental consent used by the school was active (written) consent or passive (implicit) consent. Schools were offered the opportunity to provide endorsement letters to be included with the consent letter to the parents. Among the participating schools, 114 (or about 15 percent of the sample) provided these letters.

The most common objection voiced during the recruitment process was concern about burden, loss of instructional time, and overtesting of students. These were the overwhelming reasons cited for refusals both at the district and school level.

In addressing the concerns, flexibility in scheduling was offered to the schools. Survey Days were conducted from mid-January through the beginning of June so that schools could choose a date when they were less busy. Some 61.6 percent (unweighted) of eligible schools participated and 38.4 percent refused. Of the school refusals, approximately 36 percent occurred at the district level and 64 percent at the school level. Eleven schools allowed administration of the student questionnaire but did not allow any testing. In 2 additional schools, the school allowed administration of the student questionnaire and a math test, but no reading test.

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[47] An additional 14 districts were contacted. Ten districts reported information indicating that their selected school(s) were ineligible. Four districts were contacted conditionally, but their schools were not selected.
[48] There were 162 eligible sample schools not affiliated with districts/dioceses.

4.2.3 Pre-data Collection Activities

After obtaining school approval for the study, a study notebook was sent to the coordinator that detailed the tasks for which he/she was responsible and included instructions on preparing and sending a 10th-grade enrollment list. The coordinator was asked to provide an enrollment list of 10th-grade students. For each student, the coordinator was asked to give information about sex, race, ethnicity, and whether the student had an individualized education program (IEP). Some schools also agreed to provide Social Security numbers and/or school identification numbers to facilitate tracing in the longitudinal follow-up. After the enrollment list was received, students were sampled. The list of sampled students was sent to the coordinator and he/she was asked to provide address and telephone information for each student. The coordinator was also asked to provide the titles of the students' English and mathematics courses and the teachers of those subjects for each student. Approximately 2 months prior to the scheduled Survey Day, the coordinator was asked to send another enrollment list of their 10th-grade students. This information was used to identify students who had enrolled after the original list was provided.

Approximately 135 survey administrators were trained to conduct data collection in the schools. Prior to training, each survey administrator (SA) was mailed a copy of the survey administrator manual and a home study exercise. The SAs were instructed to read the manual prior to training and complete the home study exercise to be turned in on the first day of training. Training was held for 2 days each in Durham, North Carolina, and Los Angeles, California, in early January 2002. Staff from five field supervisor regions were trained at each session. With the exception of an introductory session that was held with the regional training group as a whole, the SAs were divided into training groups by field supervisor region. Each training room contained a lead trainer from the project staff and a field supervisor. The training agenda is shown below in figure 7.

Each SA received case assignment cards for each of his/her assigned schools. The case assignment cards contained information about the school, including the name and phone number of the school coordinator and the designated Survey Day and make-up day. After training, the SAs contacted each study coordinator prior to Survey Day to make logistical arrangements. These arrangements included verifying that the test supplies had arrived, that the coordinator had reserved a room for testing, and the coordinator had distributed staff questionnaires as well as reminder notices to sampled students. At the same time, the SA determined if the coordinator had received any parental refusals. If so, the SA began refusal conversion efforts (if the school was willing to provide a telephone number for the parent). In active (explicit) consent schools, the SA also determined from the coordinator which parents had not yet returned permission forms. If the school was willing to provide telephone numbers, the SA began calling the parents to prompt them to return the forms.

Figure 7. Survey administrator training agenda: 2002

Day 1		Day 2	
8:30 – 8:40	Introductions	8:30 – 9:15	Survey Day from start to finish
8:40 – 8:45	Confidentiality	9:15 – 10:30	Disposition of forms
8:45 – 9:15	Prior NCES studies/Overview of ELS:2002	10:30 – 10:45	BREAK
		10:45 – 11:15	Contacting parents
9:15 – 9:30	Prior contacts with schools	11:15 – 11:30	Student and staff nonresponse follow-up
9:30 – 10:30	Case assignment card (CAC), working with the school coordinator		
10:30 – 10:45	BREAK	11:30 – 12:00	Hiring and training survey administrator assistants (SAAs)
10:45 – 12:00	Working with the school coordinator (continued)	12:00 – 1:00	LUNCH
12:00 – 1:00	LUNCH	1:00 – 1:15	Dealing with disruptive students/ other problems at schools
1:00 – 2:00	Survey Day logistics	1:15 – 3:00	Headway procedures
2:00 – 2:15	Routing test exercise	3:00 – 3:15	BREAK
2:15 – 2:45	Student questionnaire	3:15 – 5:00	Distribution of assignments
2:45 – 3:15	Edit exercise		
3:15 – 3:30	BREAK		
3:30 – 4:00	Facilities checklist		
4:00 – 4:15	Staff questionnaires		
4:15 – 5:00	Make-up days		

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Each SA recruited, hired, and trained a survey administrator assistant (SAA) to help in the school. In some cases, the SA was able to use the same SAA for all of the assigned schools. However, in a few cases, the schools were located far enough away from where the SA lived that conducting Survey Day involved an overnight stay. In that case, the SA hired an SAA who lived close to the school.

4.3   Data Collection Procedures, Student Questionnaires, and Tests

Prior to questionnaire and test administration, parents were sent consent letters to notify them about the study. As mentioned previously, during the recruitment process, the parental permission procedure was discussed with the schools. Schools were encouraged to allow passive (implied) consent unless the school expressed the need for active consent. A total of 95 schools (12.6 percent) required active parental consent.

For schools that required active parental consent, information packets were sent via Federal Express to all parents for whom street addresses were given. If only a post office box address was available, packets were sent via regular mail (since Federal Express only delivers to street addresses). For students without a provided mailing address, parent packets were sent to the school for the coordinator to distribute. Each packet contained a letter about the study, a consent form, a brochure about the study, and an envelope bearing the school coordinator's name (to whom parents could return the consent form). In some cases, the principal had drafted an endorsement letter that was also included. The packets were sent to coordinators 4 weeks prior to each school's scheduled Survey Day. Prior to Survey Day, the SAs checked with the coordinators to obtain the names of parents who had not yet sent back a consent form. If they

were given telephone numbers, the SAs telephoned the parents to prompt them to return the forms.

Very few parents returned forms expressing refusal to let the student take part. However, many parents did not return the form at all. As a result, only 1,335 of the 2,150 eligible 10th-grade students (62.1 percent) sampled at schools requiring active permission took part in the in-school portion of the study. An additional 141 students at those schools were interviewed by telephone for an overall student participation rate (unweighted) of 68.7 percent at active consent schools.

For schools that allowed passive parental consent, letters were sent via first-class mail to all parents for whom mailing addresses were available. For those without a provided mailing address, parental packets were sent to the school for the coordinator to distribute. The packets contained a letter about the study, a consent form, a brochure about the study, and an envelope bearing the school coordinator's name (for parents to use to return the consent form) parents could return the consent form. An endorsement letter from the school was included, if one was provided. Passive parent consent letters were sent 2 weeks prior to the scheduled Survey Day. SAs contacted the school coordinators prior to Survey Day to determine if any parents had sent back forms that refused consent. For those parents, the survey administrators attempted refusal conversion (if the school was willing to provide telephone numbers).

As occurred with the active consent schools, very few parents returned forms expressing refusal to let their students take part in the study. As a result, 13,494 of the 15,441 eligible 10th-grade students (87.4 percent) sampled from passive consent schools took part in the in-school portion of the study. An additional 392 students at those schools were interviewed by telephone for an overall student participation rate (unweighted) of 89.9 percent at passive consent schools.

Parental consent letters were available in English and Spanish. Both English and Spanish versions of the letter and study brochure were sent to parents of all students who had been identified as Hispanic by their schools. A version of the consent letter was translated into Mandarin, Vietnamese, Korean, and Tagalog. An English version of the letter and brochure was sent with the Asian language translations to parents of all students who had been identified as Asian by their schools.

Shortly before Survey Day, reminder postcards were mailed to the sampled students for whom addresses were available. School coordinators were also provided with reminder notices to distribute to the sampled students several days prior to Survey Day.

On the Survey Day at each school, the SA checked in with the school coordinator and collected any parental permission forms that had come in. In active consent schools, the SA checked the student roster to make sure that only students who had returned signed permission forms were allowed to participate. In both active and passive consent schools, the SA made sure that no one for whom the school had received a parental refusal was allowed to participate, unless the parent had rescinded that decision in writing. As students entered the testing room, they were checked off on the student roster. After the majority of the sampled students arrived, the school coordinator was asked to try to locate the students who were not present.

The SA and SAA administered the student questionnaire and tests via a group administration. First, students were given a timed routing test in math and reading. After completing the routing tests, the students completed the student questionnaire. While the students completed the questionnaire, the SA and SAA graded the routing tests. This was done by using an answer key that overlaid the test form. The SA used the scores from the routing test to determine the second-stage tests in math and reading (low, medium, high ability) to assign to each student based on ability level. After the questionnaires were collected, the SA gave the students a short break and served a light snack. After the break, the SA handed out second-stage cognitive tests. While the students completed the second-stage tests, the SA and SAA edited the student questionnaires for completeness. If a student neglected to answer a questionnaire item deemed to be critical (student questionnaire critical items are listed in appendix C), the SA/SAA asked the student to complete it after the end of the second-stage test.

If less than 100 percent of the eligible students participated on Survey Day, the SA attempted to confirm the make-up day that had been scheduled during the school recruitment process. Staff asked to return for a second make-up day if attendance was still below 100 percent at the first make-up day. Because of the reduced number of students participating, make-up days were staffed by one person (either the SA or the SAA) instead of two. In some cases, schools did not permit the SA to conduct a make-up day session. Of the 15,362 participants, 85.4 percent were surveyed in their school on survey day, another 11.1 percent were surveyed on make-up day, and 3.5 percent were surveyed outside school over the telephone.

Computer-assisted telephone interviews (CATI) were conducted for students who were unable to participate in the group-administered sessions. Student phone numbers were obtained from the school (when given), or via address tracing (if the school released an address only). Prior to conducting student telephone interviews, verbal parental consent was obtained.

When the response rate was likely to be depressed, students were offered gift certificates for participation. In schools that required active consent, a Survey Day drawing was held for two $20 gift certificates. In schools that only allowed survey administration during off-school hours (after school, weekends, or school holidays), each participating student was offered a $20 gift certificate. All participating students were also offered a $20 gift certificate when schools would not release student addresses and sent the parental consent materials out themselves.

4.4 Data Collection Procedures, Teacher Survey

The teacher questionnaire was designed to obtain teacher reports of information. As mentioned previously, at the time that the student sample was selected, the school coordinator was asked to provide the names of each sampled student's math and English teachers. The coordinator was asked for the name of the fall teacher if the student was enrolled in class during the fall. If the student was not enrolled in class in the fall, the coordinator was asked for the name of the spring teacher. Teacher data collection was conducted via a mailed questionnaire. Questionnaire packets were prepared for each teacher, and all of the packets were mailed to the school coordinator for distribution. Each packet contained a lead letter, a brochure explaining the study, the ELS:2002 Uses of Data booklet, a list of sampled students for that particular teacher, the teacher questionnaire, and a postage-paid return envelope. Teachers who were being asked to report on more than 16 students also received a supplementary teacher questionnaire.

Teachers were sent a reminder postcard that asked them to complete the questionnaire and return it. Prompting telephone calls were made to nonresponding teachers through September 2002.

If it was determined during prompting calls that a particular teacher had not taught the students identified as belonging to them, an attempt was made to identify the student's correct teacher and to send that teacher additional materials. During these calls, some teachers who had already returned questionnaires were identified. For those teachers, a supplemental questionnaire that contained only questions about individual students was mailed.

Incentives were offered to responding teachers, based upon the number of students that each teacher was asked to report on. Incentives offered were: $10 to teachers reporting on 1-5 students, $20 to those reporting on 6–10 students, $30 to those reporting on 11–15 students, and $40 to teachers reporting on 16 or more students.

By the end of the data collection period, at least one teacher report had been received for 92.4 percent of all of the participating students.

4.5   Data Collection Procedures, School Administrator Survey

At the time that the schools were recruited, the school coordinator was asked to designate an individual at the school to be responsible for completing the school administrator questionnaire. At the time that Survey Day materials were sent to the school, a packet for the person designated to receive the school administrator questionnaire was included. The packet contained a lead letter, a brochure explaining the study, the ELS:2002 Uses of Data booklet, the school administrator questionnaire, and a postage-paid return envelope. Because the bulk of the questions in the questionnaire were of a general nature about the school and its policies, any knowledgeable staff member was permitted to complete the majority of the questionnaire. It was required that the final section be filled out by the school's principal. Burden on the principal was reduced by the length of this section (it took about 5 minutes to complete) and the fact that someone else at the school could complete the rest of the questionnaire.

Prompting for school administrator questionnaires was done during contacts with the schools. A total of 663 questionnaires were received by mail (88.2 percent) and an additional 80 school administrators completed abbreviated questionnaires by telephone (10.6 percent) for a 98.8 percent (unweighted) administrator response rate. Completed school administrator questionnaires provide 99.0 percent (weighted) coverage of all responding students.

In an effort to determine the characteristics of schools that did not participate in ELS:2002, such schools (or their affiliated districts) were asked to complete a school characteristics questionnaire for nonresponding schools. This questionnaire gathered information about basic characteristics of the refusing schools, which were also asked for in the school administrator questionnaire for participating schools. Questionnaires were mailed to schools or districts and followed up by telephone as needed. Among the 469 nonresponding eligible sample schools, a total of 437 completed questionnaires (93.2 percent) were received.

4.6   Data Collection Procedures, Library Media Center Survey

At the time that the schools were recruited, the school coordinator was asked to designate an individual at the school to be responsible for completing the library media center questionnaire. This could be anyone on staff who was knowledgeable about the library media center. At the time that the Survey Day materials were sent to the school, a packet for the person designated to receive this questionnaire was included. The packet contained a lead letter, a brochure explaining the study, the ELS:2002 Uses of Data booklet, the library media center questionnaire, and a postage-paid return envelope.

Prompting for library media center questionnaires was done during contacts with the schools. A total of 718 questionnaires were received by mail (95.5 percent, unweighted). Completed library media center questionnaires represented 96.4 percent (weighted) coverage of all responding students.

4.7   Data Collection Procedures, Facilities Checklist

In addition to reports from students and staff about each school, there was also interest in obtaining an objective reporting about the physical plant. The facilities checklist was to be completed by the SA based on his/her observations in the building on the school's Survey Day. (Survey Days were normally held on Tuesdays, Wednesdays, or Thursdays.) The form was designed to be completed by the SA without assistance from school personnel. To achieve a measure of standardization in the observations, SAs were instructed to complete the form at the same time of day for each school. Most survey administrations took place in the morning; facilities checklists were completed immediately after the morning administration. However, in those cases in which there was an afternoon survey administration, the facilities checklist was completed prior to the survey administration. Procedures included reporting on conditions visible from the school's front hallway, student bathrooms, one classroom, the school's parking lot, and adjacent property. SAs were also asked to report on various security measures observed throughout the school building.

Survey administrators completed facilities checklists in all 752 schools.

4.8   Data Collection Procedures, Parent Survey

At the time that the ELS:2002 sample was selected from the school enrollment list, each school was asked to provide home addresses for the parents of each sampled student. In many cases, the schools provided addresses for all sampled students. In a few cases, schools provided addresses if they had a signed release on file for the student. In those cases, some but not all of the addresses were provided for sampled students. In other cases (specifically, in 14 schools, or about 2 percent of the school sample), the school would not provide any home addresses.

Parent questionnaires were mailed on the school's scheduled Survey Day to all parents for whom addresses had been provided. For parents with no address available, the parent questionnaire was not mailed until the student questionnaire was sent in and the locator information was recorded.

Parent questionnaire packets contained a lead letter and brochure explaining the study, the parent questionnaire, and a postage-paid return envelope. Packets were addressed "To the Parent/Guardian of [student's name]." Questionnaire instructions asked for the parent who was most knowledgeable about the child's education to complete the questionnaire. Questionnaires were available in English and Spanish.

One week after each parent questionnaire was mailed, a thank you/reminder postcard was sent. The postcard thanked the parents who had already completed and returned the questionnaire and asked those who had not to do so. Four weeks after the initial questionnaire mailing, the process of contacting nonresponding parents by phone and asking them to complete the survey by computer-assisted telephone interview (CATI) was begun.[49] For parents who expressed reluctance to participate, an abbreviated telephone interview to gather critical items was offered (if refusal conversion attempts proved to be unsuccessful).

About 1 month prior to the end of data collection, an abbreviated parent questionnaire was mailed to parents of participating students who had not yet responded. Parents were offered the option of completing the abbreviated questionnaire and returning it by mail or calling a toll-free number to complete the questionnaire by telephone interview. Of the 15,362 responding students, parent data (either by mailed questionnaire or by telephone interview) were received from 13,488 of their parents. This represents a weighted coverage rate of 87.4 percent.

4.9   Data Collection Results

Tables 43–45 summarize the data collection results for the ELS:2002 base year. Table 43 reviews the school sample selections and sample realization. The final sample size (752) was below the original target (800), for a 94 percent rate of sample realization. About 64.7 percent (631) of the initially fielded schools (976) cooperated; cooperation rates were lowest for the other private school sector.[50]

Table 44 displays weighted and unweighted completion rates based on the overall study/sample design, in which student questionnaire completers constitute the basic unit for the public-use files (students who, for reasons of English language limitations or disability, would have been unable to complete or validly complete the research instruments, were nevertheless included in the study; however, these students appear only on the restricted-use files). For purposes of this table, the completion rate was calculated as the ratio of the number of completed interviews divided by the number of eligible sample members. Note that the participating student sample defines the eligible parent and teacher samples. Teacher and parent reports appear on the public-use files only if they can be linked to a participating student.

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[49] English-language parent interviews were conducted by CATI; however, Spanish-language parent telephone interviews were conducted with paper-and-pencil methods.

[50] As may be seen in table 41, sample realization was lowest for other private schools (with a target of 100, only 77 were recruited, compared to 95 recruited schools and a target of 100 in the Catholic school sector, and a target of 600 with 580 schools recruited for the public school sector). Cooperation was also lowest for the other private school sector, as may be seen in table 43. Weighted response rates were 69 percent for public, 74 percent for Catholic, but only 63 percent for other private schools. In contrast, in NELS:88, other private schools had the highest cooperation rate and public schools the lowest.

Table 45 shows weighted and unweighted participation rates for school recruitment, and response rates for the school components (administrator, library, facilities) at the school level. Overall 1,221 schools were selected and found to be eligible. Some 752 participated. Facilities checklists were collected at all 752 schools, library media center questionnaires at 718 of the schools, and school administrator questionnaires at 743 of the schools.

In considering participation rates, it is important to note that while school-level and individual-level response rates are often considered separately, effects of nonresponse in a two-stage sample are, for many purposes, multiplicative across the two stages. A true indication of the response rate for students can be computed by multiplying school participation rates by individual participation rates. For example, defining school participation in terms of the percentage of schools that held Survey Days, and multiplying that percentage by the overall student response rate, the overall response rates are:

- 59.2 percent (0.68*0.87) for students;

- 66.8 percent (0.68*0.99) for school administrators;

- 65.0 percent (0.68*0.96) for libraries; and

- 67.8 percent (0.68*1.00) for facilities checklist.

As a point of comparison, these multistage participation rates are similar to those of the 1980 HS&B base year survey and to those of NELS:88 base year.

Table 43. ELS:2002 base year school sample selections and realization: 2002

Stratum	Estimated size	Eligible original selections	Target N	Total N cooperating schools	Sample realization (percent of target achieved)	Cooperating original selections	Cooperating alternative selections
Total	24,397	976	800	752	94.00	631	121
Public schools	17,311	735	600	580	96.67	484	96
Catholic schools	1,098	117	100	95	95.00	83	12
Other private schools	5,988	124	100	77	77.00	64	13

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Table 44.   ELS:2002 base year completion/coverage rates, by component at the student level: 2002

	Student questionnaire completion rates		Student test coverage rates		Parent questionnaire coverage rates		Teacher questionnaire coverage rates		School administrator's questionnaire coverage rates		Library media center coverage rates	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total	87.28	87.33	95.08	94.67	87.45	87.80	91.64	91.66	98.98	99.04	96.37	95.84
Participated	15,362		14,543		13,488		14,081		15,215		14,723	
Selected	17,591		15,362		15,362		15,362		15,362		15,362	
School type												
Public	87.05	86.72	95.10	94.54	87.25	87.37	91.41	90.85	98.91	98.80	96.48	96.17
Catholic	90.26	90.87	96.73	95.99	91.99	90.94	96.92	96.93	100.00	100.00	94.35	95.21
Other private	89.86	87.91	92.50	93.94	87.42	87.17	91.30	91.38	99.54	99.79	95.69	93.87
Urbanicity												
Urban	85.01	85.42	94.99	94.25	85.14	86.92	88.11	88.86	98.42	98.79	94.01	93.49
Suburban	87.41	87.43	95.62	95.49	88.11	87.96	92.30	92.28	99.43	99.28	97.27	96.84
Rural	90.41	90.70	93.84	93.29	89.34	88.97	95.40	95.08	98.68	98.88	97.67	97.47
Region												
Midwest	87.68	88.66	95.75	94.53	85.79	87.11	95.14	95.31	99.94	99.92	98.83	96.83
Northeast	82.21	82.77	95.91	96.13	87.93	87.04	89.47	89.36	97.81	98.52	92.66	92.83
South	89.87	89.95	94.45	94.59	88.03	88.39	93.38	93.40	99.29	99.49	97.17	97.23
West	87.07	85.37	94.65	93.67	87.96	88.28	87.15	85.94	98.45	97.60	95.58	94.74
Race/Ethnicity[1]												
Asian/Pacific Islander	83.89	83.60	94.41	93.74	87.29	87.48	86.10	85.68	96.30	96.75	94.29	94.04
Black	87.02	86.91	95.62	95.29	83.12	83.90	89.66	90.29	97.81	98.37	93.25	93.56
Hispanic	85.74	86.16	95.92	95.77	86.86	87.12	86.28	88.63	98.29	98.32	94.20	94.49
Native American/Alaska Native	91.76	91.16	92.33	94.03	83.13	82.09	92.74	91.79	100.00	100.00	99.64	99.25
White	88.55	89.24	95.37	95.71	88.70	89.33	95.50	95.65	99.49	99.67	97.61	97.29
Other[2]	81.42	82.69	90.72	87.37	87.75	86.02	75.66	80.55	99.78	99.79	96.98	93.90
Highest parent education[3]												
Did not finish high school	†	†	96.24	95.06	82.74	82.60	88.23	88.08	98.52	97.85	93.85	92.48
High school graduate or GED[4]	†	†	95.23	94.48	83.31	83.19	91.81	90.84	99.02	99.05	96.92	96.09
Some college (< 4-year degree)	†	†	95.13	94.89	89.10	89.72	92.01	92.10	98.91	99.07	96.55	96.02
Bachelor's degree	†	†	95.60	95.41	88.43	88.75	91.77	91.99	98.88	99.00	96.12	95.78
Graduate/professional degree	†	†	93.61	93.44	89.79	89.87	91.84	92.53	99.42	99.44	96.58	96.42

† Not applicable.
[1] Race/ethnicity classification was based on school-provided sampling information.
[2] Other category includes multiracial and missing.
[3] Highest parent education was imputed if otherwise missing.
[4] GED = Graduate equivalency diploma.
NOTE: Facilities checklist coverage rates were 100 percent and do not appear in the table.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Table 45.   ELS:2002 base year school-level participation rates and completion rates for school surveys at the school level: 2002

	School participation rates		School administrator questionnaire completion rates		Library media center completion rates		Facilities checklist completion rates	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total	67.80	61.59	98.53	98.80	95.93	95.48	100.00	100.00
School type								
Public	69.09	62.63	99.62	98.62	97.43	95.86	100.00	100.00
Catholic	74.04	67.86	100.00	100.00	93.23	95.79	100.00	100.00
Other private	62.94	49.68	94.77	98.70	91.72	92.21	100.00	100.00
Urbanicity								
Urban	67.27	60.39	99.39	98.40	94.47	92.80	100.00	100.00
Suburban	59.81	59.28	99.86	99.45	98.23	96.95	100.00	100.00
Rural	79.32	71.21	96.62	97.87	94.37	96.45	100.00	100.00
Region								
Midwest	73.87	68.61	95.82	99.47	93.51	96.81	100.00	100.00
Northeast	60.37	52.14	99.24	97.76	94.07	91.04	100.00	100.00
South	70.33	72.87	99.75	99.29	98.64	97.16	100.00	100.00
West	63.06	48.84	99.64	97.97	96.11	94.59	100.00	100.00

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Chapter 5
Data Preparation and Processing

This chapter describes the automated systems used to control survey processes; procedures used to maintain receipt control; aspects of data preparation (such as coding); and the various procedures for data capture, cleaning, and editing. The chapter is organized into seven sections: (1) overview of systems design, development, and testing, (2) data receipt, (3) coding for hardcopy instruments, (4) data capture for optically scanned instruments, (5) data cleaning and editing, (6) data capture and editing for computer-assisted telephone interviewing (CATI), and (7) data processing and file preparation.

5.1   Overview of Systems Design, Development, and Testing

Most systems were designed during the field test with concern for the processes needed for the main study. The effort was to test systems in a smaller environment to reveal points in which improvements could be implemented on a larger scale. After the field test, improvements were implemented and checked in a test environment. The following systems were developed during the field test:

- a recruiting system;

- a Survey Control System (SCS);

- Survey Day materials generation programs;

- survey administrator telephone touch-tone data capture systems;

- a questionnaire receipt application;

- TELEform (application used for scanning questionnaires);

- a Structured Query Language (SQL) server database to store scanned data responses;

- a scanned image database;

- a parent computer-assisted telephone interview (CATI);

- parent CATI and scanned data concatenation programs;

- computer-assisted data entry (CADE) programs for the facilities checklist;

- data cleaning programs;

- a web-based Integrated Management System (IMS); and

- production reports.

A full development process, including design, programming, testing, and implementation was used in the creation of these systems. Specifications were developed in word processing documents and flowchart applications and progress was tracked using Microsoft Project and Microsoft Excel. Specifications for questionnaires were designed in word processing documents

and were updated to reflect what changed between the field test questionnaires and the full-scale questionnaires. CATI specifications were developed from the questionnaire specifications and included CATI application pseudo code for each CATI item.

Between the field test and full-scale studies, systems and procedures were evaluated and the following functionality was added to the full-scale operations:

- a Survey Day materials printing application (based on materials processed for Survey Day mailing);

- a mail return application;

- an incentive tracking application;

- a dynamic reporting utility that provided managers with current information from the SCS database;

- a student CATI component (linked to the parent CATI);

- a scanned image archive application that allowed images to be burned to compact disc (CD) archives;

- a scanned image archive server that allowed instant access to scanned questionnaires during the data cleaning and review process;

- a cleaning and editing application that allowed editors to review and correct questionnaire data as appropriate, working in conjunction with actual scanned images in cases in which inconsistent data occurred;

- a data review system that allowed reviewers to randomly review questionnaires with data in order to detect data deficiencies (e.g., scanning problems); and

- an occupation coding application.

5.2 Data Receipt

The data preparation facility received all materials returned to RTI after a school's survey was complete or individual respondents (e.g., school faculty, parents, etc.) sent in completed questionnaires. Procedures were established to systematically receive and record all required forms; this process included the scanning of bar-coded labels. Additional receipt events were added for the full-scale study to identify questionnaires that were not completed fully or accurately and to allow project staff to follow up promptly. Different versions of questionnaires (e.g., full, abbreviated, Spanish, etc.) were easily distinguishable within the receipt process and were automatically batched separately based on the questionnaire type. For example, Spanish questionnaires were translated to an English questionnaire in preparation for scanning.

After questionnaires were received and added to the receipt system, a batch number was assigned to the questionnaire. To assist the project team in cases that required referring to a questionnaire, the system was able to access dynamically the status of an individual questionnaire and provide the batch number that it belonged to. If the questionnaire had moved beyond the scanning stage, the scanned image could be accessed as well. Questionnaires were

occasionally identified for data removal (e.g., when parent consent was lacking). Rather than deal with the removal process manually, a spreadsheet was developed to document these cases and case removal was integrated into the data delivery process. This was a useful model because it did not disrupt the questionnaire processes and provided the ability to add cases back to final data files when appropriate (e.g., when parental permission was obtained).

5.3   Coding for Hardcopy Instruments

The following text items were obtained in the questionnaires:

- respondent occupation (from parent questionnaire);

- respondent partner occupation (from parent questionnaire);

- mother/female guardian occupation (from student questionnaire);

- father/male guardian occupation (from student questionnaire);

- expected occupation after high school (from student questionnaire); and

- expected occupation at age 30 (from student questionnaire).

The parent questionnaire allowed respondents to choose from a list of 16 occupation codes, relating to their occupation text. When occupation codes were not selected, the text was available for review and coding. The student questionnaire only collected occupation text, and did not provide the occupation categories.

Occupation text was loaded into a coding application (when occupation codes were lacking) in which a coding specialist could select the correct code from the 16 occupation categories. The resulting codes were merged back into the data files.

5.4   Data Capture for Optically Scanned Instruments

The following questionnaires were developed for optical scanning:

- a student questionnaire;

- an abbreviated student questionnaire;

- a first-stage routing test;

- second stage math and reading tests;

- a parent questionnaire;

- a school administrator questionnaire;

- library and media center questionnaires; and

- a facilities checklist.

Questionnaires were designed for TELEform scanning, and after questionnaires were received and batched they were ready for TELEform scanning. A TELEform questionnaire

contained text fields that could be recognized by scanning machines and interpreted forms text to data through optical character recognition. Verifiers reviewed data that was not interpreted accurately by the scanning machines or was not consistent with expected ranges. Once verification was complete, the data were converted to an American Standard Code for Information Interchange (ASCII) file and the questionnaire image was written to the server. This process provided immediate access to raw questionnaire data and a repository of images accessible by ELS:2002 staff.

TELEform development began with the field test TELEform document and specifications in Microsoft Word that indicated changes that were made between the field test and the full-scale study. Modifications were easily made and variable names were updated appropriately. Any new TELEform documents were first developed in Microsoft Word as a specification. As changes in the TELEform document were required, the corresponding Microsoft Word document was updated using the "Track Changes" tool. Reviewers would compare the specifications to the printed version of the TELEform document to ensure that all questionnaires were the latest version. When a TELEform document was confirmed as final, internal testing of the scanning and data-writing processes occurred. About 10 forms were printed and filled out for testing purposes. The test forms were scanned so that the resulting data could be compared to the original questionnaire; this comparison would detect problems with the printed questionnaire, the scanning program, or the Structured Query Language (SQL) server database.

Scanning procedures were evaluated after the field test in an effort to streamline the scanning process for the full-scale study. Different stages of the scanning process were timed, and averages across each stage (i.e., cutting, scanning, evaluation, verification, data/image commit) for each questionnaire were used to analyze system and staffing needs. The need for efficient archiving procedures arose from the large amount of space taken by scanned images on the server and the need for access to the image for review. An application was developed to control the archiving process across the tens of thousands of scanned images. Archive procedures were modified from those used during the field test and an SQL database was created to track what had been archived (and to which CD volume) for easy image retrieval.

Questionnaire data were committed to ASCII data files and loaded with a scheduled process into a SQL server database each night. Raw SQL server data were compared to the original questionnaires to ensure that scanning procedures were accurately storing data to the SQL server. The SCS tracked each form that was scanned by indicating a scanned event whenever the SQL Server database was updated for a questionnaire. If for some reason a record was not transmitted successfully before or during the commit (i.e., nightly loading process) to the SQL server, a scanned event would be lacking for the questionnaire and could be easily identified later for rescanning. This approach ultimately ensured that all questionnaires received would eventually have a corresponding data record and could not be dropped without detection.

5.5   Data Cleaning and Editing

An application was developed in which case/item-specific issues were reviewed and new values were recorded for subsequent data cleaning and editing. Records were selected for review based on one of the following criteria: random selection, suspicious values during frequency reviews, values out of expected ranges, and values not adhering to a particular skip pattern. The

review application provided the case/item level information, reasons for review, and a link to the scanned image of the questionnaire. Reviewers determined scanning corrections, recommended changes (if respondents had misinterpreted the question), and reviewed items randomly to spot potential problems that would require more widespread review.

The application was built on a SQL server database that contained all records for review and stored the recommended data changes. Editing programs built in SAS read the SQL Server database to obtain the edits and applied the edits to the questionnaire data. Questionnaire data were stored at multiple stages across cleaning and editing programs, so comparison across each stage of data cleaning could be easily confirmed with the documentation on recommended edits. Raw data were never directly updated, so changes were always stored cumulatively and applied each time a cleaned data set was produced. This provided the ability to provide documentation on all changes and easily fix errors or reverse decisions upon further review.

Editing programs also contained procedures that output inconsistent items across logical patterns within the questionnaire. For example, instructions to skip items could be based on previously answered questions; however, the respondent may not have followed the proper pattern based on the previous answers. These items were reviewed, and rules were written to either correct previously answered (or unanswered) questions to match the dependent items or blank out subsequent items to stay consistent with previously answered items.

5.6   Data Capture and Editing for CATI

In an effort to boost response rates, the following CATI instruments were developed: student (developed from the TELEform abbreviated version) and parent (developed from the TELEform full-length version, plus a module to administer an abbreviated version).

CATI logic was designed such that the TELEform and CATI records could be concatenated into one data file. It is possible that a respondent was included in both the TELEform and CATI sample; however, rules were implemented to identify these cases during file concatenation. The TELEform source took precedence over the CATI source unless the TELEform source was incomplete.

CATI instruments were developed with logic based on the skip patterns in the questionnaires. Questions were automatically skipped during administration. The questionnaire development program (CASES) stored data for each item answered, but respondents were allowed to go back to previously answered items. In rare cases, a previously answered item could be changed in such a way that the questionnaire logic was inconsistent with data already answered from a different logical path. Editing programs were built to review and ultimately blank out items that would not have been answered otherwise.

5.7   Data Processing and File Preparation

All TELEform questionnaire scans were stored in a SQL server database. CATI applications were used to supplement questionnaires where Paper and Pencil Interviewing (PAPI) was not always desirable. CATI data were exported nightly to ASCII files. Cleaning

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programs were designed to concatenate CATI and TELEform SQL Server data into SAS data sets, adjusting and cleaning variables when formats were not consistent. Special attention focused on this concatenation to verify that results stayed consistent and to rule out possible format problems. In some cases, data were collected from both modes of administration for a respondent. Procedures were developed to remove the duplication within the raw data sets by selecting the latest scanned case; however, this rule was overridden with alternative records when record-by-record comparison determined otherwise.

Once questionnaire data were concatenated and cleaned across modes and versions, the following cleaning and editing steps were implemented:

- anomalous data cleaning based on review of data with original questionnaire image (e.g., scanning errors);

- rule-based cleaning (changes that were made based on patterns in data, rather than review of images);

- hard-coded edits based on changes recommended by a reviewer if respondents misunderstood the questionnaire (e.g., respondent was instructed to enter a percentage; however, there was strong evidence that the respondent entered a count rather than the percentage); and

- edits based on logical patterns in questionnaire (e.g., skip pattern relationships between gate and dependent questions).

All respondent records in the final data set were verified with the SCS to spot inconsistencies. For example, it was possible that data were collected for a respondent who later was set to an ineligible status. It would not be appropriate to include that data, and the SCS served as a safeguard to ensure data integrity. Furthermore, the data files served as a check against the SCS to ensure that all respondent information was included in production reports.

Item documentation procedures were developed to capture variable and value labels for each item. Item wording for each question was also provided as part of the documentation. This information was loaded into a documentation database that could export final data file layouts and format statements used to produce formatted frequencies for review. The documentation database also had tools to produce final electronic codebook input files.

Chapter 6
Data File Contents

This chapter provides a concise account of the Education Longitudinal Study of 2002 (ELS:2002) base year data file contents. It addresses the following six topics: (1) structure of the Electronic Codebook (ECB) system, (2) analysis populations, (3) weights and flags, (4) composite and classification variables, (5) variable naming conventions, and (6) the hardcopy student component codebook.

6.1 Data Structure

ELS:2002 base year data have been made available in public- and (for licensed users) restricted-use versions[51] in an Electronic Codebook (ECB) format on CD-ROM. The ECB is designed to be run in a Windows environment. The ECB is available (at no cost) from the National Center for Education Statistics (NCES). Appendix A supplies a brief introduction to the ECB, including its installation.

The ECB system serves as an electronic version of a fully documented survey codebook. It allows the data user to browse through all ELS:2002 variables contained on the data files, to search variable and value names for key words related to particular research questions, to review the wording of these items along with notes and other pertinent information related to them, to examine the definitions and programs used to develop composite and classification variables, and to "output" the data for statistical analysis. The ECB also provides an electronic display of the distribution of counts and percentages for each variable in the data set. Analysts can use the ECB to select or "tag" variables of interest, print hardcopy codebooks that display the distributions of the tagged variables, and generate SAS and SPSS program code (including variable and value labels) that can be utilized with the analyst's own statistical software.

The ECB comprises two megafiles: first, a megafile at the student level, which encompasses student, parent, and teacher data; and second, a megafile at the school level, which encompasses data from the facilities checklist, the school administrator questionnaire, and the library media center questionnaire. Weights, participation flags and status indicators, and composite and classification variables come first on the file, followed by the questionnaire variables.

6.2 Base Year Analysis Populations

The base year data can only be used cross-sectionally at this time, as a description of America's high school sophomores as of the spring term of the 2001–2002 school year. However, its cross-sectional use includes cross-cohort (intercohort) comparisons with two earlier national samples of sophomores: High School and Beyond Longitudinal Study (HS&B) sophomores in 1980, and National Education Longitudinal Study of 1988 (NELS:88) sophomores in 1990. Appendix H includes a discussion of special issues in comparing the

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[51] A license is required to access the restricted-use ECB.

cohorts and a crosswalk of common items among the three studies. Also, equated test scores have been generated so that achievement in reading and mathematics in NELS:88, and in mathematics in HS&B, can be compared across the three studies. An equated score has also been provided, putting reading scores (and in the future, math scores) of the ELS:2002 sophomore cohort and the 15-year-old cohort of the Program for International Student Assessment (PISA) on the same scale.

6.3   Weights and Flags

The public-use files contain one weight for use with student data (BYSTUWT) and one weight for use with school-level data (BYSCHWT). A further student weight (BYEXPWT), that encompasses all students in the study including those who were exempted from taking the survey instruments because of limited English proficiency or a severe disability, appears only on the restricted file, as well as the design (raw or base) weight from which the final weight was derived.

Participation flags (which are always dichotomous) and status variables (which have more than two values), as well as weights, may be used for subsetting—in other words, they can be used to select the subset of respondents that the analyst intends to examine. For example, if one wishes to select only those students for whom there are assessment data, the status variable BYTXSTAT would be invoked (a "0" means no assessments were completed; a "1" means a reading test only was completed; a "2" indicates a mathematics test only was completed; and a "3" indicates both tests [assessments in reading and in mathematics] were completed). If one wishes not to use the imputed test scores, then the imputation flag must be invoked, for example, BYMATHIM ("1" means a missing mathematics score was imputed, and "2" means that it was not).

6.4   Composite and Classification Variables

Composite variables—also called constructed, derived, or created variables—are usually generated using responses from two or more questionnaire items or from recoding of a variable (typically for disclosure avoidance reasons). Some are copied from another source (e.g., a variable supplied in sampling, or a variable imported from an external database). Examples of composite variables include school variables (school sector, urbanicity, region of the country), assessment scores (achievement quartile in reading or in math), psychological scales (mathematics self-efficacy), and demographic variables (sex, race, Hispanic ethnicity, and month and year of birth).

Most of the composite variables can be used as classification variables or independent variables in data analysis. For purposes of better estimation in cross-sectional analysis, many of the composites have undergone imputation procedures for missing data (all imputed versions of variables have been flagged).

6.5   Naming Conventions

Data users should find naming conventions for variables, flags, and weights intuitive and quite similar to those employed in NELS:88. Most variables begin with an indicator of the wave (in this case, the base year, BY). Weights follow the same wave-naming convention and also contain the suffix "WT" (e.g., BYSTUWT, is the name for the final student weight for base year questionnaire completion, BYSCHWT the name for the final school weight). First follow-up variables will begin with the prefix "F1," second follow-up with "F2," and so on. A few composite variables will be updated round by round, as new respondents (freshened students or prior round nonrespondents) enter the responding sample. These cross-wave composites (e.g., SEX, RACE) have no prefix indicative of wave, because they are round independent.

Variable names also distinguish (in their third character or third and fourth characters) between components. "BYS," for example, indicates a base year student questionnaire variable, while "BYP" stands for base year parent. Likewise "A" is used for the principal (school administrator) questionnaire, "TM" for reports from the mathematics teacher, "TE" for the English teacher, "L" for the library media center instrument, and "F" for the facilities checklist. Variables that reflect specific items in the questionnaire carry the question number in the variable name, immediately after the component indicator. Hence, BYS26 would be item 26 from the base year student questionnaire, and BYP41 would be item 41 in the parent instrument.

The round-specific constructed variables are typically not anchored in a single questionnaire item and may sometimes reflect nonquestionnaire sources of information, such as the assessments. Test scores carry the prefix BYTX. BYTXMQU, for example, indicates the quartile score for the base year mathematics test. Flags are indicated by the suffix "FLG" or "FG." Variable names also distinguish between the public (P) and restricted (R) use forms, where variables differ between them.

6.6   Guide to the Hardcopy Codebooks

Although for most purposes the flexibility of the electronic codebook will best meet users' needs, in some situations it may be helpful to also have access to a specialized hardcopy codebook of the student data. The hardcopy codebooks appear as PDF files only for the web-published version of this manual (see *http://nces.ed.gov/surveys/els2002*), and corresponds to appendix G of this document. It supplies a comprehensive description of the student data file. For each variable on the student component data file, the codebook provides a summary of the related information, including the question number and wording, variable name, and the responses to the item along with their unweighted frequency and percent and weighted percent. It also provides missing data frequencies sorted by the following reserve codes:

- "Don't know"[52]
- "Refused"
- "Multiple response"
- "Not reached"

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[52] For the sake of convenience, "Don't knows" receive a common reserve code, but in hardcopy codebooks and other contexts as well, a distinction is made between "Don't know" arising from a response volunteered in a CATI interview (a true reserve code), and "Don't know" arising from a legitimate response option in a questionnaire (which need not be looked at as a true reserve code).

- "Legitimate skip/NA"
- "Nonrespondent"
- "Out of range"

- "Data suppressed"
- "Missing"

Information on obtaining the ELS:2002 ECB (and other NCES electronic codebooks) can be found by reviewing the data products for the study at *http//nces.ed.gov/pubsearch*. Information on applying for a restricted-use license also appears on the NCES web site: *http://nces.ed.gov/pubsearch/licenses.asp*

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Appendix A
Introduction to the Electronic Codebook

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Appendix A
Introduction to the Electronic Codebook

This appendix supplies a brief introduction to the ELS:2002 data in Electronic Codebook (ECB) format. Special attention is given to general instructions on how to get started using the ELS:2002 data and an orientation to ECB and variance estimation software that can be used to manipulate the data.

A.1 Obtaining the ELS:2002 ECB

The ELS:2002 base year ECB on CD-ROM carries the NCES publication number NCES 2004–404. This data product contains

- ELS:2002 data from the base year;

- ECB software; and

- documentation.

A single copy of an ELS:2002 public-use CD-ROM may be obtained without cost from the Education Publications Center (ED Pubs), until supplies are exhausted. This group can be contacted by telephone at 1–877–4ED–PUBS or by writing

ED Pubs
P.O. Box 1398
Jessup, MD 20794–1398.

Requests can also be made electronically to *http://www.edpubs.org/* or to *customerservice@edpubs.org*. Requesters will need the title of the data product and the NCES number (NCES 2004–404 for the ELS:2002 ECB).

A restricted-use version of the ECB is available to institutionally based users in the United States whose research requires this additional level of information. Contact NCES at *http://nces.ed.gov/pubsearch/licenses.asp.*
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A.2 Features and Content of the ELS:2002 ECB

ECBs allow the user to

- search a list of variables based on keywords or labels;

- tag (i.e., select) variables for analysis;

- generate SAS and SPSS syntax for system files;

- produce printed codebooks of selected variables;

- import tag files; and

- access database files for extraction.

The overall organization of data reflects two integrated and comprehensive data files, or megafiles. One megafile is at the student level, the other at the school level. School-level variables include information collected in the base year school administrator questionnaire, library media center questionnaire, and facilities checklist. At the student level, data from the student questionnaire, the student assessments in reading and mathematics, the teacher questionnaire, and the parent questionnaire are represented. Weights, participation flags and status indicators, and composite variables (also called constructed variables, derived variables, or created variables) are located at the beginning of the file, followed by the questionnaire variables.

Some important variable naming conventions (normally embedded in the first 3 to 4 characters of each variable name) may be noted. Normally the first 3 to 4 characters of each variable name identify the instrument from which the variable is taken. BYS stands for base year student; BYS21 stands for question 21 in the student questionnaire. BYP stands for base year parent, BYA for the base year administrator questionnaire, and so on. A label with the terminal characters "WT" is indicative of a weight (e.g., BYSTUWT is the final or nonresponse-adjusted student weight for the base year). Test variables contain the characters "TX," while flags are indicated by FLG or FG and status variables by ST (e.g., BYTXSTAT refers to test completion status in the base year). The content of the student and school megafiles is described more specifically in the sections below.

A.2.1 Student Megafile

The student-level file contains variables from the student, parent, and teacher questionnaires, as well as scores for the assessments in reading and mathematics.

The main contents of the student file, in order of appearance, and associated naming conventions, are as follows:

- *IDs and Weights*. Student and school IDs and weights (BYSCHWT, BYSTUWT) are at the beginning of the data file.

- *Student-level Composites*. Student-level composites are typically derived from student or parent sources. Included with student-level composites are BYTX* variables for data associated with the reading and math assessments.

- *School-level Composites*. School-level composites have been replicated at the student level for analytical convenience.

- *Data from Outside Sources*. The restricted-use ECB, but not the public-use ECB, includes access to CCD/PSS data, replicated at the student level, as well as confidential geocode data and linkages to external sources.

- *Imputation Flags (e.g., –IM, as in BYMATHIM)*. These flags indicate whether missing values for a variable or composite were imputed.

- *Participation Flags (e.g., –FLG, FG, or F, as in BYTEQFLG)*. These indicators are dichotomous. They indicate whether or not some feature of the data is available for a respondent (e.g., Spanish-language parent questionnaire, teacher ratings, etc.).

- *Status Flags (e.g., –STAT, as in BYTXSTAT).* These indicators have more than two values, but are otherwise similar to participation flags; they indicate the participation status of sample members and availability of contextual data for them.

- *Student Questionnaire Data (BYS*).* These data come from scanned forms filled out by the student or from the computer-assisted telephone interview (CATI).

- *Parent Questionnaire Data (BYP*).* These data come from scanned forms filled out by the parent or from the CATI interview.

- *English Teacher Data (BYTE*).* These data come from scanned teacher questionnaires filled out by the student sample member's English teacher. English teacher data have been linked to the appropriate student(s).

- *Math Teacher Data (BYTM*).* These data come from the scanned teacher questionnaire and have been linked to the appropriate student(s).

A.2.2 School Megafile

The school-level file contains all questionnaires administered at the school level. This includes the school administrator questionnaire, the library media center questionnaire, and the facilities checklist.

Variable prefixes on the school file identify the contents:

- *IDs and Weights.* Student and school identifications (IDs) and the school weight (BYSCHWT) are at the beginning of the data file

- *School-level Composites.* School-level composites are produced from questionnaire data allowing an analyst access to data in an easier format.

- *Data from Outside Sources.* Licensed users of the restricted-use file will have access to CCD/PSS data via NCES identification number (NCESID), geocodes, and other information for linking to external sources.

- *School Administrator Data (BYA*).* These data come from scanned forms filled out by the school principal and other administrative staff.

- *Library Section Data (BYL*).* These data come from scanned forms filled out by the librarian or library media center specialist.

- *School Facilities Data (BYF*).* These data come from scanned forms filled out by the survey administrator during the student surveys at the school.

The school ID is constructed such that student file records can merge with the school data.

A.3   Installing the ECB

A.3.1 Hardware/Software Requirements

The ECB program is designed to run on a PC with Windows 95 or higher versions.

A.3.2 Installation Procedures

To install the ECB, complete the following steps:

1. Close all applications on your computer.

2. Place the CD–ROM into the CD-ROM drive.

3. From Windows, click on "START" and then "RUN."

4. Browse through the CD-ROM drive for the "ecbw" folder and open "SETUP.exe" file.

5. Setup will guide you through the installation of the ECB.

6. Click on ECB icon to run.

A.4   Using the ECB

A.4.1 Understanding the File Structure and Capacity

The ECB is ready to use once it is installed. To understand quickly the structure of the file and the power provided by the ECB to produce data files requires an understanding of the "hot" keys and some practice:

1. On the toolbar found at the top of the ECB screen, click on each "hot" key.

2. Consult the "Electronic Codebook Help Guide" available on the CD-ROM (file named HELP.pdf) for a specific overview of the ECB functions.

A.4.2 Examining the Frequencies Available for Each Variable on the ECB

By examining these data descriptions, the ELS:2002 user will begin to appreciate the complexity of collecting data from respondents (legitimate values, legitimate skips, refusals, etc.). It is important to realize that some respondents

- did not respond to the entire instrument;

- skipped individual items;

- refused to complete selected items;

- did not reach the end of the questionnaire;

- completed abbreviated versions of the instrument;

- made illegal skips; and/or

- responded outside predefined valid ranges.

The following reserve code conventions are used in the ELS:2002 data files:

- −1 = *"Don't know."* There are some instances where respondents are allowed to answer "Don't know" for questions in the hardcopy questionnaires, and this reserve code will apply. The parent CATI interview by default allows "Don't know" for most questions that a respondent does not know so that the subsequent question can be administered.

- −2 = *"Refused."* Respondents are free to refuse to answer any question to which they do not wish to respond. In the hardcopy questionnaire, such refusals are explicitly captured only for critical items (items that, because of their importance, are subject to onsite edit and retrieval). CATI interviews, by default, allow refusals to be recorded on a question-by-question basis.

- −3 = *"Legitimate Skip/NA."* Questions that are not answered because prior answers route the respondent elsewhere will be filled with "Legitimate Skip/NA." This value applies to variables from all data collection modes.

- −4 = *"Nonrespondent."* "Nonrespondent" variables from questionnaires that have no respondent are filled with the "Nonrespondent" reserve code. This applies to both the student file and the school file because each file is composed of multiple interviews. For example, the school file may contain school administrator questionnaire data and facilities data, but the school's librarian may not have responded to the library media questionnaire; hence all library media variables appear with the "Nonrespondent" reserve code.

- −5 = *"Out of Range."* Values reported by the respondent that are out of range. Certain responses were set to this value if they were beyond the reasonable limits for the given item. For example, a teacher may have indicated teaching at a particular school for a longer period of time than he/she taught overall.

- −6 = *"Multiple Response."* Non-CATI applications do not have the ability to prevent respondents from answering multiple responses to a question that requires one answer. The scanning process for hardcopy questionnaires routed these instances to a verifier to determine whether the respondent "intended" to choose one answer (e.g., eraser marks interpreted by the optical scanning equipment as a second answer). In the case that the verifier cannot determine a single unique answer, the item was assigned the reserve code for "Multiple Response."

- −7 = *"Not Reached."* Questions that are not answered because the respondent does not wish to continue the interview or, in timed sessions, because they have run out of time, are filled with a "Partial/Not Reached" reserve code. This

code was also used for the parent CATI interviews that encountered break offs during the interview (and the respondent could not be reached for completion of the interview). This reserve code is also used in the instance of use of an abbreviated version of the questionnaire, in which particular items were not included.

- –9 = *"Missing."* Questions that are not answered within the scanned hardcopy questionnaires. These questions are typically missed accidentally (e.g., respondent did not understand the routing pattern) and are not an indication of the respondent filling out only part of the questionnaire. This reserve code can also apply to CATI data where, for reasons associated with different versions, an item was not administered.

A.4.3 Creating a Taglist, Extracting Data, and Generating Program Code

The following procedures can be used to tag variables, extract data, and generate program codes on the ECB:

1. Tag variables of interest by clicking on the "tag box" next to each variable.

2. Choose the appropriate weights and flags for the population of interest. In each megafile, flags can be selected to identify a particular part of the population. For example, flags are available to identify whether a student questionnaire completer also completed a test. Weights are variables placed on the dataset to compensate for the unequal probabilities of selection and to adjust for nonresponse. When used with flags, weights allow the analyst to make generalizations about the national populations represented by the various ELS:2002 samples (e.g., schools versus students within schools). When weights are not used and/or when a flag is used inappropriately, the estimates generated will not be representative of the population.

3. After tagging the variables of interest, go to "File" and then "Output."

4. Select the program (e.g., SPSS to generate SPSS program code).

5. Specify directory and name of program code file.

6. Select appropriate button in "Confirmation" box.

7. To view the program code, select "File" and then "View Output."

8. Open the program code in the appropriate software (e.g., SPSS) to generate a working system file and run analyses. It may be necessary to modify the program slightly (check for "execute" statements, period locations, and file names). The code should identify the ASCII data file location, which will be the CD-ROM. Users should be aware of a possible SPSS syntax error associated with continuous variables: the "VALUE LABELS" statement is missing when the first tagged item for a data file is continuous and has no reserve codes.

A.4.4 Variance Estimation

Because the ELS:2002 sample design involved stratification, disproportionate sampling of certain strata (e.g., oversampling of Asians and of private schools), and clustered (e.g., students within a school) probability sampling, the resulting statistics are more variable than they would have been had they been based on data collected from a simple random sample of the same size. A number of statistical packages (e.g., SUDAAN, WESVAR, STATA, and AM) take account of complex sampling designs in the calculation of standard errors. (For an assessment of strengths and limitations of SUDAAN, Stata, and WesVar, see Broene and Rust 2000.) AM variance estimation software can be downloaded for free from the following website: *http://am.air.org/*. While users are strongly urged to employ variance estimation software, an alternative that supports the generation of approximate standard errors is use of the design effect (for details, see chapter 3 of the ELS:2002 *Data File User's Manual*).

A.5   Additional Sources of Information (NCES Reports, Bibliographic Resources)

Although only one report using ELS:2002 data has been produced to date (*A Profile of the American High School Sophomore in 2002*, NCES 2003–396), many more are planned. In addition, many of the National Education Longitudinal Study of 1988 (NELS:88) reports may be of interest, both for what they suggest about possible cross-cohort analyses, and for issues that can be examined cross-sectionally in ELS:2002 and NELS:88. ELS:2002 reports can be found in electronic format on the NCES website under *http://nces.ed.gov/pubsearch/getpubcats.asp?sid=023*. From the NCES website, documents can be searched and downloaded.

To aid researchers in locating reports that use ELS:2002 data, NCES has contracted with RTI International to produce a comprehensive annotated bibliography of publications and reports (including doctoral dissertations) that draw on ELS:2002 data. While the ELS:2002 bibliography cites only a handful of sources at this time, the number will rapidly grow. In addition, a bibliography is actively maintained for NELS:88. This bibliography can be found at: *http://nces.ed.gov/surveys/nels88/*. The NELS:88 bibliography will be valuable for those who plan cross-cohort analyses using ELS:2002 and NELS:88 sophomore data, and may serve as well to suggest particular cross-sectional analyses that have proved fruitful in the past and may be worth pursing with the ELS:2002 data set.

A.6   Reference

Broene, P., and Rust, K. (2000). *Strengths and Limitations of Using SUDAAN, Stata, and WesVarPC for Computing Variances from NCES Data Sets* (NCES 2000–03). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

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Appendix B
Base Year Questionnaires

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Appendix B
Base Year Questionnaires

Web-published PDF files of the base year questionnaires are available at:
http://www.nces.ed.gov/surveys/els2002/index.asp

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Appendix C
Student Questionnaire Critical Items

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Appendix C
Student Questionnaire Critical Items

Critical items are data elements deemed to be of special importance (for future locating of the respondent, for research, or as a data quality check on whether skip patterns are being followed correctly) and therefore are subject to edit and retrieval in the course of the in-school survey session.

Table C–1. ELS:2002 student questionnaire critical items

Variable	Variable description
BYS01	Name, address, phone number♦
BYS02	Mother's name♦
BYS03	Is her phone number the same as respondent's?♦
BYS04	Mother's address and home telephone number♦
BYS05	Her work phone number♦
BYS06	Father's name♦
BYS07	Is his address and telephone number same as respondent's?♦
BYS08	Father's address and home telephone number♦
BYS09	Father's work telephone number♦
BYS10	Name address and telephone number of relative or close friend♦
BYS13	Date of birth
BYS14	Sex of student
BYS15	Hispanic ethnicity
BYS16	Hispanic subgroup
BYS17	Race
BYS18	Asian subgroup
BYS19	Social Security number♦
BYS56	How far in school expect to get
BYS57	Plans for continuing education after high school
BYS67	Is English the student's native language
BYS68	Native language if not English
BYS81	Mother's occupation
BYS82	Father's occupation
BYS83	Mother's and father's education

♦Variable not included in any release file.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

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Appendix D
Public-Use Masked/Suppressed Variables
Available on Restricted Files for Licensed Users

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Appendix D
Public-Use Masked/Suppressed Variables Available on Restricted Files for Licensed Users

NOTE: The restricted-use files contain all variables on the public-use file. However, for purposes of protecting confidentiality, versions may differ in the amount of available detail (e.g., sometimes a given variable may appear in categorical form in the public-use file, but appear in continuous form in the restricted-use file, or it may include additional breakouts of collapsed categories, such as a restricted-use breakout for Native Hawaiians). In addition, a number of variables appear on the restricted file that have no counterpart on the public-use files (e.g., various geocode variables below the level of the four U.S. Census regions reported on the public-use file). The list below follows variable position order on the restricted-use Electronic Codebook (ECB).

Table D-1. Restricted-use unique variables, Education Longitudinal Study of 2002 (ELS:2002) base year student-level and school-level megafiles: 2002

Variable name	Variable description
Student-level variables	
BYEXPWT	Student expanded sample weight
RACE_R	Student's race/ethnicity—composite (restricted)
RACE2	Student's race/ethnicity—64 category
BYSARACE	Student's race/ethnicity—school roster
BYRACE_1	Student is White—composite
BYRACE_2	Student is Black or African American—composite
BYRACE_3	Student is Asian—composite
BYRACE_4	Student is Native Hawaiian/Pacific Islander—composite
BYRACE_5	Student is American Indian/Alaska Native—composite
HISPANIC	Student's Hispanic subgroup—composite
ASIAN	Student's Asian subgroup—composite
DOBIRTHR	Student's date of birth: year-month-day
PARACE_R	Parent's race/ethnicity—composite (restricted)
BYQXDATR	Date of base year student questionnaire administration
PISARFLG	Whether included in PISA[1] reading score concordance sample
BYIEPTYP	Federal disability category for base year IEPs[2]
BYACCTYP	Base year questionnaire/test accommodations
BYTXMTH	Math test theta T score
BYTXMTI1	Math theta T score—multiple imputation value 1 of 5
BYTXMTI2	Math theta T score—multiple imputation value 2 of 5
BYTXMTI3	Math theta T score—multiple imputation value 3 of 5
BYTXMTI4	Math theta T score—multiple imputation value 4 of 5
BYTXMTI5	Math theta T score—multiple imputation value 5 of 5
BYTXRTH	Reading test theta T score
BYTXRTI1	Reading theta T score—multiple imputation value 1 of 5
BYTXRTI2	Reading theta T score—multiple imputation value 2 of 5
BYTXRTI3	Reading theta T score—multiple imputation value 3 of 5
BYTXRTI4	Reading theta T score—multiple imputation value 4 of 5
BYTXRTI5	Reading theta T score—multiple imputation value 5 of 5

See notes at end of table.

Table D-1. Restricted-use unique variables, Education Longitudinal Study of 2002 (ELS:2002) base year student-level and school-level megafiles: 2002—Continued

Variable name	Variable description
BYRESZIP	Residential ZIP code for student/family
BYERAC_R	English teacher's race/ethnicity—composite (restricted)
BYSF1R_R	1st friend's race (restricted)
BYSF2R_R	2nd friend's race (restricted)
BYSF3R_R	3rd friend's race (restricted)
BYERAC_R	English teacher's race/ethnicity—composite (restricted)
BYMRAC_R	Math teacher's race/ethnicity—composite (restricted)
BYG10ER	Grade 10 enrollment—2001–02 school roster
BYCENDIV	Census division of school locale
BYSTATE	State code for school locale
BYCOUNTY	County code for school locale
BYSCHZIP	School ZIP code
HISPANIM	Imputation flag—Hispanic
ASIANIM	Imputation flag—Asian
BYS16	Student's Hispanic subgroup
BYS17A	Student is White
BYS17B	Student is Black/African American
BYS17C	Student is Asian
BYS17D	Student is Native Hawaiian/Pacific Islander
BYS17E	Student is American Indian/Alaska Native
BYS18	Student's Asian subgroup
BYS25CAA	1st friend is White
BYS25CAB	1st friend is Black/African American
BYS25CAC	1st friend is Asian
BYS25CAD	1st friend is Native Hawaiian/Pacific Islander
BYS25CAE	1st friend is American Indian/Alaska Native
BYS25CBA	2nd friend is White
BYS25CBB	2nd friend is Black/African American
BYS25CBC	2nd friend is Asian
BYS25CBD	2nd friend is Native Hawaiian/Pacific Islander
BYS25CBE	2nd friend is American Indian/Alaska Native
BYS25CCA	3rd friend is White
BYS25CCB	3rd friend is Black/African American
BYS25CCC	3rd friend is Asian
BYS25CCD	3rd friend is Native Hawaiian/Pacific Islander
BYS25CCE	3rd friend is American Indian/Alaska Native
BYS63	Occupation expects to have after high school—verbatim
BYS64	Occupation expects to have at age 30—verbatim
BYS68	Student's native language
BYS81A	Mother/female guardian's occupation—verbatim
BYS81B	Mother/female guardian's main job duties—verbatim
BYS82A	Father/male guardian's occupation—verbatim
BYS82B	Father/male guardian's main job duties—verbatim
BYP14	Parent's Hispanic subgroup
BYP15A	Parent is White
BYP15B	Parent is Black or African American
BYP15C	Parent is Asian
BYP15D	Parent is Native Hawaiian/Pacific Islander
BYP15E	Parent is American Indian/Alaska Native

See notes at end of table.

Table D-1.   Restricted-use unique variables, Education Longitudinal Study of 2002 (ELS:2002) base year student-level and school-level megafiles: 2002—Continued

Variable name	Variable description
BYP16	Parent's Asian subgroup
BYP19A	Mother's occupation before coming to US
BYP19B	Mother's main job duties outside US
BYP22A	Father's occupation before coming to US
BYP22B	Father's job main duties outside US
BYP29	Native language of parent respondent
BYP39A	Parent's current/most recent job for pay in US
BYP39B	Parent's main job duties
BYP43A	Spouse/partner's current/most recent job for pay in US
BYP43B	Spouse/partner's main job duties
BYTE24A	Teacher is White (English)
BYTE24B	Teacher is Black/African American (English)
BYTE24C	Teacher is Asian (English)
BYTE24D	Teacher is Native Hawaiian/Pacific Islander (English)
BYTE24E	Teacher is American Indian/Alaska Native (English)
BYTM24A	Teacher is White (math)
BYTM24B	Teacher is Black/African American (math)
BYTM24C	Teacher is Asian (math)
BYTM24D	Teacher is Native Hawaiian/Pacific Islander (math)
BYTM24E	Teacher is American Indian/Alaska Native (math)

School-level variables

Variable name	Variable description
BYSCMDST	Base year library media center questionnaire status
BYG10ER	Grade 10 enrollment—2001–02 school roster
BYCENDIV	Census division of school locale
BYSTATE	State code for school locale
BYCOUNTY	County code for school locale
BYSCHZIP	School ZIP code
BYNCESDI	NCES school district identification number
BYNCESSI	School identification number from CCD[3] or PSS[4]
BYA01	Total student enrollment as of October 2001
BYA02A	School has prekindergarten
BYA02B	School has kindergarten
BYA02C	School has 1st grade
BYA02D	School has 2nd grade
BYA02E	School has 3rd grade
BYA02F	School has 4th grade
BYA02G	School has 5th grade
BYA02H	School has 6th grade
BYA02I	School has 7th grade
BYA02J	School has 8th grade
BYA02K	School has 9th grade
BYA02L	School has 10th grade
BYA02M	School has 11th grade
BYA02N	School has 12th grade
BYA02O	School has 13th grade or higher
BYA03A	Comprehensive public school
BYA03B	Public magnet school

See notes at end of table.

Table D-1.   Restricted-use unique variables, Education Longitudinal Study of 2002 (ELS:2002) base year student-level and school-level megafiles: 2002—Continued

Variable name	Variable description
BYA03C	Public magnet school with theme
BYA03D	Public school of choice
BYA03E	Year-round school
BYA03F	Area vocational school/center
BYA03G	Full-time technical/vocational school
BYA03H	Other technical or vocational school
BYA03I	Catholic diocesan school
BYA03J	Catholic parish school
BYA03K	Catholic religious order school
BYA03L	Catholic independent school
BYA03M	Other private school with religious affiliation
BYA03N	Private school without religious affiliation
BYA03O	Boarding school
BYA03P	Indian reservation school
BYA03Q	Military academy
BYA03R	Alternative/dropout prevention/continuation school
BYA03S	Charter school
BYA21	Percentage 10th graders receive free/reduced-price lunch
BYA22A	Number of full-time teachers

[1] PISA = Program for International Student Assessment.
[2] IEP = individualized education program.
[3] CCD = Common Core of Data.
[4] PSS = Private School Survey.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Appendix E
Glossary of Terms

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Appendix E
Glossary of Terms

Accommodations (testing): In ELS:2002, certain accommodations were offered to students with barriers to participation, such as students with disabilities or students with limited English proficiency. An accommodation is a change in how a test is presented, in how a test is administered, or in how the test taker is allowed to respond. This term generally refers to changes that do not substantially alter what the test measures. The proper use of accommodations does not substantially change academic level or performance criteria. Appropriate accommodations are made to provide equal opportunity to demonstrate knowledge. Examples of test accommodations include allowing extra time, use of a large-print version of a test, or conveying instructions in sign language. Cases in which accommodations were implemented in ELS:2002 are specially flagged (the indicator is BYTXACC).

Adaptive testing: In the ELS:2002 base year, multiple test forms of varying levels of difficulty were assigned based on the examinee's score on a routing test. Thus the specific sequence of questions that each student answered was tailored to that student's ability level. An advantage of adaptive tests is that reliability per unit of testing time is greater than in a nonadaptive test. Adaptive procedures help to minimize floor and ceiling effects (see "Ceiling Effect" and "Floor Effect"). ELS:2002 adaptive testing relies on Item Response Theory (see "IRT") assumptions to place students who have taken different test forms on the same vertical score scale. In the first follow-up, each student's test form will be assigned on the basis of base year test performance.

American Indian or Alaska Native: An American Indian or Alaska Native is a person who has origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.

Asian: An Asian is a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Base weights: See "Design Weights."

Bias: Bias is the difference between the reported value and the true value. Thus the bias of an estimate is the difference between the expected value of a sample estimate and the corresponding true value for the population. Response bias is the difference between respondent reports and their behavior or characteristics. Nonresponse bias is the difference that occurs when respondents differ as a group from nonrespondents on a characteristic being studied. Sample bias is the unequal selection or the omission of members of the population, without appropriate weighting. Relatedly, undercoverage bias arises because some portion of the potential sampling frame is missed or excluded, or there are duplicate units. For example, if the school list from which a school sample is drawn is incomplete or inaccurate (owing, for example, to the birth of new schools subsequent to the time the list was drawn up), school undercoverage may occur. (See "Nonresponse Bias" and "Bias Analysis.")

Bias analysis: Nonresponse bias analysis compares the characteristics of respondents and nonrespondents. Both unit nonresponse (school, student) and item nonresponse on questionnaires were subject to bias analyses in ELS:2002. For example, certain key data items were obtained for both responding and nonresponding schools, so that a school nonresponse analysis could be conducted, and bias in school-level estimates quantified.

Black or African American: A person having origins in any of the black racial groups of Africa.

Burden: Formally, burden is the aggregate hours realistically required for data providers to participate in a data collection. Burden also has a subjective or psychological dimension: the degree to which providing information is regarded as onerous may depend on the salience to the respondent of the questions that are being posed and on other factors, such as competing time demands.

Carnegie unit: A standard of measurement used for secondary education that represents the completion of a course that meets one period per day for 1 year.

CAPI: Computer-assisted personal interviewing, in which the questionnaire is loaded into a field interviewer's laptop computer.

CATI: Computer-assisted telephone interviewing.

CCD: Common Core of Data. Data annually collected from all public schools in the United States by NCES. Data from the CCD supplied the public school sampling frame for the ELS:2002 base year.

CD-ROM: ELS:2002 data are distributed primarily in an optical laser disc medium, specifically, CD-ROM (Compact Disc Read-Only Memory). A CD-ROM is a computer storage disc in the same physical form as an audio CD; it can store approximately 650 megabytes of digital data.

Ceiling effect: The result of a test having insufficient numbers of the more difficult items. In a longitudinal study, ceiling effects in the follow-up can cause change scores to be artificially constrained for high-ability examinees. The measurement problems related to floor and ceiling effects in combination with regression effects found at the extreme score ranges seriously hamper the accuracy of change measures in longitudinal studies. More information (i.e., smaller error of measurement) is obtained with respect to ability level if high-ability individuals receive relatively harder items (and if low-ability individuals receive proportionately easier items). The matching of item difficulty to a person's ability level yields increased reliability at the extremes of the score distribution, where it is most needed for studies of longitudinal change. A strategy employed in ELS:2002 to minimize ceiling (and floor) effects is to employ test forms that are "adaptive" to the ability level of the examinee. Multilevel tests—with second stage test assignment that is based on the first stage (routing test) performance work—minimize the possibility that ceiling effects might bias the estimates of the score gains. (See "Floor Effect" and "Adaptive Test.")

Classical test theory: Classical test theory postulates that a test score can be decomposed into two parts—a true score and an error component; that the error component is random with a mean of zero and is uncorrelated with true scores; and that true scores, observed scores, and error components are linearly related.

Closed-ended: A type of question in which the data provider's responses are limited to given alternatives (as opposed to an open-ended question. See "Open-ended").

Clustering: A sample selection method in which small geographical areas such as schools (as is the case in ELS:2002), school districts, counties, or residential blocks are selected as an initial stage, with individuals selected in a subsequent step. (See "Primary Sampling Unit.")

Cluster size: The number of ELS:2002 sample members attending a particular high school.

Codebook: Documentation of each variable being measured, including variable name, columns occupied by each variable in the data matrix, values used to define each variable, unweighted frequencies, unweighted percents, and weighted valid percents. (See "Electronic Codebook.")

Coefficient of variation: The ratio of the standard deviation of an estimate to the value of the estimate.

Cognitive test battery: One of the two parts of the student survey (the second part being the student questionnaire). Two achievement areas (mathematics and reading) were measured in the base year.

Cohort: A group of individuals who have a statistical factor in common; for example, year of birth, grade in school, or year of high school graduation. ELS:2002 is a sophomore-grade cohort based on the spring term of the 2001–02 school year. It will also contain, however, a nationally representative sample of high school seniors in the spring term of the 2003–04 school year (see "Freshening"). In contrast, the Program for International Student Assessment (PISA) is an age cohort, based on students who were 15.25 years of age in April of 2000 or 2003.

Composite variable: A composite variable is one that is constructed through either the combination of two or more variables (socioeconomic status, for example, combines mother's education, father's education, mother's occupation, father's occupation, and family income or an income proxy [household items]) or that is calculated through the application of a mathematical function or transformation to a variable (e.g., conversion of raw test scores to percentile ranks). Also called a "derived variable," "created variable," or "constructed variable."

Confidence interval: A sample-based estimate expressed as an interval or range of values within which the true population value is expected to be located (with a specified degree of confidence).

Confidentiality protections: NCES is required by law to protect individually identifiable data from unauthorized disclosure. To this end, the ELS:2002 data have been subject to a disclosure risk analysis to determine which records require masking to produce the public-use data file from the restricted-use data file. Disclosure coarsening techniques (such as recoding of continuous variables into categorical, top and bottom coding, and so on), as well as data perturbation

techniques (e.g., data swapping) have been used to provide disclosure protection to the ELS:2002 data. (See also "Data Swapping" and "Disclosure Risk Analysis.")

Consent, active (explicit): One variety of informed consent is called active or explicit consent. Typically, in active consent, a signed agreement to participate in a study must be obtained. In ELS:2002, permission of parents was required before students could be surveyed. Some schools required active parental consent (i.e., that a signed permission form be obtained).

Consent, passive (implied): Another variety of informed consent is called passive or implied consent. In passive consent, a permission form is sent to the relevant party (in ELS:2002, normally the parent or guardian of the sampled student), who has the opportunity to return the form to indicate denial of permission. If the form is not returned, it is assumed that the individual has no objection to survey participation. In ELS:2002, most schools allowed passive parental consent for their sophomore's participation in the study.

Constructed response item: In the ELS:2002 assessment battery, a non-multiple-choice item that requires some type of written response.

Contextual data: In ELS:2002, the primary unit of analysis is the student, and information from the other study components, referred to as contextual data, should be viewed as extensions of the student data. For example, observations made in school administrator, teacher, librarian, and parent reports on the student's school learning environment or home situation would be considered contextual data.

Coverage rate: In ELS:2002 base year contextual samples, the proportion of the responding student sample with a report from a given contextual source (e.g., the parent survey, the teacher survey, or the school administrator survey). For the teacher survey, the student coverage rate can be calculated as either the percentage of participating students with two teacher reports, or the percentage with at least one teacher report. The teacher and parent surveys in ELS:2002 are purely contextual. The school-level surveys (school administrator, library media center, facilities checklist) can be used contextually (with the student as the unit of analysis) or in standalone fashion (with the school as the unit of analysis). (See "Response Rate.") Finally, test completions (reading assessments, mathematics assessments) are also calculated on a base of the student questionnaire completers, rather than on the entire sample, and thus express a coverage rate. "Coverage" can also refer to the issue of missed target population units on the sampling frame (undercoverage), or duplicated or erroneously enumerated units (overcoverage) (see "Bias" for discussion of undercoverage bias).

Cross-sectional analysis: A cross-sectional design represents events and statuses at a single point in time. For example, a cross-sectional survey may measure the cumulative educational attainment (achievements, attitudes, statuses) of students at a particular stage of schooling, such as 10th or 12th grade. In contrast, a longitudinal survey (or repeated measurement of the same sample units) measures the change or growth in educational attainments that occurs over a particular period of schooling. The longitudinal design of ELS:2002 generates two representative cross-sections (high school sophomores in 2002, and, through sample freshening, seniors in 2004). It also permits analysis of individual-level change over time through longitudinal analysis and of group-level and intercohort change through the cross-sectional

comparisons to past studies of similarly defined grade cohorts. (See "Longitudinal or Panel Survey" and "Cross-cohort Analysis.")

Cross-cohort (or intercohort) analysis: The ELS:2002 base year survey contained many data elements that were comparable to items from prior studies. They will supply a basis for comparison with earlier sophomore cohorts (such as 1980 sophomores in the High School and Beyond [HS&B] longitudinal study and 1990 sophomores in the National Education Longitudinal Study of 1988 [NELS:88]). With a freshened senior sample, the ELS:2002 first follow-up will support comparisons to 1972 (National Longitudinal Study of the High School Class of 1972 [NLS-72]), 1980 (HS&B), 1992 (NELS:88), and 2004 high school seniors. The first follow-up academic transcript component will offer a further opportunity for cross-cohort comparisons with the high school transcript studies of HS&B, NELS:88, and the National Assessment of Educational Progress (NAEP). With three or more timepoints, *trend analyses* are possible. With ELS:2002, this condition has now been met for the sophomore cohorts; trend studies of the senior cohorts were initiated with NELS:88. Essentially, three kinds of intercohort comparison are possible. First, cohorts can be compared on an *intergenerational or cross-cohort time-lag basis*. Both cross-sectional and longitudinal time-lag comparisons may be made. An example of a cross-sectional time-lag comparison would be looking at the status of HS&B (1980), NELS:88 (1990), and ELS:2002 (2002) sophomores to see how the situation of sophomores has changed over time. An example of longitudinal time-lag comparison would be an examination of the magnitude and correlates of achievement gain of HS&B, NELS:88, and ELS:2002 sophomores over the last 2 years of high school. Second, *fixed-time comparisons* are also possible, in which groups within each study are compared at different ages but the same point in time (e.g., the NLS-72, HS&B senior, and HS&B sophomore cohorts all could be looked at in 1986, some 14, 6, and 4 years after each respective cohort graduated from high school). Such a perspective would permit one to compare, for example, employment rates for 22-, 24-, and 32-year-old high school graduates). Finally, *longitudinal comparative analysis* of the cohorts can be performed by modeling the history of the grade cohorts.

Cut score: A cut score is a specified point on a score scale such that scores at or above that point are interpreted or acted upon differently from scores below that point.

Data element: The most basic unit of information. In data processing, it is the fundamental data structure. It is defined by its size (in characters) and data type (e.g., alphanumeric, numeric only, true/false, date) and may include a specific set of values or range of values.

Data swapping: Data swapping is defined in the *NCES Statistical Standards* as a perturbation disclosure limitation technique that results in a confidentiality edit. An example of data swapping would be to assume a data file has two potential individual identifying variables, for example, sex and age. If a sample case needs disclosure protection, it is paired with another sampled case so that each element of the pair has the same age, but different sexes. The data on these two records are then swapped. After the swapping, anyone thinking they have identified either one of the paired cases gets the data of the other case, so they have not made an accurate match and the data have been protected. (See also "Confidentiality Protections.")

Design effect: A measure of sample efficiency. The design effect (DEFF) is the variance of an estimate divided by the variance of the estimate that would have occurred if a sample of the same

size had been selected using simple random sampling. Sometimes it is more useful to work with standard errors than with variances. The root design effect (DEFT) expresses the relation between the actual standard error of an estimate and the standard error of the corresponding estimates from a simple random sample. (See also "Effective Sample Size.")

Design weights: Design weights compensate for unequal probabilities of selection. More specifically, the design weight is the inverse of the probability of selection. Design weights are also called raw weights, base weights, unadjusted weights, or sampling weights. Design weights may be contrasted to adjusted weights (adjusted to compensate for nonresponse, and also called final weights or analysis weights). Roughly, the design weight is calculated as the inverse of the probability of selection, taking into account all stages of the sample selection process. More precisely, design weights are the inverses of the expected frequencies with which population units appear in conceptually repeated samples selected using the sampling design developed for the study. Unlike the final weights, design weights are generated for all sample members, respondents and nonrespondents alike. Design weights do not appear on the ELS:2002 public-use files. (See also "Final Weights" and "Sampling Weights.")

Differential Item Functioning (DIF)**:** DIF exists when examinees of equal ability differ on an item solely because of their membership in a particular group (e.g., if an item favors males over females, or one racial or ethnic group over another, and cannot be explained by relevant factors such as differential coursetaking). DIF for ELS:2002 items was examined in the base year field test and is reported in the ELS:2002 Base Year Field Test Report. Items with DIF problems were revised or deleted.

Disability: A disability is a physical or mental impairment that substantially limits one or more of the major life activities (Title 42 U.S.C. Section 12102).

Disclosure risk analysis: Investigation of study data to evaluate and minimize the risk of identification of individual sample units, to preserve the confidentiality of the data. ELS:2002 data have been subjected to a disclosure risk analysis to protect confidential information about individual respondents; see the entry for "Public-use Data File." For a more detailed account of disclosure risk analysis, and of means of altering data (including masking, data perturbation, and data swapping) to prevent disclosure, see the current NCES Statistical Standards document.

Domain: A domain refers to a defined universe of knowledge, skills, abilities, attitudes, interests, or other human characteristics.

Effective sample size: Effective sample size may be defined as the ratio of the raw sample size divided by the design effect. (For example, the sampling variance of a mean standard score is equal to the reciprocal of the effective sample size, not the reciprocal of the raw sample size.) In essence, then, effective sample size is the sample size under a simple random sample design that is equivalent to the actual sample under the complex sample design, wherein the actual sample size is determined by multiplying the effective sample size by the anticipated design effect. (See also "Design Effect.")

Electronic codebook (ECB): While hardcopy codebooks with item stems, response categories, associated response frequency distributions, unweighted percents, and weighted valid percents

are contained within the ELS:2002 base year user's manual, ELS:2002 data are also available on CD-ROM in an electronic codebook (ECB) format. Electronic codebooks are menu-driven systems that allow users to perform functions such as the following: (a) search a list of database variables based upon key words or variable names/labels, (b) display unweighted percentages for each variable in the database, (c) display question text for each variable in the database, (d) select or tag variables for subsequent analysis, (e) generate SAS-PC or SPSS-PC+ program code/command statements for subsequently constructing a system file of the selected variables, and (f) generate a codebook of the selected variables.

Equating: Equating of two tests is established when examinees of every ability level and from every population group can be indifferent about which of two tests they take. Not only should they have the same expected mean score on each test, but they should also have the same errors of measurement. In contrast, test *linkage* results from placing two or more tests on the same scale, so that scores can be used interchangeably. (See also "Equated Test Score.")

Equated test score: Test equating takes place in two distinct contexts in ELS:2002. One context is *vertical equating* of forms for use in successive grades, such that the achievement growth of individual ELS:2002 sample members over time can be accurately measured. Another context is *cross-sectional equating* and *linking*, as to other tests (e.g., the National Education Longitudinal Study of 1988 [NELS:88], the Program for International Student Assessment [PISA], and the National Assessment of Educational Progress [NAEP]).

ETS: Educational Testing Service. RTI's subcontractor for ELS:2002 cognitive test development, scoring, and scaling.

Expanded sample: Although no sophomores were excluded from ELS:2002, those who could not validly be assessed or who could not validly complete the student questionnaire(e.g., students with a severe disability or limitation in their knowledge of the English language), were not eligible for these components. Contextual data (parent, teacher, school administrator) reports were collected for this group. In the first follow-up, their transcripts will be collected and the eligibility status of each will be re-evaluated. The expanded sample comprises all ELS:2002 sophomores; that is, both those who were eligible to complete the student questionnaire and test, and those who were not.

Facilities checklist: Completed by the RTI survey administrator, the facilities checklist is designed to extend the information available about the school by providing data on the school buildings and grounds that will help researchers to understand the adequacy and appearance of the school's physical plant, its safety and security features, and its role as a constituent of the school's general environment.

File: Refers to a data file containing a set of related computerized records.

Final weights: Final weights are sometimes called nonresponse-adjusted weights, adjusted weights, or analysis weights. Building on the design (raw) weight, they compensate for nonresponse. (See "Design Weights.")

Floor effect: The result of a cognitive test being too difficult for a large number of the examinees, causing the low-ability examinees to receive chance scores on the first testing, and on

subsequent testings if the test remains too difficult. Floor effects result in an inability to discriminate among low-ability individuals at time one or time two, and there will be no reliable discrimination among examinees with respect to amounts of change. A possible solution, utilized in ELS:2002, is to develop test forms that are "adaptive" to the ability level of the examinee, which tends to minimize the possibility of floor effects biasing the estimates of the score gains. (See also "Ceiling Effect" and "Adaptive Testing.")

Frame: A list of all the sampling units that represent the population. The Common Core of Data (CCD) and Private School Survey (PSS) were drawn upon for the ELS:2002 school frame. For an implicit list of the nation's high school sophomores as of spring term 2002, school rosters from participating schools listing their sophomore class were relied on.

Frame population: The set of elements (e.g., schools) that can be enumerated prior to the selection of a survey sample.

Freshening: A freshened sample includes cases from the longitudinal sample of a data set, plus new cases added to produce cross-sectional estimates of the population at the time of a subsequent wave of a longitudinal data collection. In the National Education Longitudinal Study of 1988 (NELS:88), freshening was the means by which high school sophomores were added in the first follow-up who were not in the eighth grade in the United States 2 years before. This process was repeated in the second follow-up, adding high school seniors who were not in the eighth grade in the United States 4 years before, and not in the tenth grade in the United States 2 years before. This process ensured that the sample would be representative of the 1992 senior class by allowing 1992 seniors who did not have a chance for selection into the base year (or the first follow-up) sample to have some probability of 1992 selection. The same procedure will be implemented in ELS:2002 in the 2004 first follow-up to ensure a nationally representative senior cohort. (See also "Half-open Interval.")

Half-open interval: A technique used to increase coverage. It is usually applied to a new list that includes cases that were covered in a previous frame, as well as new in-scope units not included in the previous frame. In this technique, new in-scope units between unit A on the previous frame up to, but not including, unit B (the next unit on the previous frame) are associated with unit A. These new units have the same selection probability as do unit As. This process is repeated for every unit on the previous frame. The new units associated with the actual sample cases are now included in the sample with their respective selection probabilities (freshening). Student sample freshening in the National Education Longitudinal Study of 1988 (NELS:88) first and second follow-ups, and the freshening to be conducted in the ELS:2002 first follow-up, rely on such a procedure. The half-open interval procedure was also used for ELS:2002 base year sample updating prior to Survey Day. (See also "Freshening" and "Sample Updating or *Refreshing*.")

Hispanic or Latino: A person of Cuban, Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race. The term "Spanish origin" can be used in addition to "Hispanic or Latino."

HS&B (High School and Beyond). The second in the series of longitudinal high school cohort studies sponsored by NCES. The HS&B base year study surveyed sophomore and senior

students in 1980. The sophomore cohort was last interviewed in 1992 and their postsecondary transcripts collected in 1993. The senior cohort was last interviewed in 1986.

Imputation: Imputation involves substituting values for missing or inconsistent data in a data set. Prediction of a missing value is typically based on a procedure that uses a mathematical model in combination with available information. Missing data for key items in ELS:2002 have been imputed.

Individualized education program (IEP): A written statement or plan for each individual with a disability that is developed, reviewed, and revised in accordance with Title 42 U.S.C. Section 1414(d).

Individually identifiable data: Data from any record, response form, completed survey, or aggregation about an individual or individuals from which information about particular individuals may be revealed.

Instrument: An evaluative device that includes tests, scales, and inventories to measure a domain using standardized procedures.

IRT: Item Response Theory. A method of estimating achievement level by considering the pattern of right, wrong, and omitted responses on all items administered to an individual student. IRT postulates that the probability of correct responses to a set of test questions is a function of true proficiency and of one or more parameters specific to each test question. Rather than merely counting right and wrong responses, the IRT procedure also considers characteristics of each of the test items, such as their difficulty and the likelihood that they could be guessed correctly by low-ability individuals. IRT scores are less likely than simple number-right or formula scores to be distorted by correct guesses on difficult items if a student's response vector also contains incorrect answers to easier questions. Another attribute of IRT that makes it useful for ELS:2002 is the calibration of item parameters for all items administered to all students. This makes it possible to obtain scores on the same scale for students who took harder or easier forms of the test. IRT will also permit vertical scaling of the two grade levels (10th grade in 2002, 12th grade in 2004). (See, in contrast, "Classical Test Theory.")

Item nonresponse: The amount of missing information when a valid response to an item or variable was expected. (See "Unit Nonresponse" and see "Bias Analysis.")

LEP: Limited English proficient. A concept developed to assist in identifying those language-minority students (individuals from non-English language backgrounds) who need language assistance services, in their own language or in English, in the schools. (See "NEP" and "LM.") A limited English proficient student is one who meets one or more of the following conditions:

    a.   the student was born outside of the United States or the student's native language is not English,

    b.   the student comes from an environment in which a language other than English is dominant, or

    c. the student is an American Indian or Alaska Native and comes from an environment in which a language other than English has had a significant impact on his/her level of English language proficiency,

and who has such difficulty speaking, reading, writing, or understanding the English language as to deny him or her the opportunity to learn successfully in English-only classrooms.

LM: Language Minority. A non-, limited-, or fully English-proficient student in whose home a non-English language is typically spoken.

Library media center questionnaire: This instrument supplies information about library/media center organization and staffing, technology resources, extent of library and media holdings, student access to and use of the library/media center, and its role in supporting the school's curriculum.

Longitudinal or panel survey: In a longitudinal design, similar measurements—of the same sample of individuals, institutions, households, or of some other defined unit—are taken at multiple time points. ELS:2002 employs a longitudinal design that follows the same individuals over time and permits the analysis of individual-level change. (See "Cross-sectional Survey.")

Machine editing: Also called forced data cleaning or logical editing. Uses computerized instructions (including logical or deductive imputation) in the data cleaning program that ensure common-sense consistency within and across the responses from a data provider.

Microdata (microrecords): Observations of individual sample members, such as those contained on the ELS:2002 data files.

MPR Associates: An RTI subcontractor for the ELS:2002 base year and first follow-up studies.

NAEP: The National Assessment of Educational Progress. NAEP is a cross-sectional assessment program that measures achievement at the group level for students in fourth, eighth, and twelfth grades and provides a time series for measuring trends in academic progress of 9-, 13-, and 17-year olds. ELS:2002 tests differ from but complement those of NAEP by providing a basis for measuring individual-level achievement growth between 10th and 12th grades in mathematics and relating cognitive gains in this subject to the individual, school, and family factors and processes that are measured in the various ELS:2002 questionnaires and school records (transcript) studies.

Native Hawaiian or Other Pacific Islander: Any person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

NCES: The National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. This governmental agency is the sponsor of ELS:2002 and is also the sponsoring agency for (among other studies) the National Assessment of Educational Progress (NAEP), the National Education Longitudinal Study of 1988 (NELS:88), the High School and Beyond (HS&B) longitudinal study, and the National Longitudinal Study of the High School Class of 1972 (NLS-72).

NELS:88: The National Education Longitudinal Study of 1988. Third in the series of longitudinal high school cohort studies sponsored by NCES. The study represents three cohorts: the eighth-grade class of 1988, the sophomore class of 1990, and the senior class of 1992. The study collected questionnaire and test data in 1988, 1990, and 1992 on students' school experiences, as well as background information from school administrators, teachers, parents (in the base year and second follow-up only), and school records. Data on postsecondary and out-of-school experiences were collected in interviews conducted in 1994 and 2000 and through a postsecondary education transcripts study in 2000–01.

NEP: No English proficiency. A student who does not speak English. (See "LEP.")

Noncoverage: Units of the target population that are missing from the frame population. Includes the problems of incomplete frames and missing units.

Nonresponse: (See "Item Nonresponse," "Unit Nonresponse," "Bias Analysis," and "Nonresponse Bias.")

Nonresponse bias: Nonresponse bias may occur as a result of not obtaining 100 percent response from the selected cases. More specifically, nonresponse bias occurs when the expected observed value deviates from the population parameter. The potential magnitude of nonresponse bias is estimated as the product of the nonresponse rate and the difference in values of a characteristic between respondents and nonrespondents. (See also "Bias" and "Bias Analysis.")

NLS-72: The National Longitudinal Study of the High School Class of 1972. This project was the first in the series of longitudinal high school cohort studies sponsored by NCES. The final round of data collection took place in 1986.

Nonsampling error: An error in sample estimates that cannot be attributed to sampling fluctuations. Such errors may arise from many sources, including imperfect implementation of sampling procedures, differential unit or item nonresponse across subgroups, bias in estimation, or errors in observation and recording.

OMB: The Office of Management and Budget, U.S. Executive Branch. OMB is a federal agency with the responsibility for reviewing all studies funded by executive branch agencies. OMB reviewed, commented on, and approved the ELS:2002 questionnaires, as indicated by their approval number and its expiration date in the top right corner of the questionnaire covers.

Open-ended: A type of question in which the data provider's responses are not limited to given alternatives.

Optical disc: A disc that is read optically (e.g., by laser technology), rather than magnetically. (See "CD-ROM.")

Optical scanning: A system of recording responses that transfers responses into machine-readable data through optical mark reading. This method of data capture was used for the ELS:2002 student questionnaires and cognitive tests, as well as for the school administrator, teacher, and library media center questionnaires, and hardcopy (as contrasted to CATI [computer-assisted telephone interviewing]) administrations of the parent questionnaire.

Oversampling: Deliberately sampling a portion of the population at a higher rate than the remainder of the population. For example, in ELS:2002, private schools have been oversampled. Within schools, Asians have been oversampled.

Parent/guardian questionnaire: The ELS:2002 parent component sought to collect information from parents of all base year student sample members. The parent or guardian who knew most about his or her child's educational experience was asked to complete the questionnaire.

PISA: The Program for International Student Assessment assesses 15-year-olds in reading, mathematics, and science. In 2000, the primary focus of the assessment was reading. The United States and 31 other nations participated, under the aegis of the Organization for Economic Cooperation and Development (OECD). In 2003, the primary focus was mathematics, and in 2006, the primary focus will be science. A crosswalk (or concordance) has been developed between the ELS:2002 reading test and the PISA reading test, so that the PISA scale can be implemented in ELS:2002. A similar scale linkage will be effected between the ELS:2002 mathematics test (2002) and the PISA math test (2003).

Population: All individuals in the group to which conclusions from a data collection activity are to be applied. Weighted results of ELS:2002 data provide estimates for populations and subgroups.

Population variance: A measure of dispersion defined as the average of the squared deviations between the observed values of the elements of a population or sample and the population mean of those values.

Postsecondary education: The provision of formal instructional programs with a curriculum designed primarily for students who have completed the requirements for a high school diploma or equivalent. This includes programs of an academic, vocational, and continuing professional education purpose, and excludes vocational and adult basic education programs.

Poststratification adjustment: A weight adjustment that forces survey estimates to match independent population totals within selected poststrata (adjustment cells).

Precision: The difference between a sample-based estimate and its expected value. Precision is measured in terms of the sampling error (or standard error) of an estimate.

Primary sampling unit (PSU): Unit chosen at the first stage of a cluster sample. In ELS:2002, the PSU is the school; in other studies, geographical units such as a county or metropolitan statistical area (MSA) may serve as the PSU.

Probability sample: A sample selected by a method such that each unit has a fixed and determined probability of selection—i.e., each population unit has a known, nonzero chance of being included.

Proficiency score: Proficiency scores (or criterion-referenced mastery scores) are based on clusters of items within each test that are of similar content and difficulty. Both normative (e.g., achievement quartiles) and proficiency scores are available from the ELS:2002 database.

PSS: Private School Survey. An NCES universe survey encompassing the nation's private schools. PSS was the private school sampling frame for the ELS:2002 base year.

Public-use data file: A public-use file includes a subset of data that have been coded, aggregated, or otherwise altered to mask individually identifiable information; it thus is available to all external users. Unique identifiers, geographic detail, and other variables that cannot be suitably altered are not included in public-use data files. Public-use edits are based on an assumption that external users have access to both individual respondent records and secondary data sources that include data that could be used to identify respondents. For this reason, the editing process is relatively extensive. When determining an appropriate masking process, the public-use edit takes into account and guards against matches on common variables from all known files that could be matched to the public-use file. The analysis used to determine which records require masking is called a disclosure risk analysis**.**

Range check: A determination of whether responses fall within a predetermined set of acceptable values.

Record format: The layout of the information contained in a data record (includes the name, type, and size of each field in the record).

Records: A logical grouping of data elements within a file upon which a computer program acts.

Refreshed student: See "Sample Updating or *Refreshing*."

Relative bias. Relative bias is the bias of the estimate divided by the estimate. It provides an indication of the order of magnitude of the bias with respect to the estimate.

Reliability: The consistency in results of a test or measurement including the tendency of the test or measurement to produce the same results when applied twice to some entity or attribute believed not to have changed in the interval between measurements.

Reserve code (or **reserved code**)**:** Certain codes have been reserved to stand for a number of situations in which missing data occurs in response frequencies. In ELS:2002, the reserve code conventions are as follows: -1 = "Don't know;" -2 = "Refused;" -3 = "Legitimate Skip/NA;" -4= Nonrespondent;" -5 = "Out of Range;" -6 = "Multiple Response;" -7 = "Not Administered— abbreviated interview;" and -9= "Missing."

Response rate: In general, unit response rates are calculated as the ratio of the weighted number of completed instruments to the weighted number of in-scope cases, using the sample base weight (the inverse of the probability of selection). In multistage samples, such as the base year of ELS:2002, overall response is the product of both stages (though for many purposes, the stages are reported separately). Item response rates are calculated as the ratio of the number of respondents for whom an in-scope response was obtained to the number of respondents who are asked to answer a given item. Calculation of unit and item response rates can be a complex matter, and additional considerations arise in reporting in follow-up waves of longitudinal studies, for composite (constructed) variables, and for other cases. More detailed information can be found by consulting NCES Standard 1-3 in the NCES 2002 Statistical Standards

document (available on the web at *<http://nces.ed.gov/pubsearch/wnew.asp?1>*). Bias analyses conducted when response rates are below targets help to assess any possible limitations to the generalizability of survey estimates. (See "Bias Analysis.")

Restricted-use data file: A restricted-use file includes individually identifiable information that is confidential and protected by law. Restricted-use data files are not required to include variables that have undergone public-use edits. ELS:2002 data are available in both public-use and restricted-use forms. Use of the restricted data requires the researcher to obtain a special license from NCES.

RTI International (RTI): A nonprofit university-affiliated research organization with headquarters at Research Triangle Park, North Carolina, that conducted the base year of ELS:2002 and is currently conducting the first follow-up of the study on behalf of NCES. RTI International is a trade name of Research Triangle Institute.

Sample: Subgroup selected, by a probability method, from the entire population, in order to represent it.

Sample updating or *refreshing*: Because students can transfer into or out of a school after sampling, the base year student sample in ELS:2002 (as in High School and Beyond [HS&B] and the National Education Longitudinal Study of 1988 [NELS:88]) was updated to remove students who had transferred out and to give sophomores who had transferred in since sampling a chance of selection. The half-open interval procedure was employed for sample updating prior to Survey Day, using the school 10th-grade enrollment lists.

Sampling error: The part of the difference between a value for an entire population and an estimate of that value derived from a probability sample that results from observing only a sample of values.

Sampling frame. See "Frame" or "Frame population."

Sampling variance: A measure of dispersion of values of a statistic that would occur if the survey were repeated a large number of times using the same sample design, instrument, and data collection methodology. The square root of the sampling variance is the standard error.

Sampling weight: A multiplicative factor equal to the reciprocal of the probability of a respondent being selected for the study, with adjustment for nonresponse. The sum of the weights provides an estimate of the number of persons in the population represented by a respondent in the sample.

Scaling: Scaling refers to the process of assigning a scale score based on the pattern of responses. (See also "Equated Test Score" and "IRT.")

School administrator questionnaire: This questionnaire was to be completed by the base year principal and/or someone designated by the principal. The questionnaire sought basic information about school policies, number of students in each class, curriculum offered, programs for disadvantaged and disabled students, and other school characteristics.

School climate: The social system and ethos or culture of the school, including the organizational structure of the school and values and expectations within it.

School coordinator: A person designated in each school to act as a contact person between the school and RTI. This person assisted with establishing a Survey Day in the school and preparing for the survey.

Section 504: Section 504 of the Rehabilitation Act of 1973, as amended (Title 29 U.S.C. 794 Section 504), prohibits discrimination on the basis of handicap in federally assisted programs and activities.

Selection probability: The chance that a particular sampling unit has of being selected in the sample.

Simple random sampling (**SRS**): SRS uses equal probability sampling with no strata or clusters. The ELS:2002 sample is stratified and clustered. Most statistical analysis software assumes SRS and independently distributed errors. For studies such as ELS:2002, special variance estimation software (such as SUDAAN, WesVar, AM, or Stata) is required to compute the standard error of estimates.

Standard deviation: The most widely used measure of dispersion of a frequency distribution. It is equal to the positive square root of the population variance.

Standard error: The positive square root of the sampling variance. It is a measure of the dispersion of the sampling distribution of a statistic. Standard errors are used to establish confidence intervals for the statistics being analyzed.

Statistical significance: The finding (based on a derived probability, rather than a certitude) that two or more estimates are truly different from one another and not a merely apparent difference reflecting chance variation.

Stratification: The division of a population into parts, or strata. In a stratified sample, the total population is divided into strata or subgroups. Strata are created by partitioning the frame and are generally defined to include relatively homogeneous units within strata. Stratification is used to reduce sampling error. In ELS:2002, the sampling frame was sorted to create strata or subgroups of schools, and schools were selected independently within each stratum. Schools were stratified by superstrata (combinations of school type or sector and geographic region) and substrata (urban, suburban, rural).

Student questionnaire: One of the two parts of the ELS:2002 base year student survey (the other part is the cognitive test battery). This instrument contained a locator section for tracing sample members for future waves of ELS:2002 and a series of questions about school and home environments, time use, attitudes, values, and aspirations.

Survey Administrator: A member of RTI's field staff in charge of conducting in-school data collection sessions (see "Survey Day" below). The individual in this role was called a Team Leader in NELS:88 and a Survey Representative in HS&B.

Survey Day: A day chosen by the school during the data collection period when an RTI survey administrator and assistant administered the survey to the school's sample of students. The Survey Day session lasted about 2 hours. Two Make-up Days were normally offered for students who missed Survey Day.

Target population: The finite set of observable or measurable elements that will be studied, or the conceptual population of analytic units for which data are collected and estimates are made. In the ELS:2002 base year, the target population was spring term 2002 sophomores in all regular public and private schools with 10th grades in the 50 states and the District of Columbia.

Teacher questionnaire: In the base year, math and reading teachers of ELS:2002 sophomore participants were asked to complete a teacher questionnaire, which collected data on school and teacher characteristics (including teacher qualifications and experience) and evaluations of student performance.

Teacher sample: In the ELS:2002 base year, two teacher reports were sought for each student, one from the student's mathematics teacher and one from the student's English teacher.

Technical Review Panel (TRP): A TRP is a specially appointed, independent group of substantive, methodological, and technical experts who offer advice to the study's contractor on issues of study design and content. TRP members are nominated by the contractor and approved by NCES. Typically TRPs are convened at least once a year within the life of a contract.

Trimming: A process by which extreme weights are reduced (trimmed) to diminish the effect of extreme values on estimates and estimated variances.

Unit nonresponse: Failure of a survey unit (e.g., at the institutional level, a school, or at the individual level, a respondent, such as a student or a teacher) to cooperate or complete a survey instrument. *Overall unit nonresponse* reflects a combination of unit nonresponse across two or more levels of data collection, where participation at the second stage of data collection is conditional upon participation in the first stage of data collection. In ELS:2002, overall nonresponse is the product of school-level nonresponse times student nonresponse. *Total nonresponse* reflects a combination of the overall unit nonresponse and item nonresponse. (See also "Item Nonresponse" and "Nonresponse Bias.")

Urbanicity (or Metropolitan Status): The ELS:2002 school sample was stratified by metropolitan status or urbanicity, in accordance with the following three locale codes: (1) Urban: the school is in a large or mid-size central city; (2) Suburban: the school is in a large or small town or is on the urban fringe of a large or mid-size city; and (3) Rural: the school is in a rural area. Locale indicators were taken from the Common Core of Data (CCD) for public schools and the Private School Survey (PSS) for private schools.

Validity: The capacity of an item or instrument to measure what it was designed to measure, stated most often in terms of the correlation between scores in the instrument and measures of performance on some external criterion. It is the extent to which a test or set of operations measures what it is supposed to measure. Reliability, on the other hand, refers to consistency of measurement over time. (See "Reliability.")

Variance: The average of the squared deviations of a random variable from the expected value of the variable. The variance of an estimate is the squared standard error of the estimate. (See "Population Variance" and "Sampling Variance.")

Wave: A wave is a round of data collection in a longitudinal survey (e.g., the base year and each successive follow-up are each waves of data collection).

Weighted response rates: Unit response rates are calculated as the ratio of the weighted number of completed interviews to the weighted number of in-scope sample cases. Unit response rates are calculated using the sample base weights (inverse of the probability of selection).

Weighted estimates: Weighted estimates (as in the ELS:2002 codebook) are survey estimates in which the sample data are statistically weighted (multiplied) by factors reflecting the sample design. The general purpose of weighting is to compensate for unequal probabilities of selection into the sample and to adjust for the fact that not all schools or individuals selected into the sample actually participated. The design weights (also known as base weights, and typically equal to the reciprocals of the overall selection probabilities) are multiplied by a nonresponse or poststratification adjustment for a final weight. Thus, for example, in ELS:2002, the 752 participating schools in the base year represent a national population of 24,795 schools. Individual schools may "represent" anywhere from a minimum of one school to a maximum of 96 schools. To take a National Education Longitudinal Study of 1988 (NELS:88) example of weighted estimates, 12,111 base year questionnaire respondents reported themselves to be male, and a slightly greater number (12,244) reported themselves to be female. When these cases are multiplied by the nonresponse-adjusted student weights to yield a weighted percent that reflects the national population of eighth graders, the estimate for males is 50.1 percent of the 1988 eighth-grade cohort, while females are estimated to comprise 49.9 percent of the nation's 1988 eighth graders.

White: A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

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Appendix F
Documentation for Imputed Variables

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Appendix F
Documentation for Imputed Variables

Table F–1.   Imputed Education Longitudinal Study of 2002 (ELS:2002) base year variables

Imputation variables
Student sex
Student race/ethnicity
Student Hispanic subgroup
Student Asian subgroup
Father's educational attainment (composite)
Mother's educational attainment (composite)
Father's occupation/occupational prestige♦
Mother's occupation/occupational prestige♦
Family income (parent report)
Highest parental education (composite)
English as native language
Student IRT number-right score in reading
Student IRT number-right score in mathematics
Standardized T-score in reading
Standardized T-score in mathematics
Standardized T-score, reading + mathematics composite
Achievement quartile in reading
Achievement quartile in mathematics
Composite achievement quartile (reading + mathematics)
Probability of proficiency, reading (3 levels/variables)
Probability of proficiency, math (5 levels/variables)
Parent-reported family composition
Student educational aspirations
Parental aspirations for student
School region
School type (public, Catholic, other private)
School metropolitan type (urban, suburban, rural)
School percent minority
School grade 10 membership

♦Composite variable based on parent reports. When parent reports were missing, the variable was based on student reports and, if still missing, on imputation. Imputed for use in construction of the socioeconomic status variable. Not available on the data file.
NOTE: The presentation of imputation variables in Table F-1 differs slightly from the presentation in Table 23. Table 23 lists the ability estimate (*theta)* in mathematics and reading from which test variables were derived. Table F-1 lists the test variables derived from the imputed version of *theta*. While only *theta* was directly imputed, the imputed *theta* provided the basis for complete information about test performance for the scores listed in Table F-1. Also, several school-level variables, listed in F-1, were identified as key, and to be imputed if there were missing data for them. For these school-level imputation variables (region, school type, metropolitan status, percent minority, and grade 10 enrollment), in the event, 100 percent coverage was obtained from universe files, and statistical imputation was not required.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Table F–2. Imputation classes and sort variables for variables imputed by weighted sequential hot deck imputation

Imputation variable	Imputation class variables	Sort variables
English as native language (STLANG)	Student race (RACE) Mother's birthplace (BYP17)	Census region (BYREGION) Urbanicity (BYURBAN) Percent minority Parent's race (PARACE) Father's birthplace (BYP20) Student birthplace (BYP23)
Student Hispanic origin (HISPANIC)	Friend race composite English as native language (BYS67)	School type (BYSCTRL) Census region (BYREGION) Urbanicity (BYURBAN) School (SCH_ID) Parent's race (PARACE)
Student Asian origin (ASIAN)	Friend race composite English as native language (BYS67)	School type (BYSCTRL) Census region (BYREGION) Urbanicity (BYURBAN) School (SCH_ID) Parent's race (PARACE)
Type of school program (SCHPROG)	School coed status (BYA11) Percent 10th graders in general HS (BYA14A) Percent 10th graders in college prep (BYA14B) Percent 10th graders in voc/tech (BYA14D)	School type (BYSCTRL) Census region (BYREGION) Urbanicity (BYURBAN) Percent minority Percent 10th graders in LEP (BYA20)
Student educational expectations (STEXPECT)	Student sex (SEX) Type of school student wants to attend after HS (BYS58) Good grade importance (BYS37)	School type (BYSCTRL) Census region (BYREGION) Urbanicity (BYURBAN) Student race (RACE) School program (BYS26) How far parent expects student to go in school (BYP81) Parent saved money for 10th graders Education after high school (BYP82)

See notes at end of table.

Table F–2. Imputation classes and sort variables for variables imputed by weighted sequential hot deck imputation—Continued

Imputation variable	Imputation class variables	Sort variables
Parental aspirations for student postsecondary achievement (PARASPIR)	Student race (RACE) Student educational expectations (BYS56)	School type (BYSCTRL) Census region (BYREGION) Urbanicity (BYURBAN) Student race (RACE) School program (BYS26) Parental aspirations for student postsecondary achievement (BYP79) Parental savings for student postsecondary schooling (BYP82)
Family composition (BYFCOMP)	Parent marital status Student race (RACE) English as native language (BYS67)	Census region (BYREGION) Urbanicity (BYURBAN) Father's educational attainment (FATHED) Mother's educational attainment (MOTHED) Number persons dependent on parent (BYP06)
Mother's educational attainment (MOTHED)	Student race (RACE) Parental aspirations for student postsecondary achievement (BYP79) Mother's birthplace (BYP17)	Census region (BYREGION) Urbanicity (BYURBAN) Family composition (BYFCOMP) Student educational expectations (BYS56) Computer in home (BYS84C)
Mother's occupation (OCCUMOTH)	Student race (RACE) Mother's educational attainment (MOTHED) Mother's birthplace (BYP17)	Census region (BYREGION) Urbanicity (BYURBAN) Family composition (BYFCOMP) Student educational expectations (BYS56) Parental aspirations for student postsecondary achievement (BYP79) Computer in home (BYS84C)
Father's educational attainment (FATHED)	Student race (RACE) Parental aspirations for student postsecondary achievement (BYP79) Father's birthplace (BYP20)	Census region (BYREGION) Urbanicity (BYURBAN) Family composition (BYFCOMP) Student educational expectations (BYS56) Computer in home (BYS84C)

See notes at end of table.

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Table F–2. Imputation classes and sort variables for variables imputed by weighted sequential hot deck imputation—Continued

Imputation variable	Imputation class variables	Sort variables
Father's occupation (OCCUFATH)	Student race (RACE)	Census region (BYREGION)
	Father's educational attainment (FATHED)	Urbanicity (BYURBAN)
	Father's birthplace (BYP20)	Family composition (BYFCOMP)
		Student educational expectations (STEXPECT)
		Parental aspirations for student postsecondary achievement (PARASPIR)
		Computer in home (BYS84C)
Household income (INCOME)	Mother's educational attainment (MOTHED)	Census region (BYREGION)
	Father's educational attainment (FATHED)	Urbanicity (BYURBAN)
	Family composition (BYFCOMP)	Student race (RACE)
		Father's occupation (OCCUFATH)
		Number of earners contributing to family income (BYP86)

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Table F–3.   Variables included in multiple imputation model for student ability estimates for reading and mathematics

Imputation variable	Variables included in multiple imputation model
Student ability estimates (theta) for reading and mathematics	School type (BYSCTRL)
	Census region (BYREGION)
	Urbanicity (BYURBAN)
	Student sex (SEX)
	Student race (RACE)
	English as native language (BYS67)
	Mother's occupation (OCCUMOTH)
	Father's occupation (OCCUFATH)
	Student educational expectations (BYS56)
	Parental aspirations for student postsecondary achievement (BYP79)
	Mother's educational attainment (MOTHED)
	Father's educational attainment (FATHED)
	Household income (INCOME)
	Family composition (BYFCOMP)

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

Table F–4. Distribution of variables before and after imputation: 2002

Variable	Before imputation		After imputation		Significance (at 0.05)
	Sample size	Weighted percent	Sample size	Weighted percent	
Student sex (SEX) Total	**15,352**	100.0	**15,362**	100.0	
Male	7,640	50.5	7,646	50.5	*
Female	7,712	49.5	7,716	49.6	
Student race (RACE)	**15,355**	100.0	**15,362**	100.0	
American Indian or Alaska Native	131	0.9	131	0.9	
Asian	1,403	3.8	1,403	3.8	
Black or African American, non Hispanic	2,033	14.4	2,033	14.4	
Hispanic, no race specified	1,001	7.2	1,001	7.2	
Hispanic, race specified	1,234	8.8	1,233	8.8	
Multiracial, non-Hispanic	742	4.3	742	4.3	
Native Hawaiian or other Pacific Islander	62	0.2	62	0.2	
White, non-Hispanic	8,749	60.4	8,757	60.4	
Student Hispanic origin (HISPANIC)	**2,167**	100.0	**2,234**	100.0	
Mexican, Mexican-American, Chicano	1,421	69.3	1,466	69.4	
Cuban	77	3.2	80	3.2	
Dominican	67	3.8	68	3.7	
Puerto Rican	284	11.5	296	11.6	
Central American	152	6.3	155	6.2	
South American	166	6.0	169	6.0	
Student Asian origin (ASIAN)	**1,671**	100.0	**1,788**	100.0	
Chinese	351	20.1	375	20.2	
Filipino	263	20.5	284	20.0	
Japanese	128	8.5	137	8.4	
Korean	268	15.7	279	15.3	
Southeast Asian	411	20.6	443	21.2	
South Asian	250	14.7	270	14.9	
English as native language (BYS67)	**15,027**	100.0	**15,362**	100.0	*
English is native language	12,502	86.2	12,766	86.1	*
English not native language	2525	13.8	2596	14.0	*
Type of school program (BYS26)	**14,368**	100.0	**15,362**	100.0	
General	5,034	38.4	5,419	38.6	*
College preparatory-academic	7,920	50.9	8,439	50.7	*
Vocational-including technical/business	1,414	10.8	1504	10.8	*
Student educational expectations (BYS56)	**13,552**	100.0	**13,901**	100.0	*
Less than high school graduation	113	0.9	128	1.0	
High school graduation or GED only	930	7.8	999	8.1	*
Attend or complete a 2-year school	867	7.2	888	7.1	
Attend college, but not complete a 4-year degree	550	4.3	565	4.3	

See notes at end of table.

Table F–4. Distribution of variables before and after imputation: 2002—Continued

| | Before imputation | | After imputation | | |
Variable	Sample size	Weighted percent	Sample size	Weighted percent	Significance (at 0.05)
Graduate from college	5,329	39.8	5,455	39.7	
Obtain a master's degree or equivalent	3,130	22.0	3,183	21.9	*
Obtain a PhD, MD, or other advanced degree	2,633	17.9	2,683	17.8	
Parental aspirations for student postsecondary achievement (BYP79)	**13,183**	100.0	**15,362**	100.0	*
Less than high school graduation	11	0.1	13	0.1	
High school graduation or GED only	438	3.8	543	4.0	*
Attend or complete a 2-year school	980	8.3	1,178	8.6	*
Attend college, but not complete a 4-year degree	125	100.0	145	100.0	*
Graduate from college	5,812	45.4	6,790	45.3	*
Obtain a master's degree or equivalent	2,773	20.1	3,200	19.9	*
Obtain a Ph.D., M.D., or other advanced degree	3,044	21.4	3,493	21.2	*
Family composition (BYFCOMP)	**13,487**	100.0	**15,362**	100.0	
Mother and father	8,111	57.3	9,131	56.8	*
Mother and male guardian	1,627	13.3	1,881	13.4	*
Father and female guardian	422	3.1	494	3.2	*
Two guardians	227	1.8	266	1.9	*
Mother only	2,376	19.0	2,755	19.1	*
Father only	400	3.1	454	3.2	*
Female guardian only	159	1.2	191	1.3	*
Male guardian only	40	0.2	48	0.2	
Lives with student less than half time	125	0.8	142	0.9	*
Mother's educational attainment (MOTHED)	**14,764**	100.0	**15,362**	100.0	*
Did not finish high school	1,821	12.9	1,933	13.2	*
Graduated from high school or GED	3,939	27.8	4,126	27.9	*
Attended 2-year school, no degree	1,783	13.1	1,856	13.1	*
Graduated from 2-year school	1,583	11.2	1,633	11.2	*
Attended college, no 4-year degree	1,556	10.5	1,595	10.3	*
Graduated from college	2,747	16.7	2,837	16.6	*
Completed master's degree or equivalent	1,034	6.0	1,066	6.0	*
Completed Ph.D., M.D., advanced degree	301	1.7	316	1.7	*
Mother's occupation (OCCUMOTH)	**14,514**	100.0	**15,362**	100.0	*
No job for pay	589	3.5	606	3.3	*
Clerical	2,348	16.7	2,480	16.7	*
Craftsperson	320	2.3	338	2.3	*
Farmer, farm manager	83	0.7	84	0.6	
Homemaker	616	4.3	761	5.0	*
Laborer	658	4.9	685	4.8	*
Manager, administrator	1,585	10.9	1,670	10.9	*
Military	28	0.2	29	0.2	

See notes at end of table.

Table F–4. Distribution of variables before and after imputation: 2002—Continued

Variable	Before imputation		After imputation		Significance (at 0.05)
	Sample size	Weighted percent	Sample size	Weighted percent	
Operative	608	4.5	638	4.4	*
Professional A	2,113	13.9	2,188	13.6	*
Professional B	589	3.8	606	3.7	*
Proprietor, owner	342	2.3	365	2.3	*
Protective service	106	0.8	114	0.7	
Sales	631	4.4	659	4.3	*
School teacher	984	6.5	1,009	6.3	*
Service	2,178	15.5	2,362	15.9	*
Technical	736	5.1	768	5.0	*
Father's educational attainment (FATHED)	**13,847**	100.0	**15,362**	100.0	*
Did not finish high school	1,792	13.6	2,040	13.9	*
Graduated from high school or GED	3,849	29.9	4,335	30.2	*
Attended 2-year school, no degree	1,298	9.9	1,450	9.9	*
Graduated from 2-year school	1,091	8.3	1,203	8.2	*
Attended college, no 4-year degree	1,294	9.4	1,426	9.3	*
Graduated from college	2,526	16.9	2,749	16.8	*
Completed master's degree or equivalent	1,187	7.5	1,289	7.4	*
Completed Ph.D., M.D., advanced degree	810	4.5	870	4.4	*
Father's occupation (OCCUFATH)	**13,147**	100.0	**15,362**	100.0	*
No job for pay	155	0.8	177	0.8	*
Clerical	314	2.5	365	2.5	*
Craftsperson	1,635	13.5	1,941	13.5	*
Farmer, farm manager	249	2.2	289	2.1	*
Homemaker	271	2.2	392	2.7	*
Laborer	1,327	10.7	1,615	11.1	*
Manager, administrator	2,007	15.0	2,264	14.5	*
Military	173	1.3	202	1.3	*
Operative	1,465	11.9	1,773	12.2	*
Professional A	1,449	10.3	1,636	10.0	*
Professional B	831	5.0	904	4.8	*
Proprietor, owner	817	5.9	930	5.8	*
Protective service	435	3.4	522	3.4	*
Sales	699	5.4	802	5.3	*
School teacher	200	1.5	216	1.4	*
Service	504	3.7	619	3.9	*
Technical	616	4.8	715	4.8	*
Household income (INCOME)	**11,907**	100.0	**15,362**	100.0	
None	56	0.4	73	0.4	*
$1000 or less	123	1.1	169	1.2	*
$1,001 – $5,000	214	1.8	285	1.8	*
$5,001 – $10,000	248	2.1	323	2.2	*

See notes at end of table.

Table F–4. Distribution of variables before and after imputation: 2002—Continued

Variable	Before Imputation		After Imputation		Significance (at 0.05)
	Sample size	Weighted percent	Sample size	Weighted percent	
$10,001 –- $15,000	498	4.3	659	4.4	*
$15,001 – $20,000	566	5.0	746	5.0	*
$20,001 – $25,000	694	6.2	940	6.5	*
$25,001 – $35,000	1,378	12.2	1,804	12.4	*
$35,001 – $50,000	2,203	19.3	2,882	19.6	*
$50,001 – $75,000	2,447	21.0	3,139	20.7	*
$75,001 – $100,000	1,641	13.2	2,064	12.9	*
$100,001 – $200,000	1,391	10.5	1,725	10.1	*
$200,001 or more	448	2.8	553	2.7	*

*A *t* test comparing the weighted percents before and after imputation showed a significant difference at the 0.05(c-1) level, where c is the number of categories within the primary variable.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

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