THE BASICS STUDY STUDENT QUESTIONNAIRE DESCRIPTIVE STATISTICS, SPRING 2016

Project Overview:
The Barriers and Supports to Implementing Computer Science (BASICS) study is a three-year exploratory research project funded by the National Science Foundation (#1339256) as part of the CS10K program – an ambitious effort to have 10,000 well-trained computer science teachers in 10,000 schools. The BASICS study seeks to contribute to this effort in part by creating and sharing valid and reliable tools to measure implementation of an introductory computer science curriculum (Exploring Computer Science, or ECS) and the key supports and barriers that affect implementation. Over the course of three years, researchers at Outlier Research & Evaluation at UChicago STEM Education, a Center at the University of Chicago developed and then administered this questionnaire to students in classes using ECS in school districts across the country. BASICS is not, in any way, an evaluation of ECS. Rather, the BASICS study focused on the ECS curriculum as it is widely used to teach introductory high school computer science.

This instrument was created using an approach that built from earlier Outlier studies of instructional resource implementation. In that earlier work, Outlier developed a conceptual framework for implementation measurement that systematically organizes instructional resources into components. It also organizes the factors affecting implementation into several categories (Century, Cassata, Rudnick & Freeman, 2012). Because the questionnaires were developed with this conceptual foundation (and adapted for use with the ECS materials, informed by a group interview with the ECS developers about the main components), they can be customized for use with instructional resources beyond ECS. Please contact us for additional information.

Here we present the BASICS student questionnaire instrument and descriptive statistics from the spring 2016 administration.

The BASICS Student Questionnaire

The Spring 2016 BASICS online student questionnaire was the third administration to students in introductory computer science classes using the ECS curriculum in three large U.S. school districts. However due to a delay in the data sharing agreement for one of the districts, only data from two districts are presented here (district A=535; district B=272 for 807 respondents total).

We are sharing *all* of the items used in this administration so that individuals interested in *using only subscales that demonstrated reliability* (i.e., internal consistency; see Cronbach's α for each scale) can do so, while others interested in seeing or using items that were removed may have that option. Items that were excluded from the final subscale versions due to low factor loading or large or significant modification indices on other scales are listed below scales from which they were removed. See the Student Measures PDF for further **technical information** about the instrument.

Questionnaire Overview:
The student descriptive statistics are organized into three sections: (1) **implementation of the ECS curriculum***,* (2) **contextual factors** that influence how students engage in the CS class, and (3) **student socio-demographics**. The headers used here were not shown to respondents as they took the questionnaire.

References Cited
Century, J., Cassata, A., Rudnick, M., & Freeman, C. (2012). Measuring Enactment of Innovations and the Factors that Affect Implementation and Sustainability: Moving Toward Common Language and Shared Conceptual Understanding. Journal of Behavioral Health Services & Research. 39 (4) 343-361.

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Student Descriptive Statistics

Implementation This section includes student report of items of: a) teacher instruction with the ECS curriculum (i.e., student perception of strategies that teachers enact during instruction to support student learning) and b) student engagement in the class.

Student Perception of Teacher Instruction with the Exploring Computer Science (ECS) Curriculum

Subscales
Teacher Facilitation of Student Autonomy (Cronbach's α=0.81)

Prompt	Item	N	M	SD
How often in the past month did your teacher ask you to do the following?	Make my own goals for learning computer science.	739	2.7	1.31
	Make my own choices about assignments related to my computer science class.	739	2.86	1.27
	Work in my computer science class without the teacher telling me what to do or managing my work time.	740	3.03	1.32
	Scale Average	**740**	**2.86**	**1.1**
Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*				

Teacher Facilitation of Cognitively Demanding Work (Cronbach's α=0.92)

Prompt	Item	N	M	SD
Think about what happened in your computer science class in the past month. During that time, how often did your teacher ask you to	Analyze data (organize, process, manipulate, or evaluate data).	732	3.25	1.2
	Explain the logic and reasoning supporting my solutions to problems.	733	3.24	1.21
	Explain why I agreed or disagreed with the work of other students in class.	733	3	1.32
	Communicate my thought processes to others.	733	3.18	1.24
	Problem solve when something didn't work the way I wanted it to work.	734	3.31	1.28

do the following?	Scale Average	733	3.2	1.25

Excluded Item: Consider alternative approaches to my work.

Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*

One item was removed from this scale in the CFA analysis due to significant and large modification indices on *Teacher Facilitation of Student Autonomy* as well as low inter-item correlation with the other five items (see the technical information for details).

Teacher Facilitation of Student Interest (Cronbach's α=0.92)

Prompt	Item	N	M	SD
How often in the past month did your computer science teacher do the following?	Asked me to consider relationships between what I was learning in the lesson and real world problems (meaning actual events or situations within or outside of school).	728	3.05	1.28
	Connected a lesson or classroom activities to my own life (e.g., by asking about my past experiences, or applying content to my daily life).	729	3.03	1.28
	Made activities and projects interesting to me by sharing relevant stories, using humor, bringing in guest speakers, etc.	729	3.08	1.29
	Connected lesson content with current events.	729	3.04	1.32
	Scale Average	**729**	**3.05**	**1.15**
Response scale*: 1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*				

Descriptive items
Student Grouping Strategies

Prompt	Item	N	M	SD
How often did you do the following in	I worked with a partner (2 people).	727	3.13	1.24

your computer science class in the past month?	I worked in a small group (3 or more people).	727	2.99	1.25
	I worked with the whole class.	727	2.42	1.35
	I worked independently/alone.	727	3.54	1.18
Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*				

Student Self-Report of Engagement in a Class Using the Exploring Computer Science (ECS) Curriculum

Subscales

Student Contribution to Small Group Work (Cronbach's α=0.91)

Prompt	Item	N	M	SD
In the past month, how often did you do the following when working in a small group?	Contributed to group work (verbally or nonverbally).	724	3.37	1.2
	Worked collaboratively with other students.	724	3.43	1.15
	Shared responsibility for activity and project work with group members.	724	3.37	1.18
	Scale Average	**724**	**3.39**	**1.09**
Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*				

Student Engagement in Discussion (Cronbach's α=0.90)

Prompt	Item	N	M	SD
How often did you do the following in your computer science class in the past month?	Talked to other students about my computer science work.	720	3.14	1.26
	Responded to questions other students had about their computer science work.	720	3.13	1.23
	Discussed what I was learning with other students in the class.	720	2.91	1.31

	Scale Average	720	3.06	1.15

Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*

Student Engagement in Cognitively Demanding Work (Cronbach's α=0.93)

Prompt	Item	N	M	SD
Think very carefully about your work in computer science class over the past month. During that time, how often did you do the following?	Problem solved when something didn't work the way I wanted it to work.	718	3.2	1.2
	Considered alternative approaches to my work.	718	3.22	1.2
	Analyzed data (organized, processed, manipulated, evaluated data).	719	3.23	1.18
	Explained the logic and reasoning supporting my solutions to problems.	718	3.19	1.23
	Scale Average	**718**	**3.21**	**1.19**

Excluded Item:
Communicated my thought processes to others.

Excluded Item:
Explained why I agreed or disagreed with the work of other students.

Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*

Two items were removed from this scale in the CFA analysis due significant and large modification indices on *Student Engagement in Discussion* as well as the larger inter-factor correlation between the two scales (see the technical information for details).

Students Work Autonomously (Cronbach's α=0.80)

Prompt	Item	N	M	SD
How often did you do the following in your computer science class in the past month?	Set my own goals for learning computer science in class.	716	2.92	1.33
	Made my own choices about assignments in computer science class.	715	3.06	1.24
	Worked on my own without the teacher telling me what to do or managing my work time.	715	3.19	1.23

	Scale Average	716	3.06	1.07

Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*

Student Risk-Taking (Cronbach's α=0.89)

Prompt	Item	N	M	SD
How often did you do the following in your computer science class in the past month?	Asked questions when I was confused about activities or assignments.	715	3.19	1.22
	Tried new things in class even when I was not sure how to do them.	714	3.16	1.19
	Tried something I thought I might fail.	715	3.13	1.21
	Answered questions even when I was not sure if it was correct.	714	3.1	1.24
	Scale Average	**716**	**3.14**	**1.05**

Response scale: *1-Never, 2-A few classes, 3-About half the class sessions, 4-Many class sessions, 5-Once or more per class session*

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Contextual Factors This section includes items that measure the presence and extent of a range of factors that can influence: a) student engagement in and attitude toward computer science as a field of study generally, and b) student feelings about their current computer science class more specifically.

Computer Science: General

Subscales
Computer Science Interest (Cronbach's α=0.94)†

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements?	I am interested in learning more computer science.	807	4.21	1.47
	I am interested in taking more computer science classes in school (high school or after high school).	807	4.01	1.54

	I am interested in doing computer science outside of school time.	805	3.77	1.58
	Scale Average	**807**	**4**	**1.45**

Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*

Computer Science Ability Beliefs (Cronbach's α=0.89

Prompt	Item	N	M	SD
	I am better at computer science than most of the other kids at my school.	800	3.87	1.36
	I am very good at computer science.	800	4.06	1.29
	I can figure out how to solve the most difficult problems in my computer science class if I try.	799	4.22	1.37
	Scale Average	**800**	**4.05**	**1.21**

Excluded Item:
I have the ability to learn computer science.

Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*

Perceived Relevance of Computer Science to Future/Future Time Perspective (Cronbach's α=0.90)

Prompt	Item	N	M	SD
	Computer science is necessary for me to accomplish what I want in school.	789	3.73	1.51
How much do you agree or disagree with the following statements?	Computer science will help me reach my goals for college/career.	790	4.01	1.47
	What I learn in computer science will benefit my future.	790	4.33	1.37
	Scale Average	**790**	**4.02**	**1.33**

Excluded Item: I think it is useful for me to learn computer science.	
Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*	

Computer Science Identity (Cronbach's α=0.84)†

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements?	Kids like me do computer science.	795	3.93	1.42
	I like computer science more than other kids at my school.	794	3.59	1.48
	I think I could become a computer scientist one day.	795	3.4	1.61
	Scale Average	**796**	**3.64**	**1.31**

Excluded Item: I do computer science in my free time.	
Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*	

Descriptive items

School Community Support for Computer Science

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements?	Teachers and administrators at my school think that computer science is just as important as math and science.	807	3.8	1.34
	Guidance counselors at my school think that computer science is just as important as math and science.	806	3.72	1.34
	My teachers are encouraging me to do more with computer science.	805	3.82	1.45
	My guidance counselor is encouraging me to do more with computer science.	805	3.32	1.48
Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*				

Community Values/ Perceptions of Support for Computer Science: Friends & Family

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements?	My friends think it would be good to choose a job/career in computer science.	805	3.65	1.47
	My friends think it is important for students to take computer science.	805	3.46	1.43
	My family members think it would be good for me to choose a job/career in computer science.	803	3.91	1.526
	My family thinks it is very useful for me to take this course.	805	4.07	1.455
	My family thinks I should take more computer science courses.	805	3.76	1.500
	Scale Average	805	3.77	1.28
Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*				

Interest in More Computer Science Courses

Item	Response Options	N	%
If you had the opportunity to take more computer science courses in the future, would you?	Yes	549	68.37
	No	254	31.63
	Total	**803**	**100**

Interest in Computer Science Career†

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements?	I am interested in pursuing a career in computer science.	781	3.4	1.65
	I think I would enjoy a career in computer science.	781	3.65	1.62
Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*				

Beliefs & Values about Computer Science

Item	Response Options (respondents select one)	N	%
Select the one statement that you agree with the most about introductory computer science in high schools.	Introductory computer science should be required for all high school students.	178	23.67
	Introductory computer science should only be required for some high school students (for example, students in a CTE program, or a school computer science "major," pathway," or "cluster" with computer science requirements).	272	36.17
	Introductory computer science should only be offered to high school students as an elective option.	302	40.16
	Total	**752**	**100**

Friends and Family in Computer Science

Items	Response Options	N	%
Do you know anyone outside of school who works in computer science? (For example, working as a Computer Programmer, Software Developer, Web Developer, Network Administrator, etc.)	Yes	311	43.62
	No	402	56.38
	Total	**713**	**100**
	Response Scale (using slider bar)	**N**	**%**
[If "YES" to above] On a scale of 0-5 where "0" = Not at all and "5" = A great deal, how much has this person or these people influenced your interest in continuing to learn computer science? Please drag the slider to the appropriate influence level.	0 (not at all)	25	8.09
	1	25	8.09
	2	52	16.83
	3	89	28.8
	4	61	19.74
	5 (a great deal)	57	18.45
		309	**100**

Friends and Family Interest in Computer Science

Items	Response Options	N	%
Do you have friends or family members who are interested in computer science?	Yes	369	51.97
	No	341	48.03

	Total	710	100
	Response Scale (using slider bar)	**N**	**%**
[If "YES" to above] On a scale of 0-5 where "0" = Not at all and "5" = A great deal, how much has this person or these people influenced your interest in continuing to learn computer science? Please drag the slider to the appropriate influence level.	0 (not at all)	28	7.63
	1	34	9.26
	2	72	19.62
	3	109	29.7
	4	64	17.44
	5 (a great deal)	60	16.35
	Total	**367**	**100**

School/District Computer Science Requirement

Item	**Response Options**	**N**	**%**
Is this computer science course required for you?	Yes	185	22.92
	No	470	58.24
	I don't know	152	18.84
	Total	**807**	**100**

Prior Computer Science Experience at School

Items	**Response Options**	**N**	**%**
Before your current computer science class, had you taken any other computer science classes at school?	Yes	228	31.84
	No	488	68.16
	Total	**716**	**100**
[If "YES" to above] What computer science course(s) had you taken before your current computer science class?	[Open response]		

Prior Computer Science Experience Outside of Formal School

Items	**Response Options**	**N**	**%**
Have you ever participated in computer science activities or programs somewhere outside of school hours (such as at an after school program, online, or at a camp or summer program)?	Yes	149	20.9
	No	564	79.1
	Total	**713**	**100**

	Response Options	N	%
[If "YES" to above] Where did you previously take a computer science class or program outside of school hours? Select all that apply.	After school program at my school	42	28.19
	After school program somewhere else (e.g., Boys and Girls Club, etc.)	34	22.82
	Online program	61	40.94
	Summer program/camp	32	21.48
	Other	32	21.48

Note: All percents are out of N=149, the total number of students who reported participating in prior experiences.

Prior Computer Science Experience: Content

Item	Response Options	N	%
[If "YES" to participation in CS outside of school hours OR "YES" to prior CS experience in school] What topic(s) did you learn about during your computer science activity or program? Select all that apply.	Programming/ Coding	217	71.38
	Robotics	105	34.54
	Security/Cyber Security	85	27.96
	Web design	176	57.89
	Game design	138	45.39
	App making	86	28.29
	Other	29	9.54

Note: All percents are out of N=304, the total number of students who had any prior experience—whether in school, out of school, or both.

Computer Science: Feelings About the Class

Subscales

Attitude/Motivation for Class (Cronbach's α=0.96)

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements	I like my computer science class.	751	4.36	1.45
	I think my computer science class is interesting.	750	4.23	1.48

about your computer science class?	I enjoy my time in computer science class.	751	4.34	1.44
	I like doing the activities we do in my computer science class.	751	4.19	1.49
	Scale Average	**751**	**4.28**	**1.38**

Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*

Sense of Belonging (Cronbach's α=0.95)†

Prompt	Item	N	M	SD
How much do you agree or disagree with the following statements about your computer science class?	I feel that I am supported in this computer science class.	748	4.24	1.41
	I feel that I am a part of this computer science class.	747	4.33	1.39
	I feel that I am accepted in this computer science class.	748	4.46	1.34
	I feel comfortable in this computer science class.	748	4.52	1.34
	Scale Average	**749**	**4.38**	**1.28**

Response scale: *1-Completely Disagree, 2-Mostly Disagree, 3-Slightly Disagree, 4-Slightly Agree, 5-Mostly Agree, 6-Completely Agree*

Note: This scale was adapted from one validated in a University of Washington multi-institution study about connections to community at the undergraduate level (for more details, see: http://www2.ee.washington.edu/research/community/Community/Belonging.html).

Descriptive items

Challenges Enrolling in Computer Science

Item	Response Options (respondents select up to three)	N	%
There may have been some things that made you consider NOT taking this computer science course. Pick up to three statements that are most true for you. If none of	It was difficult to fit this course in to my schedule.	91	12.2
	I didn't know what the course was about.	255	34.18
	I wasn't sure I would have all of the skills I would need.	259	34.72
	The course conflicted with an elective I wanted to take.	122	16.35

these are true for you, select the option at the bottom of the list to tell us none of these were true for you.	I thought I needed a computer at home to take the course (and I didn't have one).	58	7.77
	No one in the school told me about the course (e.g. teacher, counselor, principal, etc.).	157	21.05
	My family did not want me to take this computer science course.	17	2.28
	No one I knew was taking the course.	147	19.71
	People in the school advised me against taking introductory computer science (e.g. teacher, counselor, principal, etc.).	55	7.37
	Other	46	6.17
	None of these were true for me.	222	29.76

Note: Percents do not add up to 100% because respondents could select up to three challenges, with the exception of the item, "None of these were true of me," in which case respondents were prohibited from selecting other response options. All percents are out of N=746, the total number of respondents for this question (i.e., N=61 with missing data).

Recommendation of Computer Science Class

Items	Response Options	N	%
Would you recommend that another student take this computer science class?	Yes	597	79.71
	No	152	20.29
	Total	**749**	**100**
[If "YES" to above] Please explain why you would recommend this computer science class to another student.	[open response]		
[If "NO" to above] Please explain why you would not recommend this computer science class to another student.	[open response]		

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Student Socio-Demographics These descriptive items ask about the characteristics of students that are also potential correlates of engagement in and experience with computer science learning.

Descriptive items

Student Characteristics

Items	Response Options	N	%
What grade are you in?	9th grade	318	44.79
	10th grade	235	33.1

	11th grade	98	13.8
	12th grade	59	8.31
	Total	**710**	**100**
How old are you?	13 years old	1	0.14
	14 years old	78	10.96
	15 years old	270	37.92
	16 years old	205	28.79
	17 years old	97	13.62
	18 years old	53	7.44
	19 years old	5	0.7
	20 years old	1	0.14
	21 years old	2	0.28
	Total	**712**	**100**
I identify my gender as:	Male	417	58.57
	Female	250	35.11
	Other	17	2.39
	Prefer not to answer	28	3.93
	Total	**712**	**100**
Which of the following best represents your racial and/or ethnic identity? Select all that apply.	American Indian or Alaskan Native	5	0.73
	Asian	35	5.09
	Black or African American	202	29.4
	Hispanic or Latino/Latina	194	28.24
	Native Hawaiian or Other Pacific Islander	3	0.44
	White	95	13.83

Multiple categories	131	19.07	
Other	22	3.2	
Total	**687**	**100**	

Note: The multiple category includes the aggregate of participants who selected more than one racial/ethnic category.

Access to Technology at Home

Items	Response Options	N	%
Do you have access to technology in your home now?	Yes	666	93.8
	No	44	6.02
	Total	**710**	**100**
[If "YES" to above]: Select all the technology you have access to in your home.	Computer (desktop or laptop)	631	94.74
	Tablet (e.g., Kindle Fire, iPad, etc.)	501	75.22
	Smart phone	636	95.5
	Internet access	629	94.44

Note: All percents are out of N=666, the total number of students who reported having access to technology at home.

School Context

Items	Response Options	N	%
Are you in a CTE (Career and Technical Education) program?	Yes	312	38.66
	No	210	26.02
	I don't know	285	35.32
	Total	**807**	**100**
What region do you live in?	District A	535	66.29
	District B	272	33.71
	Total	**807**	**100**

Note: Participating district names were provided. Only data for two school districts are included in these descriptive statistics, due to a delay in the data sharing agreement with the third school district.

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† The Year 3 (spring 2016) BASICS instrument included these scales/items for the first time. Items grouped as scales showed strong internal consistency and performance in CFA analyses; we recognize that future work can further validate these scales with more samples of high school students.