Searching for Computer Science:
Access and Barriers in U.S. K-12 Education

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Executive Summary

» **Many students, parents and K-12 teachers and administrators in the U.S. highly value computer science education.** Parents see computer science education as a good use of school resources and often think it is just as important as other courses. Two-thirds of parents think computer science should be required learning in schools. Parents in lower-income households are even more likely to have this view. Many students expect to learn computer science and to use it in their future career in some way.

» Despite this high level of interest, **many school and district administrators do not perceive a high level of demand for computer science education among students and parents in their communities.** Most principals and superintendents surveyed say it is important to offer computer science education. However, given the tendency to prioritize subjects that are included in required testing, computer science is not a top priority in many schools and districts, particularly those with fewer students and those in rural areas. Less than half of principals and superintendents surveyed say their school board thinks offering computer science education is important.

» Principals and superintendents from schools and districts that do not offer computer science learning opportunities are most likely to say **the main reason their schools do not offer computer science is the limited time they have to devote to classes that are not tied to testing requirements and the low availability and budget for computer science teachers.** Few principals and superintendents mention a lack of computer equipment and software as the main reason their schools do not offer computer science, although one-third still say it is one of the reasons.

» Most students have access to computer technology at home and at school, but **Hispanic students have less access to computers with Internet access at home, and use computers less at school**, than White or Black students do.

» **Many students do not have access to computer science learning opportunities at school, with lower-income students and Black students having the least access.** Even when schools offer computer science education, there is evidence that it may be lacking the core elements. Nearly half of principals who say their schools offer computer science courses also state that computer programming/coding is not part of the coursework. Of all principals surveyed, three in four report that they do not offer computer science with programming/coding. Only 21% of principals surveyed from schools that offer computer science classes say Advanced Placement (AP) computer science courses are available at their schools.

» **Participation in computer science learning opportunities is on the rise, and many principals expect to expand these opportunities over the next few years.** Improved awareness about the importance of programming/coding as an essential element of computer science is needed so educators can integrate the full breadth of computer science into the classroom. With an expected increase in computer science learning opportunities in the near future, it is important that teachers and school administrators have access to the resources necessary to offer quality computer science education to a broader group of students. The *Searching for Computer Science: Access and Barriers in U.S. K-12 Education* report is an important step in understanding the opportunities and challenges schools face in providing quality computer science education.

Introduction

Rapid advancements in technology and the growing number of professions that rely on computer science make it crucial for all students to have opportunities to become computer literate *and* to gain foundational computer science skills, such as computational thinking and programming/ coding. These skills encourage students to create and innovate, and position them to take advantage of the growing career opportunities that arise from attaining these skills. Underscoring the increasing demand for people with computer science skills in the labor market, the U.S. Bureau of Labor Statistics (BLS)[1] estimates that jobs in computer and mathematical occupations will increase by 18% in the 10 years leading up to 2022, creating more than 1.3 million job openings by 2022.

Limited data are available about U.S. students' early exposure to computer science opportunities that may influence whether they study or pursue careers in the computer science field. Building on ideas from Google's 2014 publication, *Women Who Choose Computer Science — What Really Matters[2]*, which examined the factors that influence women to choose to pursue computer science, Google commissioned Gallup to conduct a multiyear, comprehensive research effort to better understand these factors among U.S. students. This study examines perceptions about the value of computer science among key stakeholders in K-12 education and evaluates the opportunities for students to become more involved in computer science before college.

Additionally, this study measures exposure to computer technology and access to computer science learning opportunities among different populations to identify barriers to making computer science available to all U.S. students.

Gallup interviewed nationally representative samples of 1,673 seventh- to 12th-grade students, 1,685 parents of seventh- to 12th-grade students and 1,013 first- to 12th-grade teachers via telephone in November and December 2014. In addition, Gallup surveyed a sample of 9,693 K-12 principals and 1,865 school district superintendents in the U.S. via the Web. These groups are comprehensive but not representative of all principals and superintendents in the U.S.

Gallup researchers tested all differences noted between samples and demographic subgroups for statistical significance, and, in many cases, used models to ensure differences noted are still significant after controlling for other factors. See Appendix A for more details on the methodology.

The *Searching for Computer Science: Access and Barriers in U.S. K-12 Education* report includes a selection of key findings from the first year of this expansive research project, with additional releases planned for the future.

1   http://www.bls.gov/opub/mlr/2013/article/occupational-employment-projections-to-2022.htm

2   goo.gl/rLX6ax

ACCESS TO COMPUTER TECHNOLOGY

Exposure to Computer Technology Vital to Building Confidence for Computer Science Learning

Computer technology is a gateway to computer science learning. Students with increased exposure to computer technology are more confident in their own skills and more likely to consider learning computer science in the future.

Exposure to computer technology is a prerequisite for students to participate in today's increasingly technology-reliant economy. This study measures student access to various forms of computer technology: how often students use computers at school, whether they have a computer at home or a cellphone or tablet they can use to access the Internet, and whether there is an adult in their life who works with computers or technology.
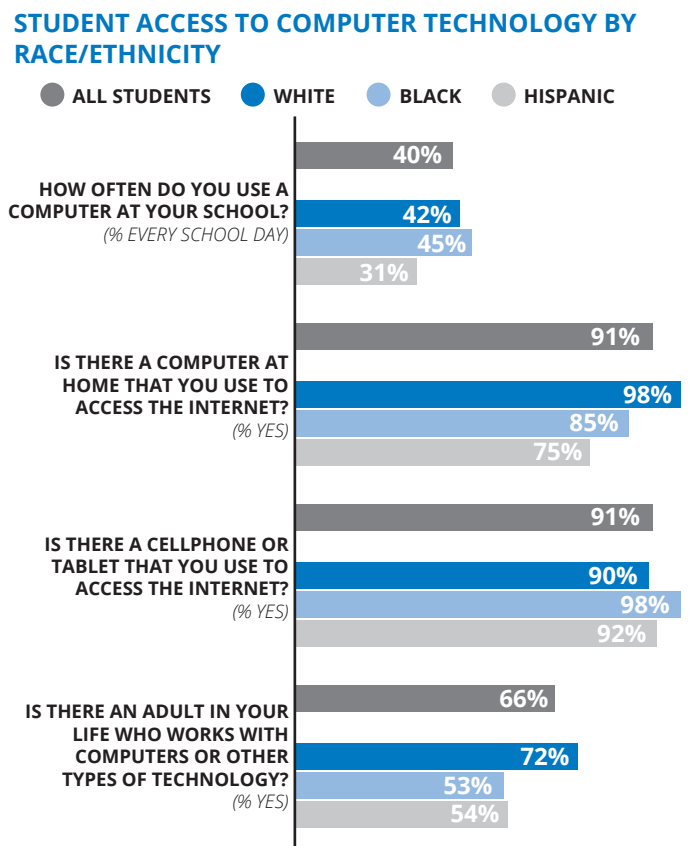
Four in 10 students reported using computers every day at school. The percentage of students using them increases as students move up grade levels *(see Figure 1)*. Fewer than one in three students (31%) in the seventh and eighth grades report using computers at school every day, but 50% of high school juniors and seniors are using them daily.
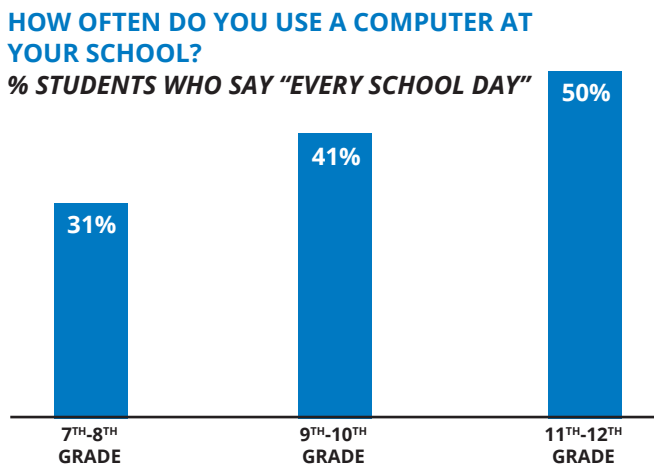
In addition to the differences measured across grade levels, there are some differences in computer technology use across racial and ethnic categories *(see Figure 2)*. Hispanic students are less likely than White or Black students to use computers at school daily, and are less likely to have exposure to computers in their home setting. One in four Hispanic students do not have a computer at home that they can use to access the Internet, compared with 15% of Black students and only 2% of White students. Nearly all students, regardless of race, have a cellphone or tablet that they can use for Internet access. Black and Hispanic students are also less likely than White students to have an adult in their life who works with computers or technology.

Figure 1.

HOW OFTEN DO YOU USE A COMPUTER AT YOUR SCHOOL?
% STUDENTS WHO SAY "EVERY SCHOOL DAY"

7TH-8TH GRADE	9TH-10TH GRADE	11TH-12TH GRADE
31%	41%	50%

Figure 2.

STUDENT ACCESS TO COMPUTER TECHNOLOGY BY RACE/ETHNICITY

● ALL STUDENTS ● WHITE ● BLACK ● HISPANIC

HOW OFTEN DO YOU USE A COMPUTER AT YOUR SCHOOL? *(% EVERY SCHOOL DAY)*
- 40%
- 42%
- 45%
- 31%

IS THERE A COMPUTER AT HOME THAT YOU USE TO ACCESS THE INTERNET? *(% YES)*
- 91%
- 98%
- 85%
- 75%

IS THERE A CELLPHONE OR TABLET THAT YOU USE TO ACCESS THE INTERNET? *(% YES)*
- 91%
- 90%
- 98%
- 92%

IS THERE AN ADULT IN YOUR LIFE WHO WORKS WITH COMPUTERS OR OTHER TYPES OF TECHNOLOGY? *(% YES)*
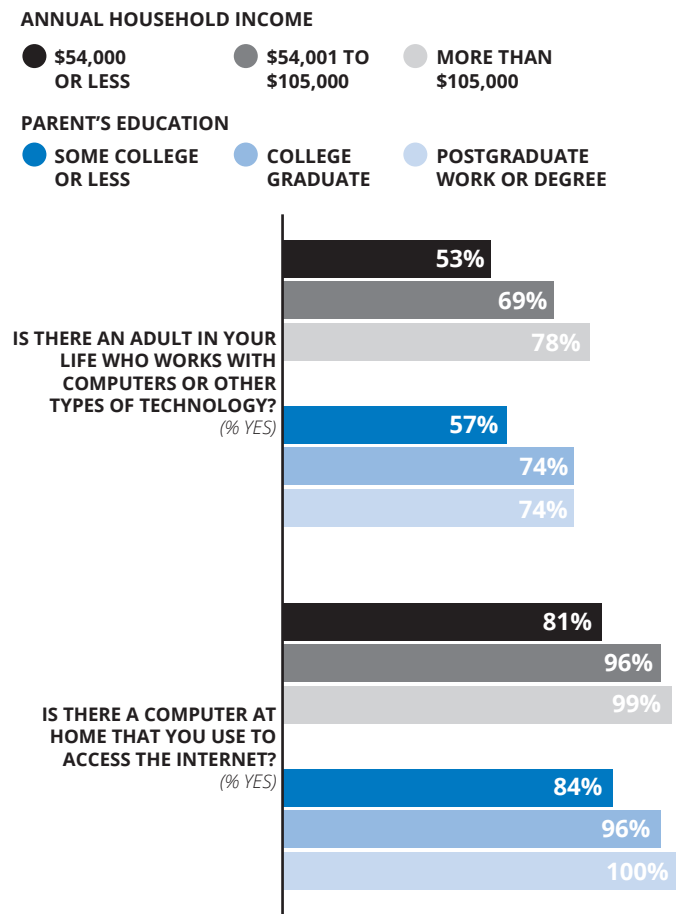- 66%
- 72%
- 53%
- 54%

Students from higher-income households and those with at least one parent with a college degree are more likely to have an adult in their life who works with computers or technology, and are more likely to have a computer at home that they can use to access the Internet *(see Figure 3)*.

This study also finds that students with more exposure to computer technology — measured by combining responses from the four items in Figure 2 — report higher levels of confidence in their ability to learn computer science. This exposure is related to other areas of their education as well. Students with more exposure to technology are also more confident in their skills in fundamental areas of learning, such as math, science, reading and writing, as well as other skills foundational to computer science learning, such as designing and creating things and figuring out how things work. While schools have less control over exposure to technology at home, ensuring that all students have access to computer technology at school is vital to providing a necessary technological foundation for computer science learning.

Figure 3.

EXPOSURE TO COMPUTER TECHNOLOGY
% STUDENTS

ANNUAL HOUSEHOLD INCOME

● $54,000 OR LESS   ● $54,001 TO $105,000   ○ MORE THAN $105,000

PARENT'S EDUCATION

● SOME COLLEGE OR LESS   ● COLLEGE GRADUATE   ● POSTGRADUATE WORK OR DEGREE

IS THERE AN ADULT IN YOUR LIFE WHO WORKS WITH COMPUTERS OR OTHER TYPES OF TECHNOLOGY?
(% YES)

- 53%
- 69%
- 78%
- 57%
- 74%
- 74%

IS THERE A COMPUTER AT HOME THAT YOU USE TO ACCESS THE INTERNET?
(% YES)

- 81%
- 96%
- 99%
- 84%
- 96%
- 100%

COMPUTER SCIENCE
LEARNING OPPORTUNITIES

Many Students Lack the Opportunity to Learn Computer Science in School

Many U.S. students in grades seven to 12 do not have access to a computer science class at school. Black students are less likely than White and Hispanic students to have access to computer science learning opportunities in school. Three in four principals surveyed report that their school does not offer computer science classes with programming/coding.

Google's recent study, *Women Who Choose Computer Science — What Really Matters*, identified the importance of pre-college exposure to computer science as a way to generate interest and curiosity, as well as establish a sense of competency that may lead to further interest in computer science. Schools can incorporate computer science skills into the K-12 learning experience in many ways. During the traditional school day, schools could offer dedicated computer science classes or fold the learning into other classes. They could also host after-school groups or clubs at which students can learn computer science. While dedicated computer science courses and clubs are most common, more resources are becoming available to teachers who want to incorporate computer science learning into other classes.

More than half of the seventh- to 12th-grade students surveyed (58%) say their school offers a dedicated computer science class, and 52% say computer science is taught as part of other classes *(see Figure 4)*. More than four in 10 students (43%) say they have an opportunity to learn computer science through a school-sponsored group or club. Slightly more than half of students (54%) are also aware of opportunities in the community to learn computer science outside of school.

While more than one-third of U.S. students in grades seven to 12 do not have access to a dedicated computer science class at school, one-fourth of these students have access to a group or club at which they can learn computer science. Overall, approximately 25% of seventh- to 12th-grade students report having no access to a computer science class or club at school.

To ensure that respondents were thinking only about computer science — and not computers more generally — respondents were provided with a definition of computer science after the first questions on computer science knowledge. In addition, respondents were reminded multiple times throughout the survey that computer science involves using programming/coding to create more advanced artifacts, such as software, apps, games, websites and electronics, and that computer science is not equivalent to general computer use.

Students in seventh and eighth grades are less likely to say they have computer science learning opportunities at school than students in ninth to 12th grades.

Figure 4.

COMPUTER SCIENCE LEARNING OPPORTUNITIES BY GRADE

ALL STUDENTS   7TH-8TH GRADE   9TH-10TH GRADE   11TH-12TH GRADE

ARE THERE CLASSES WHERE *ONLY* COMPUTER SCIENCE IS TAUGHT IN YOUR SCHOOL? *(% YES)*
- 58%
- 45%
- 61%
- 69%

IS COMPUTER SCIENCE TAUGHT AS PART OF *OTHER* CLASSES AT YOUR SCHOOL? *(% YES)*
- 52%
- 46%
- 54%
- 57%

AS FAR AS YOU KNOW, ARE THERE ANY GROUPS OR CLUBS THAT MEET AT YOUR SCHOOL WHERE STUDENTS LEARN COMPUTER SCIENCE? *(% YES)*
- 43%
- 37%
- 43%
- 48%
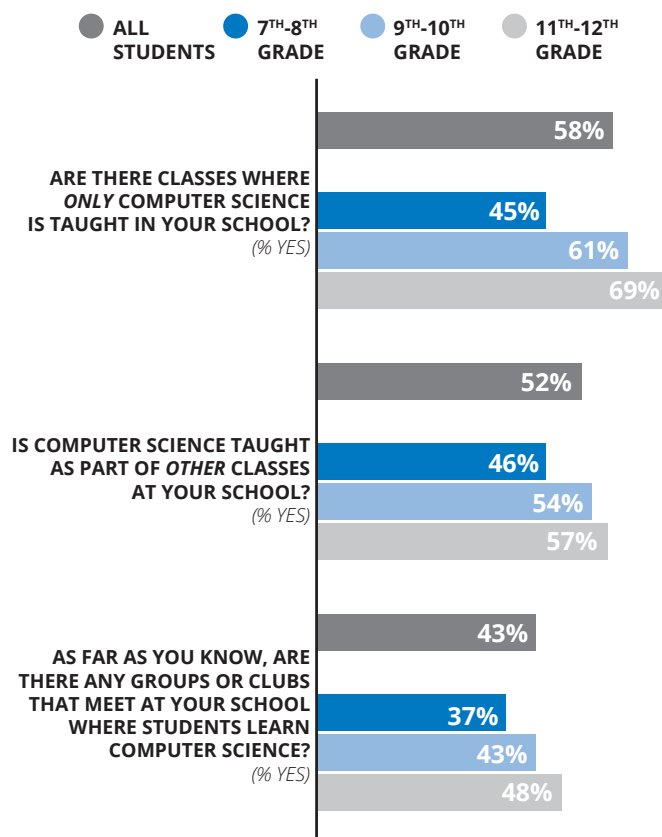
Figure 5.

COMPUTER SCIENCE LEARNING OPPORTUNITIES BY RACE/ETHNICITY AND INCOME
% STUDENTS

	RACE/ETHNICITY			HOUSEHOLD INCOME		
	White	*Black*	*Hispanic*	*$54,000 or less*	*$54,001-$105,000*	*More than $105,000*
Are there classes where ONLY computer science is taught in your school? *(% Yes)*	62%	49%	53%	48%	60%	69%
Is computer science taught as part of OTHER classes at your school? *(% Yes)*	54%	46%	52%	49%	53%	55%
As far as you know, are there any groups or clubs that meet at your school where students learn computer science? *(% Yes)*	45%	32%	43%	33%	42%	51%

In general, Black students, regardless of income, are less likely than White or Hispanic students to report having opportunities to learn computer science at school *(see Figure 5)*. Hispanic students are also less likely than White students to report having dedicated computer science classes, but after accounting for household income, this effect diminishes and is no longer statistically significant. Access to computer science classes and clubs is generally lowest for students from lower-income households. Inequitable access to computer science education potentially places these students at a disadvantage as computer technology continues to advance.

Many computer science courses available to students do not offer programming/coding — a core element of computer science. AP computer science courses are also limited.

While many students report that their schools have computer science learning opportunities, key elements of computer science are missing at some of these schools. About half (47%) of principals who say their schools have computer science learning opportunities also state the material does not include programming/coding. Overall, of all principals surveyed, three in four say their school does not offer any opportunities to learn computer programming/coding — a core element of computer science.
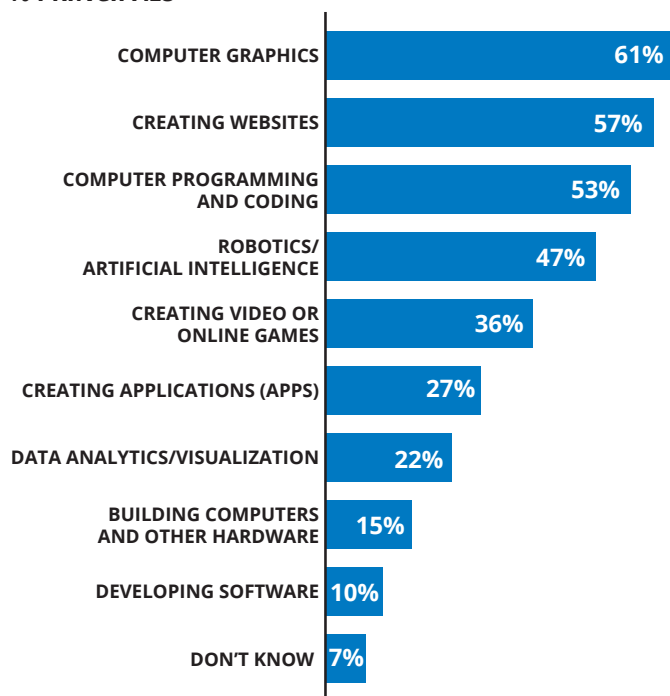
Additionally, Advanced Placement (AP) computer science learning opportunities are limited. Only 21% of principals surveyed from schools that offer computer science classes say AP computer science courses are available at their schools. Sixty-four percent say there are no AP computer science courses, and 15% say they don't know.

Among principals in schools that offer computer science courses, those with a higher percentage of students living in households below the poverty line are less likely to say their schools offer AP computer science courses. These schools are also less likely to have programming/coding included in their computer science learning opportunities.

A majority of principals at schools with computer science learning opportunities cite computer graphics and website creation as elements included in the learning material. Nearly half mention robotics and artificial intelligence *(see Figure 6)*.

Figure 6.

DO THE COMPUTER SCIENCE OPPORTUNITIES OFFERED IN YOUR SCHOOL INCLUDE ANY OF THE FOLLOWING ELEMENTS? *SELECT ALL THAT APPLY.*
% PRINCIPALS

Element	%
COMPUTER GRAPHICS	61%
CREATING WEBSITES	57%
COMPUTER PROGRAMMING AND CODING	53%
ROBOTICS/ ARTIFICIAL INTELLIGENCE	47%
CREATING VIDEO OR ONLINE GAMES	36%
CREATING APPLICATIONS (APPS)	27%
DATA ANALYTICS/VISUALIZATION	22%
BUILDING COMPUTERS AND OTHER HARDWARE	15%
DEVELOPING SOFTWARE	10%
DON'T KNOW	7%

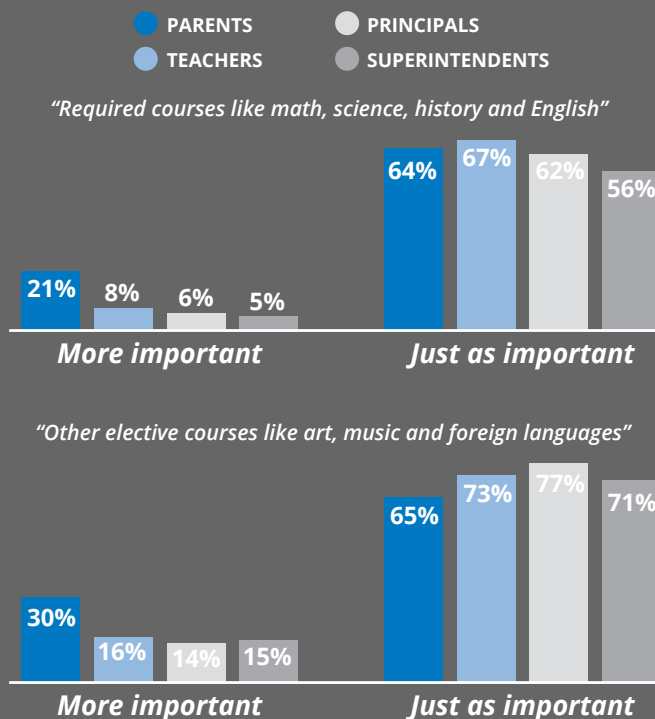# DEMAND FOR COMPUTER SCIENCE EDUCATION AND BARRIERS TO LEARNING

Parents Want Computer Science in Schools, but Administrators Do Not Perceive the Demand

Parents highly value computer science education and think it is a good use of resources at their children's schools; however, school and district administrators surveyed do not perceive a high demand for computer science education among parents and students in their communities.

Parents, teachers and administrators highly value computer science education, and a majority say opportunities to learn computer science are just as important as required courses such as math, science, history and English, and elective courses such as art, music and foreign languages *(see Figure 7)*. Parents are significantly more likely than other groups to think that computer science is more important than required courses and elective courses.

Figure 7.

DO YOU THINK OFFERING OPPORTUNITIES TO LEARN COMPUTER SCIENCE IS MORE IMPORTANT, JUST AS IMPORTANT OR LESS IMPORTANT TO A STUDENT'S FUTURE SUCCESS THAN ... ?

- PARENTS
- TEACHERS
- PRINCIPALS
- SUPERINTENDENTS

"Required courses like math, science, history and English"

	More important	Just as important
Parents	21%	64%
Teachers	8%	67%
Principals	6%	62%
Superintendents	5%	56%

"Other elective courses like art, music and foreign languages"

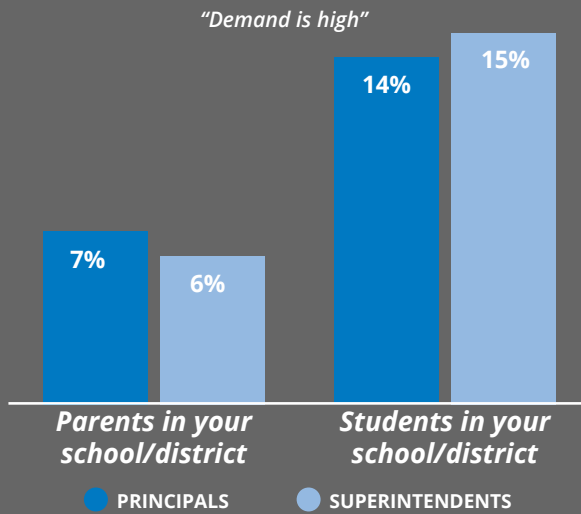|	More important	Just as important
Parents	30%	65%
Teachers	16%	73%
Principals	14%	77%
Superintendents	15%	71%

However, one of the reasons some principals give as to why their schools do not offer computer science learning opportunities is a lack of demand from students and parents. In fact, only 7% of principals and 6% of superintendents surveyed say demand for computer science is high among parents. Fourteen percent of principals and 15% of superintendents say demand is high among students *(see Figure 8)*.

This perceived lack of demand from parents and students is contrary to the sentiments that students and parents in this study express. Nine in 10 parents surveyed say that offering opportunities to learn computer science is a good use of resources at their child's school, and just as many (91%) want their child to learn more computer science in the future. While these are not measures specifically

about demand, they do suggest parents are more enthusiastic about computer science education than administrators realize. Moreover, students have the expectation that they will learn computer science — more than 80% say they will likely learn computer science in the future.

Figure 8.

WHICH OF THE FOLLOWING BEST DESCRIBES THE DEMAND FOR COMPUTER SCIENCE EDUCATION AMONG ... ?

"Demand is high"

14% 15%

7% 6%

Parents in your school/district   *Students in your school/district*

● **PRINCIPALS**   ● **SUPERINTENDENTS**

Students and parents also anticipate that computer science skills will be necessary for future jobs. Most students (90%) say they are at least somewhat likely to have a job someday where they will need to know computer science, and most parents (85%) say the same about their child's future job *(see Figure 9)*.

Students also perceive support from their parents for computer science learning. Nearly all students surveyed (95%) say adults in their family would be supportive if they wanted to learn computer science. There is an opportunity to spark interest in computer science among K-12 students that could spawn further participation in computer science studies in college.

Parents in lower-income groups place a higher value on computer science learning than those with higher incomes. Parents from households in the lowest-income group, $54,000 or less annual income, are more likely than parents from higher-income households to say most students should be required to learn computer science *(see Figure 10)*. They are also more likely to say computer science education is more important to a student's future success than required

Figure 9.

"[HOW LIKELY ARE YOU TO/HOW LIKELY IS IT THAT YOUR CHILD WILL] HAVE A JOB SOMEDAY WHERE [YOU/HE/SHE] WOULD NEED TO KNOW SOME COMPUTER SCIENCE?"
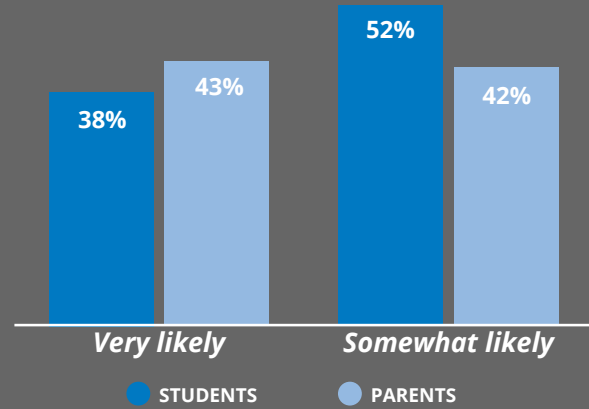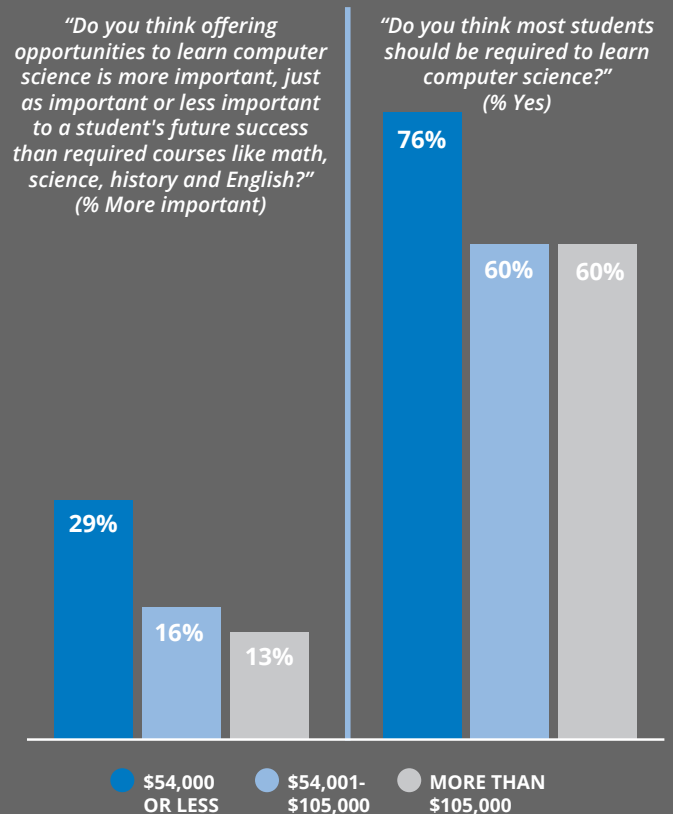
52%
43% 42%
38%

Very likely   *Somewhat likely*

● **STUDENTS**   ● **PARENTS**

Figure 10.

HOUSEHOLD INCOME COMPARISONS
% PARENTS

"Do you think offering opportunities to learn computer science is more important, just as important or less important to a student's future success than required courses like math, science, history and English?"
(% More important)

"Do you think most students should be required to learn computer science?"
(% Yes)

76%
60% 60%
29%
16% 13%

● **$54,000 OR LESS**   ● **$54,001-$105,000**   ● **MORE THAN $105,000**

courses. School and district administrators need to be aware of the high level of support and interest in computer science education among students *and* parents in their communities.

Teachers and Administrators Say Computer Science Is Not a Top Priority for Their School or District

Despite the value students, parents, teachers and school administrators place on computer science, teachers, principals and superintendents are unlikely to say computer science education is a top priority for their school or district, and less than half say their school board thinks it is important to offer computer science education.

Fewer than one in three teachers and administrators surveyed say computer science is a top priority in their school or district. Less than half say their school board thinks it is important to offer computer science education *(see Figure 11).*

Principals at certain types of schools are more likely to say computer science learning is a top priority *(see Figure 12).* Principals at larger schools (those with 900 or more students) and principals at schools with students in seventh grade or higher are more likely to say computer science learning is a top priority. Private school principals are more likely than public school principals to say their school board thinks computer science education is important to offer in their schools, and are more likely to say computer science learning is a top priority for their school.

Figure 11.
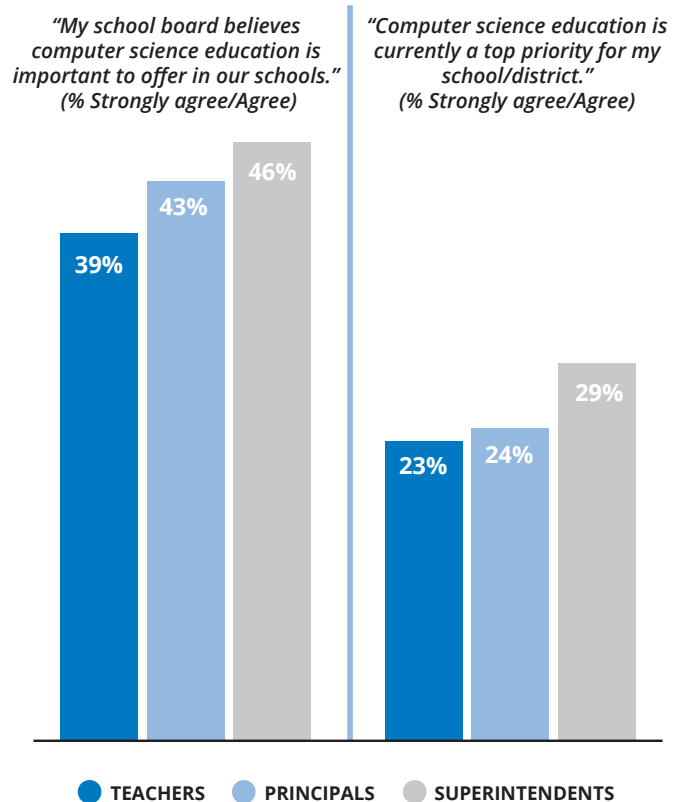
COMPUTER SCIENCE PRIORITIES

"My school board believes computer science education is important to offer in our schools." (% Strongly agree/Agree) — TEACHERS 39%, PRINCIPALS 43%, SUPERINTENDENTS 46%

"Computer science education is currently a top priority for my school/district." (% Strongly agree/Agree) — TEACHERS 23%, PRINCIPALS 24%, SUPERINTENDENTS 29%

● TEACHERS ● PRINCIPALS ● SUPERINTENDENTS

Figure 12.

COMPUTER SCIENCE PRIORITIES BY SCHOOL DEMOGRAPHICS
% PRINCIPALS

	TYPE OF SCHOOL		GRADE RANGE		NUMBER OF STUDENTS		
	Public, state or county	Private	School has only 6th grade or lower	School has 7th grade or higher	Fewer than 500	500 to fewer than 900	900 or more
My school board believes computer science education is important to offer in our schools. *(% Strongly agree/Agree)*	42%	52%	39%	46%	42%	43%	50%
Computer science education is currently a top priority for my school. *(% Strongly agree/Agree)*	22%	34%	18%	28%	23%	24%	32%

Superintendents in small-town or rural districts are less likely than superintendents in large cities and suburbs to agree that their school board thinks computer science is important, and less likely to say it is a top priority *(see Figure 13)*.

Figure 13.

PRIORITIES DIFFER BY LOCALITY

"My school board believes computer science education is important to offer in our schools." (% Strongly agree/Agree)

"Computer science education is currently a top priority for my district." (% Strongly agree/Agree)

52%

43%

34%

27%

● **CITY/SUBURB SUPERINTENDENTS**　　● **TOWN/RURAL SUPERINTENDENTS**
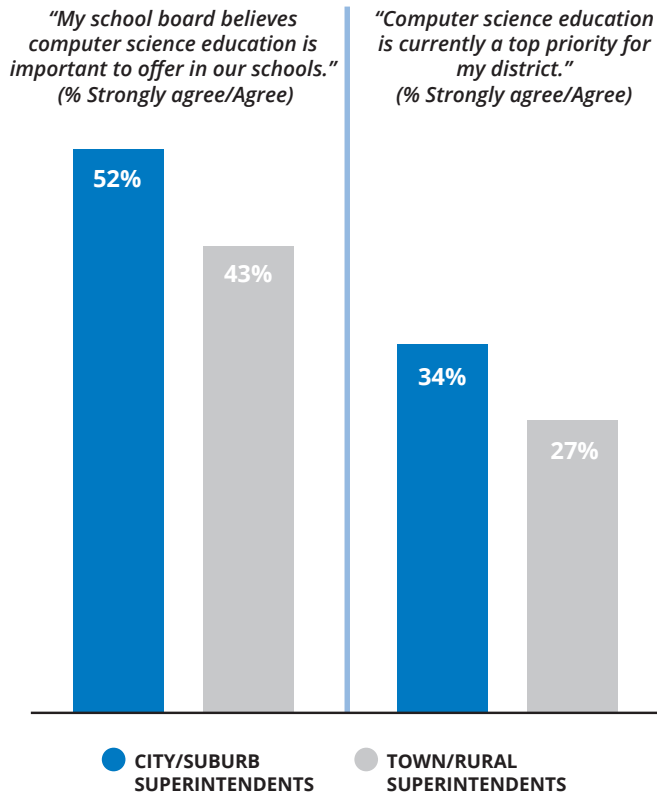
A Focus on Testing Along With Staffing Limitations Hinder Some Schools From Offering Computer Science

In the face of pressure to focus on testing and limited staffing options, about half of teachers, principals and superintendents and two-thirds of parents think most students should be required to learn computer science.

School principals and superintendents are most likely to select a focus on testing as "the main reason" when given a list of potential reasons why their school does not offer computer science *(see Figure 14)*. Nearly a third (32%) of principals and 24% of superintendents say their school or

district has to devote most of its time to courses related to testing requirements, and these courses do not include computer science.

Superintendents are more likely than principals to select low demand among students and parents as a reason their school does not offer computer science. About half of superintendents choose this, compared with about 30% of principals. This perceived barrier confirms the finding that few administrators believe demand from parents and students is high and reinforces the need for students and parents to communicate their interest in computer science to administrators.

Forty-two percent of principals and 73% of superintendents say that there are no teachers available at their schools/in their districts with the necessary skills to teach computer science. The inability to hire and/or train teachers to lead computer science classes also prevents

Figure 14.

AS FAR AS YOU KNOW, WHY DOESN'T YOUR SCHOOL/DISTRICT OFFER ANY WAYS TO LEARN COMPUTER SCIENCE?
SELECT ALL THAT APPLY.
AS FAR AS YOU KNOW, WHICH OF THE BELOW REASONS IS THE *MAIN* REASON YOUR SCHOOL/DISTRICT DOESN'T OFFER WAYS TO LEARN COMPUTER SCIENCE?
(ASKED ONLY OF THOSE WITH NO COMPUTER SCIENCE LEARNING OPPORTUNITIES IN THEIR SCHOOL/DISTRICT)

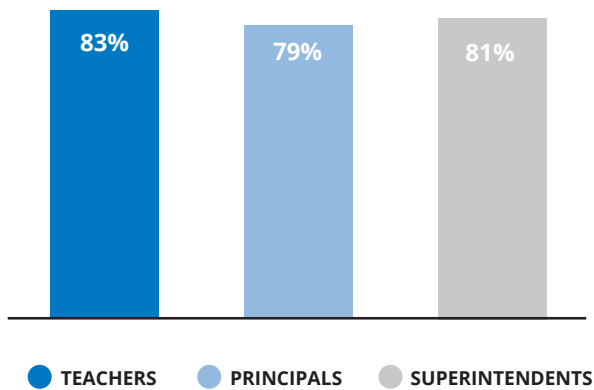|	PRINCIPALS		SUPERINTENDENTS	
	A reason	*The main reason*	*A reason*	*The main reason*
We have to devote most of our time to other courses that are related to testing requirements, and computer science is not one of them.	47%	32%	52%	24%
There is not enough money to train or hire a teacher.	44%	13%	57%	17%
There are no teachers available at my school/in my district with the necessary skills to teach computer science.	42%	9%	73%	17%
There are too many other courses that students have to take in order to prepare for college.	22%	9%	39%	9%
We do not have sufficient budget to purchase the necessary computer equipment.	34%	6%	31%	1%
There is not enough demand from students.	29%	6%	49%	15%
There is not enough demand from parents.	30%	4%	50%	4%
We do not have sufficient budget to purchase the necessary computer software.	33%	2%	33%	1%
We do not have the necessary computer equipment.	28%	2%	20%	0%
We do not have the necessary computer software.	32%	1%	27%	0%
There are no teachers available to hire with the necessary skills to teach computer science.	10%	1%	32%	6%
There is not enough classroom space.	17%	1%	16%	2%
Internet connectivity is poor at my school/in my district.	10%	0%	10%	1%

many schools/districts from offering computer science; 44% of principals and 57% of superintendents name this as a reason their school or district does not offer computer science learning opportunities. This barrier is likely influenced by the belief that teachers need extensive training/coursework in computer science to successfully teach it. Roughly 80% of teachers, principals and superintendents strongly agree or agree that this is true *(see Figure 15)*. By comparison, no more than a third of principals and superintendents mention a lack of equipment and software as a reason their school does not offer computer science, as seen in Figure 14.

Forty percent of principals from schools that do not offer computer science learning opportunities say there is a teacher currently at the school who could teach computer science *(see Figure 16)*, indicating that other barriers, especially limited resources and a focus on testing in areas other than computer science, stand in the way of offering computer science in these schools. About half say they would have to hire a new teacher.

Figure 15.

TEACHERS NEED EXTENSIVE TRAINING/COURSEWORK IN COMPUTER SCIENCE IN ORDER TO SUCCESSFULLY TEACH COMPUTER SCIENCE.
% STRONGLY AGREE/AGREE

TEACHERS	PRINCIPALS	SUPERINTENDENTS
83%	79%	81%

Figure 16.

IF THERE WERE NEW OPPORTUNITIES TO OFFER COMPUTER SCIENCE IN YOUR SCHOOL, WOULD YOU HAVE TO HIRE A NEW TEACHER, OR IS THERE A TEACHER CURRENTLY AT YOUR SCHOOL WHO COULD TEACH COMPUTER SCIENCE?
% PRINCIPALS

WOULD HAVE TO HIRE A NEW TEACHER	52%
TEACHER CURRENTLY AT SCHOOL WHO COULD TEACH	40%
DON'T KNOW	8%
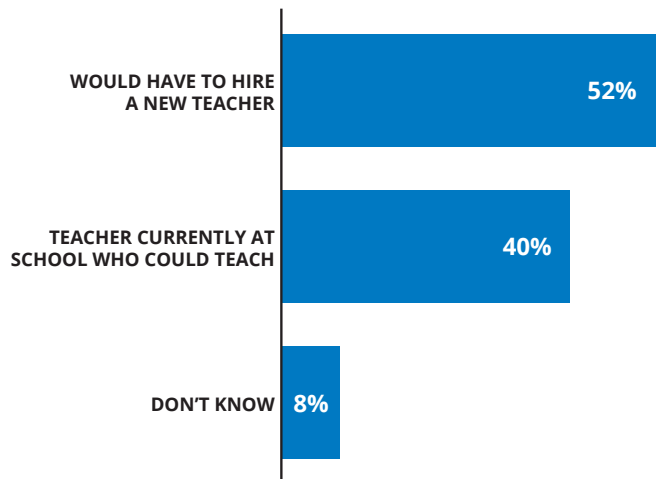
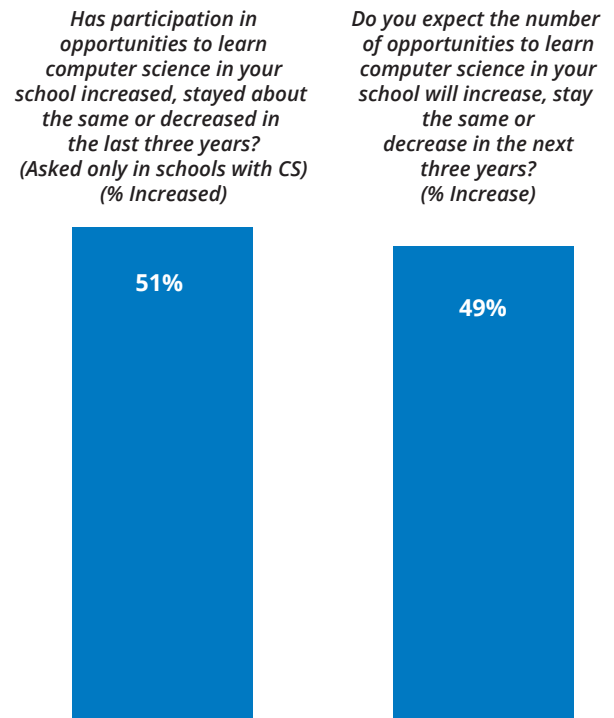## Opportunity for and Participation in Computer Science Learning Increasing

Computer science learning is on the rise and positioned to increase in the next few years.

Even with limitations in offering widespread and comprehensive computer science education, more students are learning computer science in junior high and high school than ever before. The College Board[3] reports that between 2012 and 2014, there was a 50% increase in the number of students who took the AP computer science exam. In 2013,[4] more than a third of high school computer science teachers noted an increase in enrollment in computer science courses in the prior three years. However, participation in AP computer science testing among Blacks and Hispanics is still quite low. The College Board reports that less than 15% of all the AP Computer Science A test takers in 2014 were Black or Hispanic.

This is consistent with findings from this study, in which about half of principals surveyed from schools with opportunities to learn computer science say participation in computer science learning in their schools has increased in the last three years. About half of principals (49%) also expect the number of computer science learning opportunities to increase in the next three years *(see Figure 17)*.

Figure 17.

OPPORTUNITIES TO LEARN COMPUTER SCIENCE
% PRINCIPALS

Has participation in opportunities to learn computer science in your school increased, stayed about the same or decreased in the last three years? (Asked only in schools with CS) (% Increased)

51%

Do you expect the number of opportunities to learn computer science in your school will increase, stay the same or decrease in the next three years? (% Increase)

49%

3 http://media.collegeboard.com/digitalServices/pdf/research/2014/National_Summary.xlsx, http://media.collegeboard.com/digitalServices/pdf/research/2013/National_Summary_13.xls

4 http://csta.acm.org/Research/sub/Projects/ResearchFiles/CSTASurvey2013Comp.pdf

Conclusion

There is widespread support for computer science learning in school among students and parents; however, many school leaders underestimate this interest. It is important that students and parents make their desires and expectations known to administrators as they structure learning opportunities in their school.

Most teachers, principals and superintendents agree that it is important to offer computer science; still, amid pressure to focus on testing requirements and the limitations they face regarding qualified teachers, most school and district leaders have yet to make computer science a top priority. Inequitable access to computer technology and computer science learning opportunities prevents some students from building a computer science foundation needed for the future. Even in schools where computer science learning opportunities exist, the curriculum does not necessarily include programming/coding.

However, many principals expect opportunities to learn computer science to increase over the next few years. It is important that these opportunities include core elements of computer science, as well as more advanced opportunities for learning as technology continues to evolve and play a larger role in society. Teachers should look for ways to incorporate programming/coding into computer science learning to help expand these opportunities to more students. There are many resources available for teachers and school administrators aiming to incorporate computer science learning opportunities into their schools, including professional development opportunities and materials for teachers. The *Searching for Computer Science: Access and Barriers in U.S. K-12 Education* report outlines key challenges that many schools must overcome to provide the quality computer science education that students and parents want. Read about Google's recommendations based on this research. A forthcoming report will explore broader perceptions about computer science among these groups, including ingrained stereotypes that might limit some students from pursuing computer science careers.

About Google

Google's core mission is to organize the world's information and make it universally accessible and useful. Google creates products to increase access to opportunity, break down barriers and empower people through technology. To help reach these goals, Google works to inspire young people around the world not just to use technology but to create it. There is a need for more students to pursue an education in computer science, particularly girls and minorities, who have historically been underrepresented in the field. More information on Google's computer science education efforts is available at g.co/csedu.

About Gallup

Gallup delivers analytics and advice to help leaders and organizations solve their most pressing problems. Combining more than 80 years of experience with its global reach, Gallup knows more about the attitudes and behaviors of employees, customers, students and citizens than any other organization in the world. Gallup works with leaders and organizations to achieve breakthroughs in customer engagement, employee engagement, organizational culture and identity, leadership development, talent-based assessments, entrepreneurship and well-being. Gallup's 2,000 professionals include noted scientists, renowned subject-matter experts and bestselling authors who work in a range of industries, including banking, finance, healthcare, consumer goods, automotive, real estate, hospitality, education, government and business-to-business. For more information, visit www.gallup.com or education.gallup.com.

Appendix A: Methods

Results for the *Searching for Computer Science: Access and Barriers in U.S. K-12 Education* report are based on surveys conducted with students, parents, teachers, principals and superintendents.

Telephone interviews were conducted for students, parents and teachers currently living in all 50 states and the District of Columbia using a combination of two sample sources: the Gallup Panel and the Gallup Daily tracking survey. The Gallup Panel is a proprietary, probability-based panel of U.S. adults selected using random-digit-dial (RDD) and address-based sampling methods. The Gallup Panel is not an opt-in panel. The Gallup Daily tracking survey sample includes national adults with a minimum quota of 50% cellphone respondents and 50% landline respondents, with additional minimum quotas by time zone within region. Landline and cellular telephone numbers are selected using RDD methods. Landline respondents are chosen at random within each household based on which member had the most recent birthday. Eligible Gallup Daily tracking respondents who previously agreed to future contact were contacted to participate in this study. Parent and student interviews were conducted in English and Spanish. Teacher interviews were conducted in English only.

Student interviews were conducted Nov. 19-Dec. 17, 2014, with a sample of 1,673 students in grades seven to 12.

Parent interviews were conducted Nov. 19-Dec. 8, 2014, with a sample of 1,685 parents with at least one child in grades seven to 12.

Teacher interviews were conducted Nov. 25-Dec. 14, 2014, with a sample of 1,013 first- to 12th-grade teachers.

Student and parent samples are weighted to correct for unequal selection probability and nonresponse. Parent data are weighted to match national demographics of age, gender, education, race, ethnicity and region. Student data are weighted to match national demographics of age, gender, race, ethnicity and region. Demographic weighting targets are based on the most recent Current Population Survey.

Teacher samples are weighted to correct for unequal selection probability and nonresponse. The data are weighted to match national demographics of age, gender, education, race, ethnicity and region. Demographic weighting targets are based on Gallup Daily tracking information.

All reported margins of sampling error include the computed design effects for weighting.

For results based on the total sample of students, the margin of sampling error is ±3.4 percentage points at the 95% confidence level.

For results based on the total sample of parents, the margin of sampling error is ±3.5 percentage points at the 95% confidence level.

For results based on the total sample of teachers, the margin of sampling error is ±4.0 percentage points at the 95% confidence level.

Web surveys were completed by principals and superintendents contacted using sample provided by established education sample providers. The sample sources are comprehensive but not representative of all principals and superintendents currently in the U.S. Interviews were conducted in English only.

Principal surveys were completed Nov. 11-Dec. 10, 2014, with a sample of 9,693 principals at the elementary, middle and high school levels.

Superintendent surveys were conducted Nov. 12-Dec. 19, 2014, with a sample of 1,865 school district superintendents.

In addition to sampling error, question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of public opinion polls. It should also be noted that differences between telephone respondents and Web respondents are not perfectly comparable both because of modal differences and the representativeness of the samples.

All Hispanic students are categorized as Hispanic in this report. Non-Hispanic Black students and non-Hispanic White students are categorized as Black and White, respectively.

Appendix B: Full Results

Access to Computer Technology

Figure B1.

HOW OFTEN DO YOU USE A COMPUTER AT YOUR SCHOOL? DO YOU USE A COMPUTER EVERY SCHOOL DAY, MOST SCHOOL DAYS, SOME SCHOOL DAYS OR NEVER?

STUDENTS

		GRADE LEVEL		
	Total	*7th or 8th*	*9th or 10th*	*11th or 12th*
Every school day	40%	31%	41%	50%
Most school days	27%	28%	28%	24%
Some school days	30%	37%	29%	23%
Never	3%	4%	3%	3%

Figure B2.

STUDENTS

			RACE/ETHNICITY		
		Total	*White*	*Black*	*Hispanic*
How often do you use a computer at your school? Do you use a computer every school day, most school days, some school days or never?	*Every school day*	40%	42%	45%	31%
	Most school days	27%	28%	25%	25%
	Some school days	30%	26%	27%	40%
	Never	3%	3%	3%	4%
Is there a computer at home that you use to access the Internet?	*Yes*	91%	98%	85%	75%
	No	9%	2%	15%	25%
Is there a cellphone or tablet that you use to access the Internet?	*Yes*	91%	90%	98%	92%
	No	9%	10%	2%	8%
Is there an adult in your life who works with computers or other types of technology?	*Yes*	66%	72%	53%	54%
	No	32%	26%	44%	46%

Note: Because of rounding, responses for a given question may not add to 100%.
"Don't know" responses below 5% do not appear in most tables in Appendix B.

Computer Science Learning Opportunities

Figure B3.

STUDENTS

			GRADE LEVEL		
		Total	*7th or 8th*	*9th or 10th*	*11th or 12th*
Are there classes where ONLY computer science is taught in your school?	*Yes*	58%	45%	61%	69%
	No	37%	53%	31%	25%
	Don't know	5%	2%	7%	5%
Is computer science taught as part of OTHER classes at your school?	*Yes*	52%	46%	54%	57%
	No	42%	49%	38%	39%
	Don't know	5%	5%	8%	3%
As far as you know, are there any groups or clubs that meet at your school where students learn computer science?	*Yes*	43%	37%	43%	48%
	No	51%	60%	48%	46%
	Don't know	6%	4%	9%	6%

Figure B4.

STUDENTS

			RACE/ETHNICITY			HOUSEHOLD INCOME		
		Total	*White*	*Black*	*Hispanic*	*$54,000 or less*	*$54,001 to $105,000*	*More than $105,000*
Are there classes where ONLY computer science is taught in your school?	*Yes*	58%	62%	49%	53%	48%	60%	69%
	No	37%	34%	48%	36%	45%	35%	28%
	Don't know	5%	4%	3%	11%	7%	4%	3%
Is computer science taught as part of OTHER classes at your school?	*Yes*	52%	54%	46%	52%	49%	53%	55%
	No	42%	43%	48%	36%	44%	43%	40%
	Don't know	5%	3%	6%	12%	7%	4%	5%
As far as you know, are there any groups or clubs that meet at your school where students learn computer science?	*Yes*	42%	45%	32%	43%	33%	42%	51%
	No	51%	49%	62%	49%	60%	51%	44%
	Don't know	6%	5%	6%	8%	7%	7%	5%

Figure B5.

DO THE COMPUTER SCIENCE OPPORTUNITIES OFFERED IN YOUR SCHOOL INCLUDE ANY OF THE FOLLOWING ELEMENTS? SELECT ALL THAT APPLY.

	Principals
Computer graphics	61%
Creating websites	57%
Computer programming and coding	53%
Robotics/Artificial intelligence	47%
Creating video or online games	36%
Creating applications (apps)	27%
Data analytics/visualization	22%
Building computers and other hardware	15%
Developing software	10%
Don't know	7%

Demand for Computer Science Education and Barriers to Learning

Figure B6.

DO YOU THINK MOST STUDENTS SHOULD BE REQUIRED TO LEARN COMPUTER SCIENCE?

	Parents
Yes	67%
No	33%

Figure B7.

MOST STUDENTS SHOULD BE REQUIRED TO TAKE A COMPUTER SCIENCE COURSE.

	Teachers	*Principals*	*Superintendents*
Strongly agree	33%	29%	22%
4s	23%	30%	30%
3s	26%	24%	27%
2s	11%	11%	15%
Strongly disagree	7%	4%	5%

Figure B8.

		Parents	Teachers	Principals	Superintendents
Do you think offering opportunities to learn computer science is more important, just as important or less important to a student's future success than required courses like math, science, history and English?	More important	21%	8%	6%	5%
	Just as important	64%	67%	62%	56%
	Less important	15%	25%	29%	35%
	Don't know	0%	0%	3%	3%
Do you think offering opportunities to learn computer science is more important, just as important or less important to a student's future success than other elective courses like art, music and foreign languages?	More important	30%	16%	14%	15%
	Just as important	65%	73%	77%	71%
	Less important	5%	11%	8%	12%
	Don't know	0%	0%	2%	2%

Figure B9.

PARENTS

		Total	HOUSEHOLD INCOME		
			$54,000 or less	$54,001 to $105,000	$105,001 or more
Do you think offering opportunities to learn computer science is more important, just as important or less important to a student's future success than required courses like math, science, history and English?	More important	21%	29%	16%	13%
	Just as important	64%	58%	70%	65%
	Less important	15%	13%	14%	22%
Do you think offering opportunities to learn computer science is more important, just as important or less important to a student's future success than other elective courses like art, music and foreign languages?	More important	30%	30%	26%	32%
	Just as important	65%	66%	67%	61%
	Less important	5%	3%	7%	7%

Figure B10.

		Principals	Superintendents
Which of the following best describes the demand for computer science education among parents in your school/district? Is demand ...	High	7%	6%
	Moderate	34%	37%
	Low	50%	51%
	Don't know	8%	5%
Which of the following best describes the demand for computer science education among students in your school/district? Is demand ...	High	14%	15%
	Moderate	44%	49%
	Low	37%	34%
	Don't know	5%	2%

Figure B11.

		Students	Parents
[How likely are you to/How likely is it that your child will] have a job someday where [you/he/she] would need to know some computer science? Is it very likely, somewhat likely or not at all likely?	Very likely	38%	43%
	Somewhat likely	52%	42%
	Not at all likely	10%	15%

Figure B12.

		Principals	Superintendents
As far as you know, why doesn't your school/district offer any ways to learn computer science? Select all that apply.	We have to devote most of our time to other courses that are related to testing requirements and computer science is not one of them.	47%	52%
	There is not enough money to train or hire a teacher.	44%	57%
	There are no teachers available at my school/in my district with the necessary skills to teach computer science.	42%	73%
	We do not have sufficient budget to purchase the necessary computer equipment.	34%	31%
	We do not have sufficient budget to purchase the necessary computer software.	33%	33%
	We do not have the necessary computer software.	32%	27%
	There is not enough demand from parents.	30%	50%
	There is not enough demand from students.	29%	49%
	We do not have the necessary computer equipment.	28%	20%
	There are too many other courses that students have to take in order to prepare for college.	22%	39%
	There is not enough classroom space.	17%	16%
	Don't know	11%	1%
	Internet connectivity is poor at my school/in my district.	10%	10%
	There are no teachers available to hire with the necessary skills to teach computer science.	10%	32%
As far as you know, which of the below reasons is the main reason your school/district doesn't offer ways to learn computer science?	We have to devote most of our time to other courses that are related to testing requirements and computer science is not one of them.	32%	24%
	There is not enough money to train or hire a teacher.	13%	17%
	Don't know	12%	2%
	There are no teachers available at my school/in my district with the necessary skills to teach computer science.	9%	17%
	There are too many other courses that students have to take in order to prepare for college.	9%	9%
	We do not have sufficient budget to purchase the necessary computer equipment.	6%	1%
	There is not enough demand from students.	6%	15%
	There is not enough demand from parents.	4%	4%
	We do not have sufficient budget to purchase the necessary computer software.	2%	1%
	We do not have the necessary computer equipment.	2%	0%
	We do not have the necessary computer software.	1%	0%
	There are no teachers available to hire with the necessary skills to teach computer science.	1%	6%
	There is not enough classroom space.	1%	2%
	Internet connectivity is poor at my school/in my district.	0%	1%

Figure B13.

		Teachers	Principals	Superintendents
Teachers need extensive training/coursework in computer science in order to successfully teach computer science.	Strongly agree	58%	44%	45%
	4s	25%	35%	36%
	3s	13%	14%	12%
	2s	2%	4%	4%
	Strongly disagree	1%	1%	1%
	Don't know/Does not apply	0%	2%	1%
My school board believes computer science education is important to offer in our schools.	Strongly agree	18%	17%	15%
	4s	21%	27%	30%
	3s	29%	26%	31%
	2s	20%	12%	14%
	Strongly disagree	10%	4%	4%
	Don't know/Does not apply	2%	15%	5%
Computer science education is currently a top priority for my school/district.	Strongly agree	8%	6%	7%
	4s	16%	18%	22%
	3s	28%	30%	35%
	2s	24%	25%	25%
	Strongly disagree	24%	18%	10%
	Don't know/Does not apply	0%	3%	0%

Figure B14.

		SUPERINTENDENTS	
		City/Suburb	Town/Rural
Teachers need extensive training/coursework in computer science in order to successfully teach computer science.	Strongly agree	47%	44%
	4s	37%	36%
	3s	11%	13%
	2s	2%	5%
	Strongly disagree	1%	2%
	Don't know/Does not apply	2%	1%
My school board believes computer science education is important to offer in our schools.	Strongly agree	18%	15%
	4s	34%	29%
	3s	27%	32%
	2s	13%	15%
	Strongly disagree	3%	5%
	Don't know/Does not apply	6%	5%
Computer science education is currently a top priority for my district.	Strongly agree	7%	7%
	4s	27%	20%
	3s	33%	36%
	2s	23%	26%
	Strongly disagree	9%	11%
	Don't know/Does not apply	1%	0%

Figure B15.

		Principals
If there were new opportunities to offer computer science in your school, would you have to hire a new teacher or is there a teacher currently at your school that could teach computer science?	*Would have to hire a new teacher*	52%
	There is a teacher currently at the school that could teach a new computer science offering.	40%
	Don't know	8%

Figure B16.

PRINCIPALS

		GRADE RANGE		NUMBER OF STUDENTS			TYPE OF SCHOOL	
		School has only 6th grade or lower	*School has 7th grade or higher*	*Fewer than 500*	*500 to fewer than 900*	*900 or more*	*Public, state or county*	*Private*
My school board believes computer science education is important to offer in our schools.	*Strongly agree*	14%	18%	16%	17%	19%	15%	24%
	4s	25%	28%	26%	26%	31%	26%	28%
	3s	25%	26%	25%	26%	24%	27%	20%
	2s	11%	12%	13%	11%	10%	12%	11%
	Strongly disagree	4%	4%	5%	3%	4%	4%	5%
	Don't know	20%	11%	15%	16%	12%	16%	12%
Computer science education is currently a top priority for my school.	*Strongly agree*	4%	7%	6%	6%	8%	5%	11%
	4s	13%	21%	17%	17%	23%	17%	24%
	3s	26%	33%	29%	30%	33%	30%	29%
	2s	26%	25%	26%	25%	22%	26%	22%
	Strongly disagree	24%	13%	19%	17%	12%	19%	13%
	Don't know	6%	1%	3%	3%	1%	3%	2%

Figure B17.

		Principals
Has participation in opportunities to learn computer science in your school increased, stayed about the same or decreased in the last three years?	*Increased*	51%
	Stayed about the same	43%
	Decreased	3%
Do you expect the number of opportunities to learn computer science in your school will increase, stay the same or decrease in the next three years?	*Increase*	49%
	Stay about the same	43%
	Decrease	1%
	Don't know	7%