

ASSESSMENT WITHIN CENSUS AT SCHOOL: A PILOT PROGRAM IN THE UNITED STATES

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Census at School is an internationally developed program for grades 4–12 operating in the United Kingdom, New Zealand, Australia, Canada, and South Africa. By collecting data about their classmates, students learn data analysis and statistical concepts. Introducing the program in the United States now is particularly opportune, as the decennial census is being conducted this year. The U.S. Census at School evaluation involves two parts: implementation analysis and impact analysis. The first stage, implementation analysis, will cover teacher training, rating of trainers, video class instruction, survey of teachers, and time by activity. In this presentation, we will focus on aspects of the study that are under way, including training and observing teachers.

BACKGROUND

The Census at School program (www.censusatschool.com) is an internationally developed program for grades 4–12 that began in the United Kingdom in 2000 after a proposal was developed and tested in New Zealand. It is now fully operative in the UK, New Zealand, Australia, Canada, South Africa, and—this year—Japan and Ireland. Students anonymously fill out an online questionnaire about their lives and activities. Using their classroom data and data from random samples of their peers, students learn about data analysis and statistical concepts using tested Census at School lesson plans. The program improves students' understanding of surveys and censuses, as well as their collective statistical literacy. The American Statistical Association (ASA) and Population Association of America (PAA) are bringing the Census at School program to the United States.

Each country in the program adheres to a core set of international questions in addition to its own standard questions for grades 4–8 and 9–12. The USA questionnaire will include the 13 international questions, plus questions specific to the USA. Each classroom also may add its own questions. In most countries, the questionnaire is completed on the computer at school. Responses to the national questions are collectively held within each country, with the international responses kept in a central repository in the UK. These repositories allow for samples to be drawn within and across countries, providing an informative database for classroom learning.

Census at School provides a comprehensive introduction to data collection and handling. By analyzing their data, students learn about survey results, statistical concepts, and children from other places. As students expand their analyses nationally and internationally, Census at School promotes broader domestic and international understanding.

Now is a particularly opportune time to introduce the program in the United States, as the census will be conducted this year. The U.S. Census at School program will build awareness of the census as students learn how it provides a picture of the U.S. population every 10 years and essential information for planning education, health, transportation, and many other services. Other countries have introduced this program during the build-up and data collection for their censuses with success in increasing participation in the national census.

MOTIVATION FOR THIS PROGRAM IN THE UNITED STATES

- Promote and increase students' and teachers' interest in statistical literacy through participation in a national and international statistical program.
- Raise parents' and teachers' awareness of the 2010 U.S. population census by collecting real data from and about their school-age children and students.
- Introduce teachers and students to Census at School data-handling activities, lesson plans, and resources made available through cooperation with representatives from participating countries.
- Increase awareness of the efforts made in the United States and other countries to improve statistical literacy in school children through Census at School and other programs by

sharing existing hands-on curriculum materials with teachers in the United States and other countries.

- Increase knowledge of U.S. school children about their peers in other participating countries.

OBJECTIVES

- Involve students in collecting data about themselves and improve understanding of the data-gathering process and its purpose and benefit to society.
- Foster a positive attitude toward statistics through real data of compelling interest to students.
- Enhance the process of statistical inquiry across the curriculum.
- Train school teachers in data collection and analysis.
- Encourage effective Information and Communication Technology (ICT) teaching and learning, including the use of the Internet.
- Provide access to large and meaningful multivariate data sets.
- Make comparisons between students' responses in different countries.

EXPECTED OUTCOMES

- Increased participation in the 2010 U.S. Census.
- Creation of a program recognizable to students and teachers in grades 4–12 that teaches skills in statistical literacy through active learning.
- Students' understanding of survey participation, how to do a survey, how to apply fundamental data concepts, how to analyze data using supporting software such as Fathom® Dynamic Data Software, and how data can be used to inform decisionmaking—all important skills in today's information society.
- Creation of an interactive online community of interest to participant teachers.
- Benefits for mathematics, science, geography, history, and social studies departments.
- The spread of statistical knowledge across international borders and development of distance learning between countries.
- Raised profiles of the statistical associations of all countries involved.

OVERVIEW OF THE U.S. PILOT PROGRAM: THE IMPLEMENTATION ANALYSIS

The U.S. Census at School program was funded by the ASA and PAA. A steering committee was formed to advise the project leader, and the program was pilot tested in January and February of 2010 by 13 middle- and high-school teachers in Washington, DC. Martha Aliaga, the ASA's director of education, met with the 13 teachers to secure their participation. Each teacher submitted their principal's letter of support and an online application. Time was spent developing good relationships with the schools and districts and organizing research teams into collaborative groups for the expansion of the program. The 13 teachers are implementing the program in 41 classes with a total of 724 students.

Aliaga is leading this project with Rebecca Nichols, who is the ASA's K–16 education manager and assists with teaching and technical support. The U.S. Census at School pilot program included five full-day training sessions held on Saturdays at the ASA office. The teachers were paid for their time, and the ASA provided the materials, including Fathom® Dynamic Data Software. Optional graduate credit was available.

The bulk of the Census at School training included instruction in data analysis, statistics, measurement, and data analysis using Fathom. Census at School data provides opportunities for students to practice the statistical problem solving process by formulating questions of interest that can be answered with the data, collecting/selecting the appropriate data, analyzing the data, and making appropriate conclusions. Teachers were given a copy of the *Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report: A Pre-K–12 Curriculum Framework* (www.amstat.org/education/gaise), which further describes the statistical problem solving process across three levels.

The training also provided instruction in the mechanics of the U.S. Census at School program, including measurement, using the online questionnaire, accessing class data, obtaining a

random sample of international data, importing Census at School data and combining data sets, and analyzing data using Fathom and the TI-84 graphing calculator. The data analysis and statistics instruction was based on hands-on exercises that actively involved the participants. The activities brought out issues of data collection, including the design and scope of conclusions that can be reached. The focus was on developing an intuitive understanding of statistical concepts and helping students appreciate how statistical inferences can be applied.

Teachers received measurement guides adapted from the New Zealand Census at School program to accompany the U.S. Census at School questionnaire. Working in groups, they discussed measurement issues and proper measurement techniques for answering questions in the questionnaire. Teachers practiced answering the questions in the online questionnaire and completed several statistical investigations using the statistical problem solving process in the context of their data and random samples from the international database. They presented their investigations to the class, which were followed by critique and discussion.



The statistical investigations and instruction in statistical problem solving provided teachers with the statistical fluency necessary to use the Census at School program with their students. The pilot program included time for teachers to form learning communities and discuss and learn the concepts through hands-on activities.

The classes and group exercises drew heavily on those already tested by other countries. After the exercises were completed, the instructor met with teachers to discuss the teaching methods and answer questions. The instructor also provided materials for teachers to conduct a similar exercise with their students. These materials were adapted from fully developed lesson plans posted on Census at School sites and lesson plans prepared by the presenters. The program instruction included training teachers to train other teachers in the Census at School program.

In addition to the in-class training and statistical investigations, participants were invited to participate in the ASA's K-12 statistics education webinars. The ASA arranged for the leader of the Fathom® Dynamic Data Software development team, William Finzer, to offer a special webinar for participants, *Exploring Census at School Data from Around the World with Fathom*, to

help them prepare for their classroom presentations. All the webinars are posted online so teachers can review the material at any time. Additional webinars on analyzing U.S. and international Census at School data will be arranged and posted on the U.S. Census at School web site.

The pilot program includes classroom observation by Aliaga while teachers implement the U.S. Census at School program in their classrooms. Teachers select the day(s) and time(s) that works best for them. Three months later, Aliaga visits the classes again. With permission from the school and parents, the classes are video recorded. Teachers are interviewed at the end of the pilot and three months after the second visit to their classrooms. These classroom visits, interviews, and written evaluations are part of evaluating the teachers participating in the pilot program, the students, and the pilot program in general.

EXPECTED EXPANSION OF U.S. CENSUS AT SCHOOL

The pilot project was designed to be replicated across the country. Plans are being made to meet with the teachers from the pilot program at the ASA office to prepare them to train new teachers before the beginning of the 2010–2011 school year. The trainees will be teachers in the Washington, DC, area.

Another objective of the pilot program was to create U.S. Census at School training materials to distribute to those who will help expand the program across the United States. So far, there are seven statisticians committed to bringing the program to their areas. We will follow up with others who attended the Census at School meeting during the Joint Statistical Meetings last August.

The pilot program will be analyzed to determine what changes are needed for the program to be implemented with central direction by the ASA throughout the United States in 2010. The size and diversity of the United States requires a creative approach in communicating and expanding the program. The approach would likely involve ASA chapters, local departments of education with support from the ASA, and the federal statistics agencies through promotion and awareness. Other networks also will be used to spread the U.S. Census at School program, such as the National Council of Teachers of Mathematics (NCTM) meetings, contact with previous participants of the ASA Meeting Within a Meeting Statistics Workshop for K–12 Mathematics and Science Teachers, ASA K–12 teacher members, the Statistics Teacher Network (STN) newsletter, and other ASA distribution and social media contacts. A detailed plan will be developed as the pilot progresses, and an evaluation will be completed when it is concluded.

Initial contact has been made with funding agencies to determine whether they are receptive to funding a national program. This would meet an objective of using the program to enhance 2010 Census awareness and teaching statistics in the middle and high schools.

ASA staff members are working to create the U.S. Census at School web site, which is necessary to collect and host U.S. Census at School data and expand the program. Student responses will be secured on a server controlled by the ASA. Identifiable information—names, identification numbers, and email addresses—will not be included. Teachers will have access to their class results and random samples of responses from U.S. students for use in their classrooms. Once the U.S. Census at School program expands across the United States, the U.S. data will be sent to a central database in the UK for use by the international community.

We will use the materials and experience gained from the pilot program to create the web site and improve the U.S. Census at School online survey. Lesson plans and instructional webinars will be posted on the web site. Teachers from the pilot program will meet during the 2010–2011 school year to develop material for the program, which would be an indication of the program's success. Teachers will feel more comfortable using their own material, and their statistical knowledge will increase.

EVALUATION OF THE PILOT PROJECT

Evaluation of the training sessions and pilot program includes formative assessments at the end of each session. These training evaluations inform the instructors of the statistical concepts and Census at School mechanics that need reviewing and further explanation in the next training session. They also inform the students of what they need to review on their own. The participants'

homework and presentations of their statistical problem solving investigations, in addition to group work, inform the review and training in the sessions.

Whether the pilot program training is successful in preparing teachers to use Census at School in their classrooms and enhancing teachers' statistical literacy will be apparent by studying the classroom teaching, videos from the pilot, teacher interviews, and program evaluations. These assessments also will provide evidence and direction for expanding the U.S. program. We are specifically interested in investigating and evaluating the following questions:

- *Implementation in the Classroom:* How will the program transport into classrooms? Will an online program and resources be effective? How does the project fit into the curriculum? Are the lesson plans appropriate for the age level? Will teachers implement the program? Are incentives needed to gain teacher participation?
- *Adaptation of the System:* Can the systems of other countries be adapted by the ASA to facilitate receipt of data, downloading of lesson plans, and adaptation of lesson plans by teachers? Can the system effectively work as a repository for Census at School data and resources?
- *Teacher Training:* Can teachers be adequately trained to conduct the program in five or fewer days? Can a cadre of teacher trainers be developed to assist in the launch of the program in several local areas? Can this teacher training model be expanded across the United States? Can webinars and other online resources facilitate teacher participation without extensive training?
- *Communication Materials for Facilitators, Teacher Trainers, and Teachers:* How effective are these?
- *Training Materials:* Did the U.S. Census at School materials work for U.S. teachers? What adaptations are required?

The U.S. Census at School pilot program evaluation will demonstrate the effective aspects of the program and what needs to be changed. It also will offer evidence as to what level of training is necessary for teachers to implement the program in their classrooms and become developers of classroom resources. The pilot will help determine whether the questions, lesson plans, and resources should be part of the expanded Census at School program. Explorations of the pilot data, evaluations, interviews, and observations will provide the necessary information to design an effective intervention and expanded Census at School program and network.

FURTHER THOUGHTS AND RECOMMENDATIONS

In addition to studying the pilot program, determining how to expand it across the United States, and investigating the impact on the statistical literacy of participating school children through further research, we also are interested in exploring how technology and working with data that is meaningful to students might improve students' understanding of statistical problem solving and increase their interest in statistics and mathematics. Since the Census at School program facilitates statistical problem solving through students posing and investigating their own questions about themselves and their peers, it will be interesting to investigate whether Census at School can provide the motivation and context to enhance the achievement of underperforming or marginalized students. It also will be of interest to investigate whether adding Experiments at School (a new program in the UK) and expanding the Census at School program to the lower grades will be reasonable and of interest.

Through the pilot program and assessments, we will be prepared to expand the program in a feasible and meaningful way to further improve statistics education. The ASA is fortunate to be involved in bringing this exciting international program to the United States to enhance statistical literacy in the schools.

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