COMPUTING **AT SCHOOL**

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Part of BCS, The Chartered Institute for IT

CAS: FEMALES AND COMPUTING/COMPUTER SCIENCE SURVEY (2018)

Between the 19th March 2018 and 29th March 2018 CAS conducted a survey, shared to CAS members via the CAS Community forum, asking 14 - 18 year old girls several questions about their perceptions of computing and computer science. This document briefly summarises the findings of that survey.

There were 402 responses. 11.9% (n=48), not from females and therefore discounted with 3% (n=13) preferring not to say.

The majority of respondents were 14 years old. The age spread of respondents was:

Age	Number	(%)
14	274	68
15	68	17
16	29	7
17	4	1
18	10	3
Other	17	4
TOTAL	402	

34.2% of respondents were studying either GCSE Computer Science or A Level Computing. The survey asked questions of those who were, and those who were not, studying either GCSE Computer Science or A Level Computing. One of the purposes of the survey was to compare the views of these two cohorts and their perception of Computing/Computer Science. A list of the questions asked can be found in the Appendix.

The result are presented here as a snapshot of opinion against the background of low take-up of the subject by females in schools. Only 20% of the GCSE cohorts were female in 2017. By comparison Physics classes were broadly 50:50. Our survey shows that girls do consider the subject at GCSE seriously, 26%, but when it came to make their options chose a different subject.

A lack of information about the subject, or perhaps poor presentation (?), external influences e.g. choices made by friends or that it's not required for a chosen university course will or that it is simply not in the right option block will all play a role. The fact that it is perceive as hard and they question their own level of understanding and therefore confidence in the subject play their part in their choices. Extrapolating precisely the reasons why females in particular, let's not forget there's a general lack of take up amongst males too, are not opting to study Computing or Computer Science are hard to determine.

What is clear, is that Computing is lagging behind the other natural sciences. This will present a major challenge for Britain. Our females are a vital part of our booming digital economy and it is time we worked together to address how we communicate our subject

with how we present the choices available to ensure our girls are making the best informed choices they can.

Contents

CHECK THE TYPES OF TOYS / GAMES / ACTIVITIES THAT YOU ENJOYED PLAYING WITH THE MOST AS A YOUNG CHILD

A list of generic toys and play activities was presented, see Appendix. It is perhaps of little surprise that the CS students tended to play ore with computer games, building sets and electronic toys than the non computer science students who did more arts and crafts, cooking/baking and sports activities. The result are compared in the figure below:
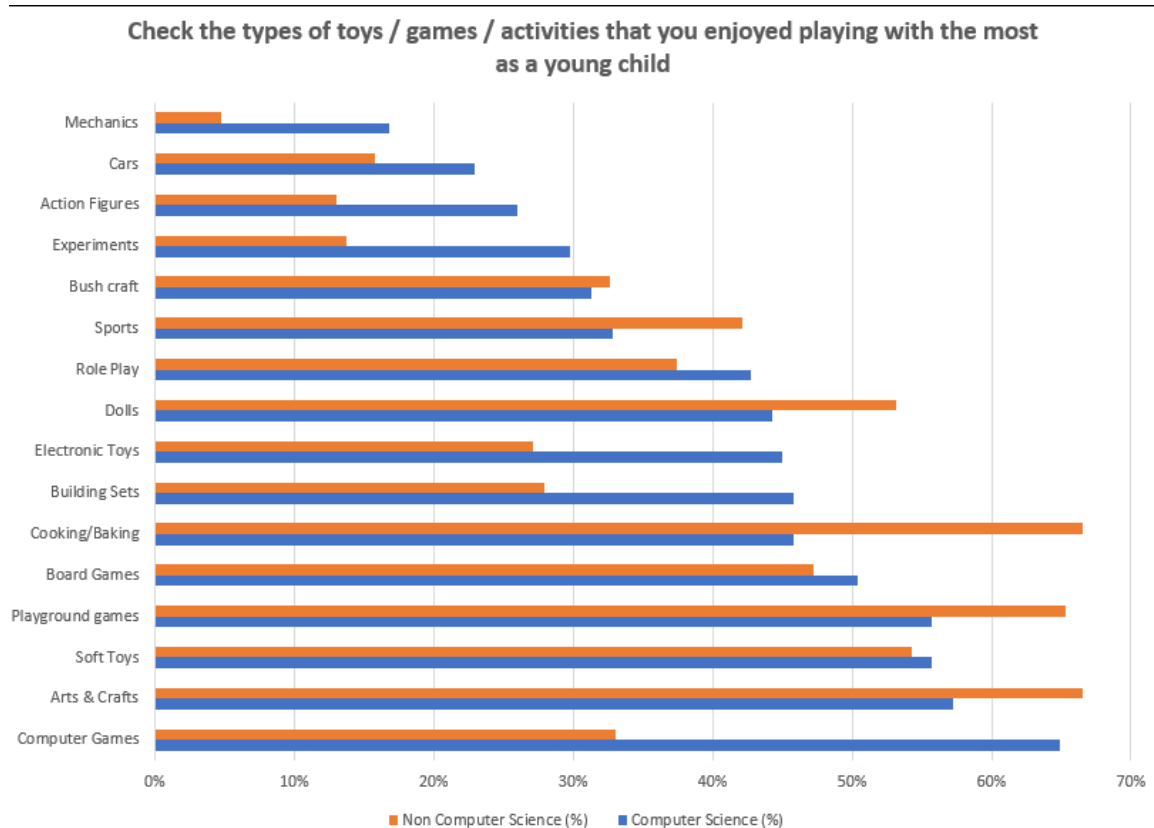
Figure 1: Comparison of activities undertaken by computer science and non computer science girls

Data for difference in results greater than 10% are shown in the table extract below:

Activity	CS Students %	Non CS Students %	Difference
Computer Games	65	33	32
Building Sets	46	28	18
Electronic Toys	45	27	18
Experiments	30	14	16

Action Figures	26	13	13
Cooking/Baking	46	67	-21
Playground Games	56	65	-10
Arts/Crafts	57	67	-10
Sports	33	42	-9

Table 1: Sample results for difference in activities undertaken

DO YOU HAVE A PARENT, GUARDIAN OR FAMILY MEMBER IN A COMPUTER SCIENCE CAREER?

Of those taking computer science one third have a parent, guardian or family member in a computer science career that may have influenced them as shown in the following bar chart but family computing connections seem to have little bearing on whether girls did computer science or not:
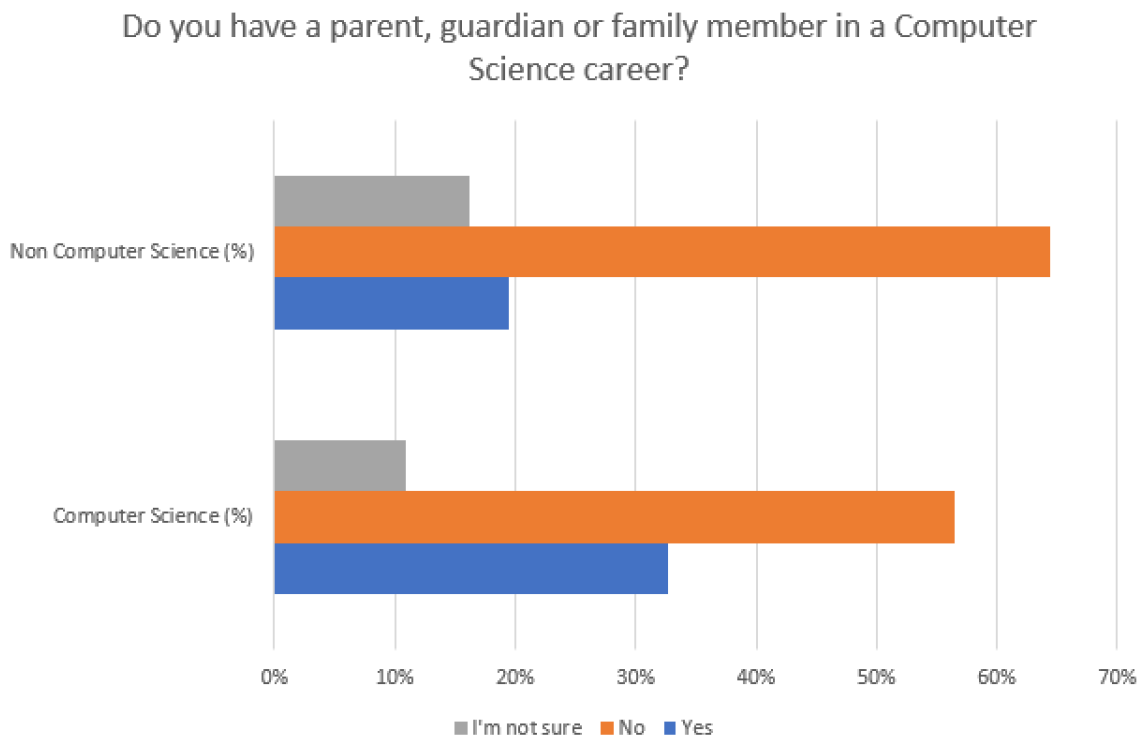
RATE YOUR SUBJECT KNOWLEDGE IN COMPUTING (SCALE OF 1 (POOR) TO 5 (OUTSTANDING))

Those not taking computer science rated their subject knowledge more negatively than those who are taking the subject.

Rate your subject knowledge in computing

Rating	Non Computer Science (%)	Computer Science (%)
5 - Outstanding	1%	7%
4	4%	30%
3	36%	48%
2	36%	9%
1 - Poor	23%	6%

Chart Area

■ Non Computer Science (%) ■ Computer Science (%)
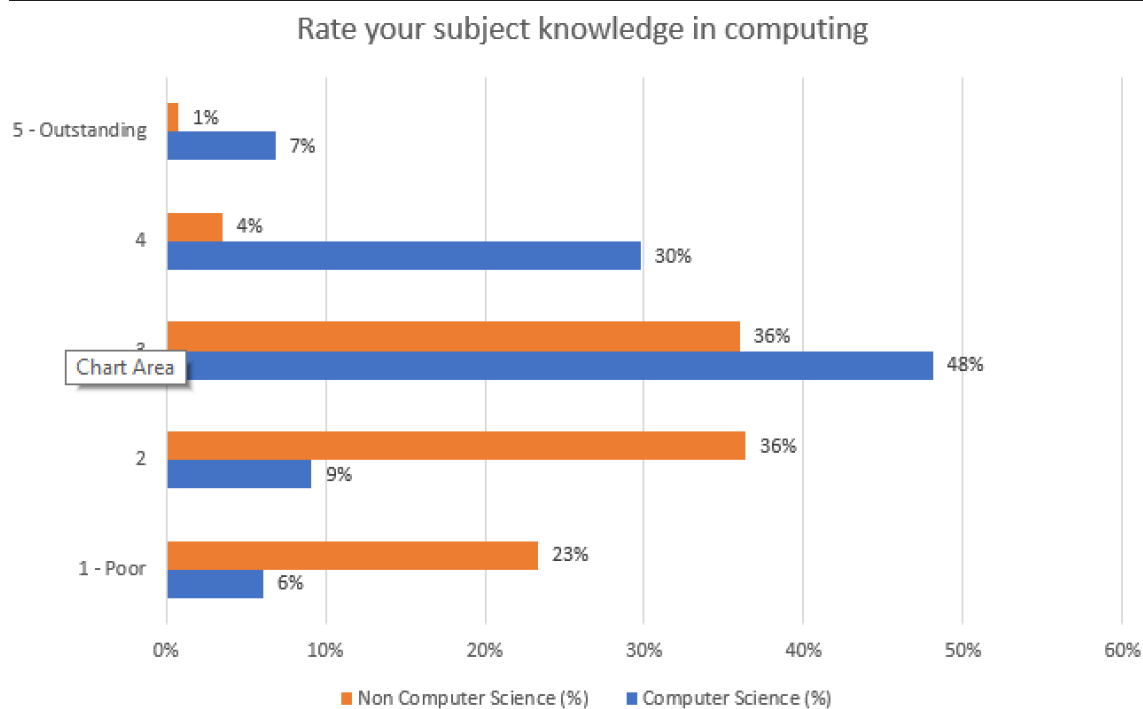
QUESTIONS FOR THOSE STUDYING COMPUTING/COMPUTER SCIENCE

WHAT FACTOR MADE YOU DECIDE ON COMPUTER SCIENCE AS A WAY FORWARD (COMPUTER SCIENCE STUDENTS ONLY)

Nearly two thirds of the students taking computer science chose it because they were interested in the subject, a further third split almost equally between choosing it as a career option or on advice from a parent or just to fill their options.

What factor made you decide on Computer Science as a way forward?
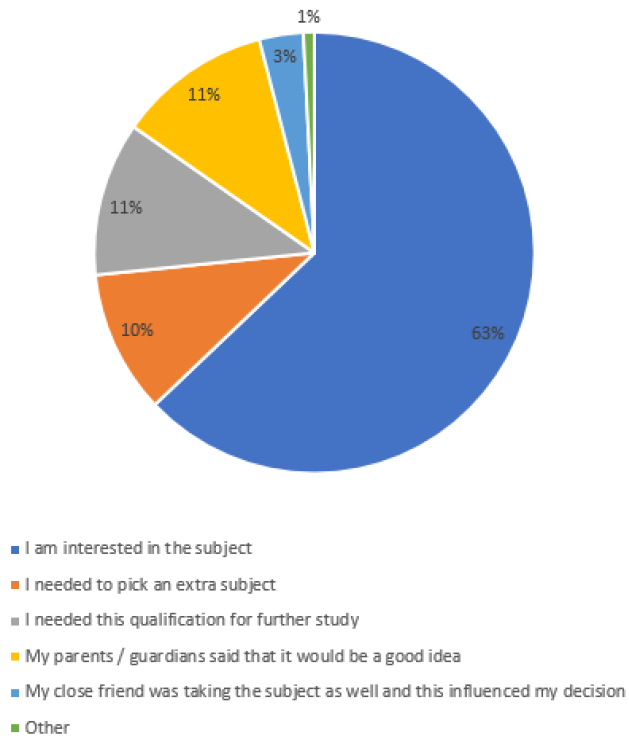
- I am interested in the subject
- I needed to pick an extra subject
- I needed this qualification for further study
- My parents / guardians said that it would be a good idea
- My close friend was taking the subject as well and this influenced my decision
- Other

IF YOU ARE LOOKING AT COMPUTING AS A CAREER, WHICH CAREER FROM THE LIST BELOW WOULD SUIT YOU BEST?

However, nearly one half of the girls did not know which career option in computing was most attractive to them, though software development was the most popular from the remaining choices. At least 7% thought teaching might suit them!

If you are looking at computing as a career, which career from the list below would suit you best?
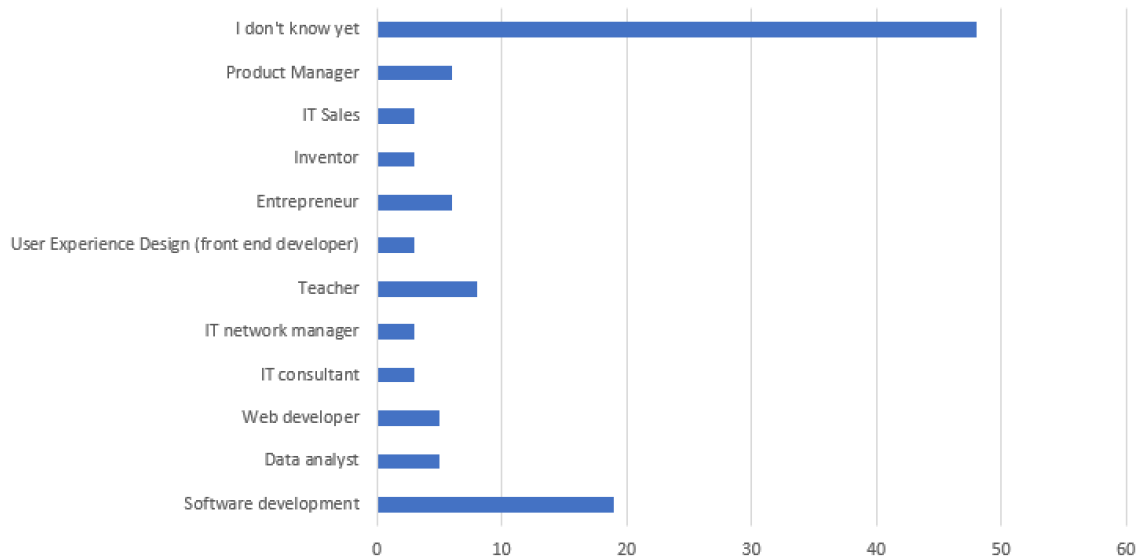
Do you have a feel for the number of job types there are in the computing world?

58% of the students felt they did not have sufficient feel for the number of job types and potential careers in computing, which perhaps influenced their responses to the previous question of either "I don't know" or "Software Development", the latter been perhaps the most obvious.
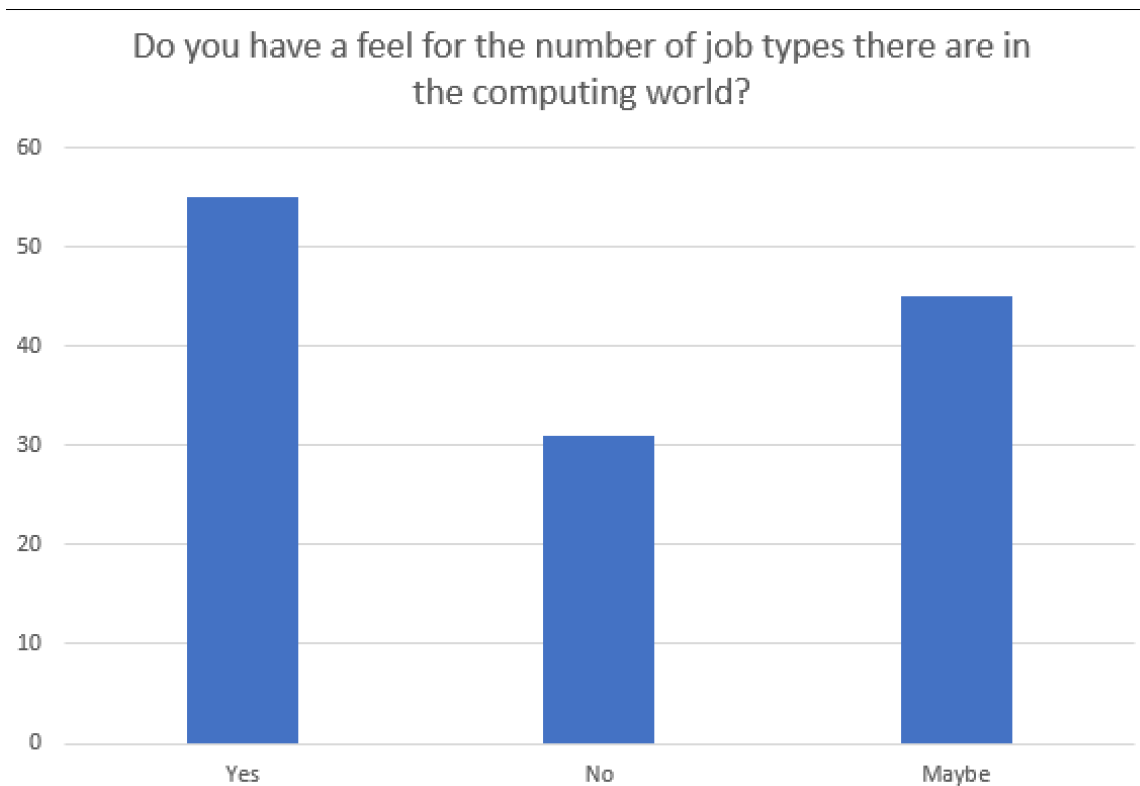
Do you have a feel for the number of job types there are in the computing world?

LOOK AT THE SKILLS BELOW AND DECIDE HOW IMPORTANT THEY ARE FOR A COMPUTER SCIENTIST, ON A RANGE OF 0 (NOT REQUIRED) TO 6 (ESSENTIAL)

This next question listed a number of specific, transferable and generic skills and were asked to rate on a scale of 1 (not required) to 6 (essential) for someone working in Computing. Of those studying computer science/computing rating the skills with a score of 4 or above there were some clear leaders:

• People skills (74%)

• Situational analysis (73%)

• Mathematics (72%)

• Project Management (72%)

• Web/Internet skills (70%)

From those not studying computer science/computing the equivalent leading skills were:

• Web/Internet skills (85%)

• Electronics knowledge (82%)

• Mathematics (78%)

- Situational Analysis (66%)

- Time Management (65%)

The following tabulates all of their responses (rating 4 and above):

Skill	CS (%)	Non CS (%)	Difference
People Skills	74	24	
Situational Analysis	73	66	
Mathematics	72	78	
Project Management	72	60	
Web/Internet Skills	70	85	
Lateral Thinking	61	50	
Electronics Knowledge	59	82	
Time Management	57	65	
Writing Skills	36	28	
Persistence	32	63	
Sense of humour	19	7	
Body Language Analysis	10	7	

Table 2: Skills seen as more than somewhat essential for a computing career

GIVEN THE SHORTAGE OF COMPUTING SKILLS IN THE UK AND ELSEWHERE, WHAT METHODS DO YOU THINK MIGHT PERSUADE THE "RELUCTANT COMPUTER PEOPLE" TO STUDY THE SUBJECT?

An open ended question asking the advice of the girls about what could/should be done to persuade those reluctant to study computing to take up the subject. There were 103 responses though not all answered the question with some choosing to exercise their sense of humour in answering. The remaining responses were analysed and grouped as follows:

Reason	Responses
Earnings Potential	12
Start younger	5
Make the lessons fun	15

Relate lessons to own experience	5
Provide work experience insights	3
More careers information	10
Stress importance of the subject	8
Improve the quality of teaching	4
Advertise the advantages	8
Make it more accessible	2
Provide taster lessons	4
Allow own choice of project	2

Table 3: What methods should be used to persuade those reluctant to study computing

HAVE YOU SPOKEN ABOUT CS TO SOMEONE WHO IS ACTIVELY AVOIDING IT AS A SUBJECT?

The majority of respondents (66%) had not spoken to someone actively avoiding the subject, those who did cited various reasons to help persuade their peers including how much fun it is and how essential computing is for future careers

QUESTIONS FOR THOSE NOT STUDYING COMPUTING/COMPUTER SCIENCE

IN YOUR OWN WORDS...WHY DID YOU DECIDE TO NOT STUDY COMPUTER SCIENCE?

An open-ended questions which produced a range of responses, though some invalid as they did not answer the question appropriately. Perhaps not surprisingly the most prevalent reason cited, paraphrased, was "It's boring" (26%) followed by "It's hard" (21%) or "I'm not interested in it" (17%). The remainder cited reasons, again paraphrased such as, "I don't understand it" (6%), "It's not useful for my career" (8%), "I'm not any good at it" (4%) and "Wanted to choose other subjects" (17%). The free form answers are illuminating in other regards, namely, citing it's hard due to the Maths and programming/coding though many IT jobs do not require either!

DID ANY OF THESE OPTIONS CONTRIBUTE TO YOUR DECISION TO NOT STUDY COMPUTER SCIENCE? SELECT ALL THAT APPLY OR LEAVE BLANK.

This questions elaborated on the previous as shown in the graph below:

Did any of these options contribute to your decision to not study Computer Science? Select all that apply or leave blank.

- I didn't like the teacher — 51
- It didn't fit with my subject option blocks — 36
- I think the subject is "nerdy" — 19
- Lack of maths attainment — 39
- I wasn't good at it/didn't feel confident with the subject — 147
- I wasn't interested — 194
- School didn't offer it — 3
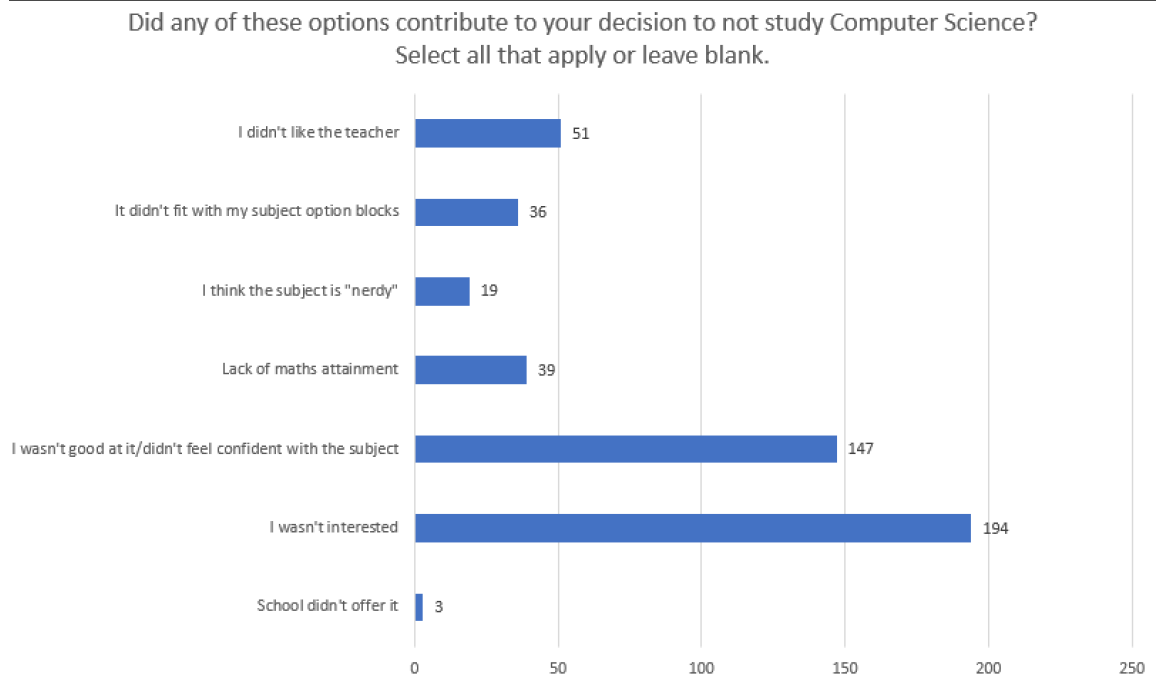
DID YOU EVER CONSIDER COMPUTER SCIENCE AS A SUBJECT TO STUDY?

One quarter of those who chose not to take computing/computer science had considered it:

Did you ever consider Computer Science as a subject to study?

26%

74%

■ Yes ■ No
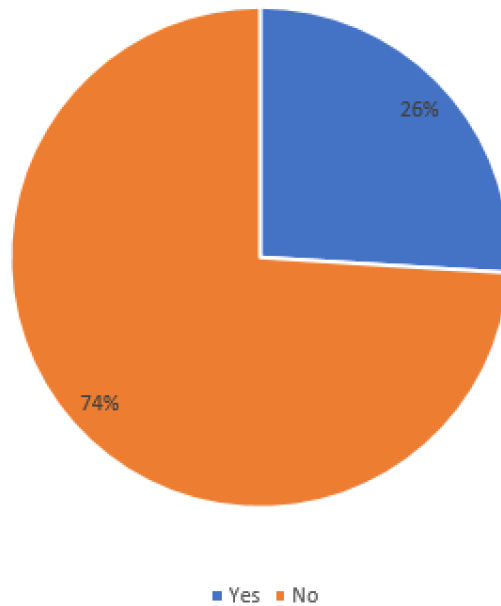
From a previous question one can surmise that the majority of the 26% chose to study other subjects in preference to computing when the time came to make their choices though it's reasonable to wonder whether more attention to that cohort might have changed their minds?

HAVE YOU EVER CARRIED OUT ANY COMPUTER SCIENCE RELATED ACTIVITIES?

56% of the girls had carried out computer science related activities but it had either made them less inclined to study the subject or had done nothing to change their mind:

Have you ever carried out any computer science related activities?
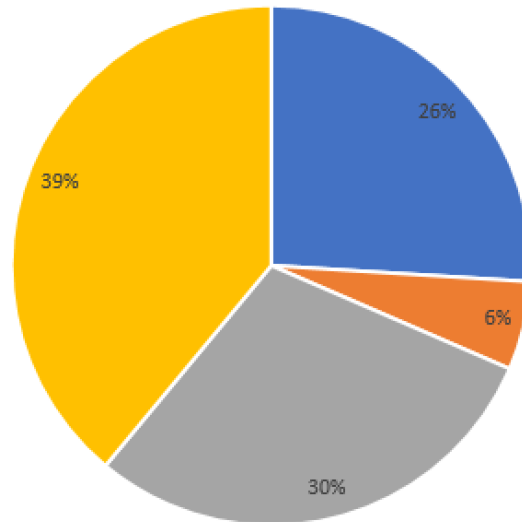
Legend:
- Yes and it made me LESS interested in the subject
- Yes and it made me MORE interested in the subject
- Yes and it didn't change my mind about the subject
- No

Curiously, 39% had not carried out any computer science related activity. It would be informative to know whether the majority of that 39% had not benefited from the curriculum change in 2014 to computing and computer science.

ARE YOU FAMILIAR WITH THE TOPICS OFFERED IN COMPUTING COURSES AT YOUR LEVEL?

Over two-thirds of those not taking computing/computer science said they were not familiar with the topics being offered at either GCSE or A Level:

Are you familiar with the topics offered in computing courses at your level?

Pie chart legend: ■ Yes ■ No — 31% (Yes), 69% (No)
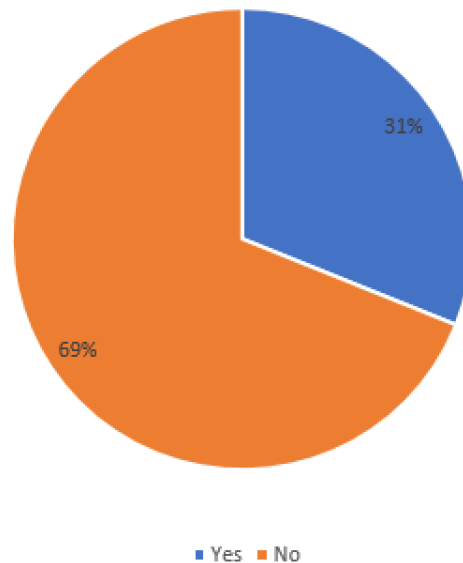
A somewhat perplexing response but without further data it's difficult to arrive at any conclusions about why this might be e.g. insufficient information provided in options booklet, lack of experience and exposure to the subject further down the school etc..

WHICH COMPUTER SCIENCE CAREER WOULD YOU CONSIDER TO BE THE MOST IMPORTANT FOR THE UK'S FUTURE ECONOMY?

44% did not know which career would be the most important though software development and teacher were the most popular after that with handfuls of responses across the other options:

Which Computer Science career would you consider to be the most important for the UK's future economy?

Career	Percentage
I don't know	44%
Product Manager	2%
IT Sales	2%
Inventor	7%
Entrepreneur	4%
User Experience Design (front end developer)	1%
Teacher	11%
IT network manager	2%
IT consultant	2%
Web developer	4%
Data analyst	6%
Software development	15%
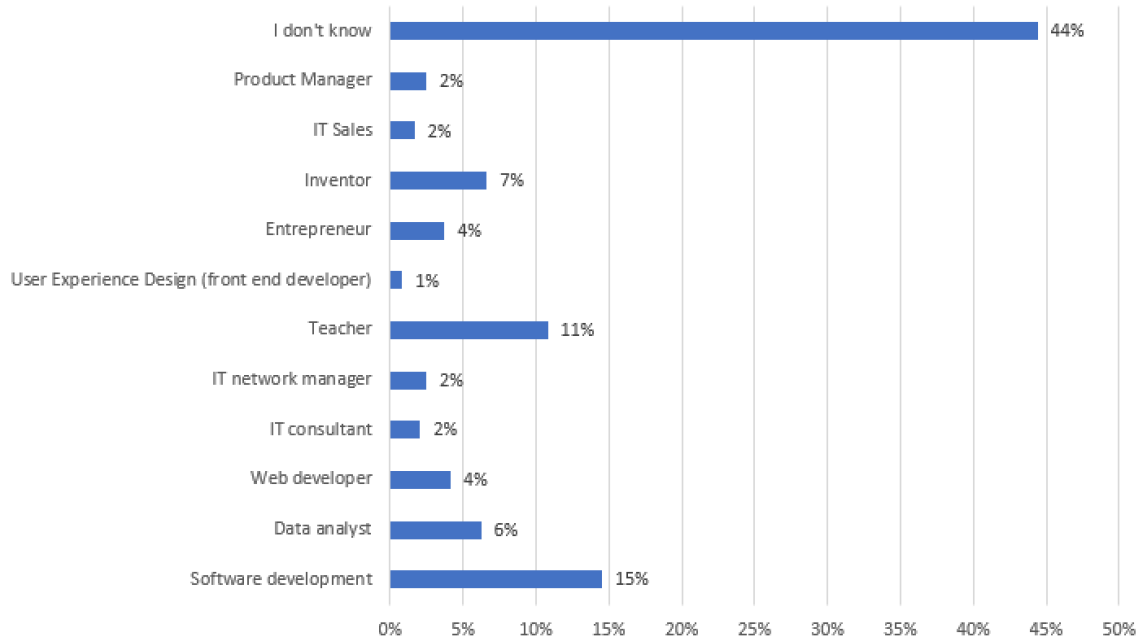
DO YOU THINK THAT HEARING A TALK FROM SOMEONE WITH A CAREER IN COMPUTER SCIENCE WOULD HELP CHANGE YOUR MIND?

73% of those not studying computing/computer science did not think a talk from someone in the industry would have helped to change their mind; with only 1% suggesting it would even be likely to do so!

Do you think that hearing a talk from someone with a career in computer science would help change your mind?

Chart Area

1% 6% 19% 52% 21%

■ 1 - unlikely ■ 2 ■ 3 ■ 4 ■ 5-likely
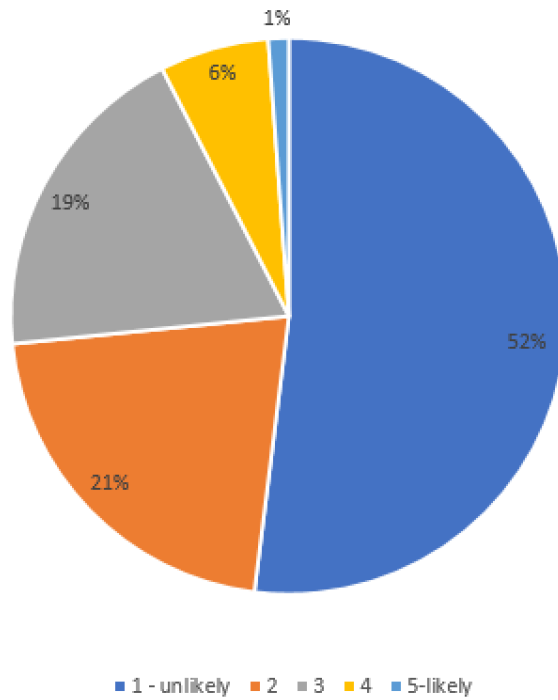
APPENDIX

QUESTIONS

- Are you female?
    - Yes
    - No
    - Would rather not say
- Tick your age
    - 14
    - 15
    - 16
    - 17
    - 18
    - Other
- Are you studying GCSE or A-Level Computer Science?

FOR COMPUTER SCIENCE STUDENTS

- Check the types of toys / games / activities that you enjoyed playing with the most as a young child:
    - action figures
    - role play
    - arts and crafts
    - computer games
    - cars
    - mechanics
    - experiments
    - cooking/baking
    - building sets
    - dolls

- board games

- electronic toys

- soft toys (teddy bears)

- outdoors - playground games

- outdoors - forest school activities (bush craft)

- outdoors - team sports

- other

- Do you have a parent, guardian or family member in a Computer Science career?

  - Yes

  - No

  - I am note sure

- Rate your subject knowledge in Computing

  - scale of 1 (poor) to 5 (outstanding)

- What factor made you decide on Computer Science as a way forward (be honest)?

  - I am interested in the subject

  - I needed to pick an extra subject

  - I needed this qualification for further study

  - My parents / guardians said that it would be a good idea

  - My close friend was taking the subject as well and this influenced my decision

  - Other

- If you are looking at computing as a career, which career from the list below would suit you best?

  - Software development

  - Data analyst

  - Web developer

  - IT consultant

  - IT network manager

  - Teacher

- – User Experience Design (front end developer)

- – Entrepreneur

- – Inventor

- – IT Sales

- – Product Manager

- – I don't know yet

- – Other

- Do you have a feel for the number of job types there are in the computing world?

  - – Yes

  - – No

  - – Maybe

- Look at the skills below and decide how important they are for a computer scientist, on a range of 0 (not required) to 6 (essential):

  - – Mathematics

  - – Writing skills

  - – Body Language Analysis

  - – Sense of Humour

  - – Lateral Thinking (challenging convention where necessary; considering the ridiculous)

  - – 'Situational Analysis ("what is the REAL problem here?" skill)

  - – People Skills

  - – Persistence

  - – Project Management

  - – Time Management

  - – Electronics Knowledge

  - – Web/Internet skills

- Given the shortage of computing skills in the UK and elsewhere, what methods do you think might persuade the "reluctant computer people" to study the subject?

- Have you spoken about CS to someone who is actively avoiding it as a subject?
    - Yes
    - No

- If you answered YES to the previous question. What did you say to them?

FOR NON-COMPUTER SCIENCE STUDENTS

- In your own words…why did you decide to not study Computer Science?

- Did any of these options contribute to your decision to not study Computer Science? Select all that apply or leave blank.
    - School didn't offer it
    - I wasn't interested
    - I wasn't good at it/didn't feel confident with the subject
    - Lack of maths attainment
    - I think the subject is "nerdy"
    - It didn't fit with my subject option blocks
    - I didn't like the teacher
    - Other

- Check the types of toys / games / activities that you enjoyed playing with the most as a young child:
    - action figures
    - role play
    - arts and crafts
    - computer games
    - cars
    - mechanics
    - experiments

- – cooking/baking

- – building sets

- – dolls

- – board games

- – electronic toys

- – soft toys (teddy bears)

- – outdoors - playground games

- – outdoors - forest school activities (bush craft)

- – outdoors - team sports

- – other

- Do you have a parent, guardian or family member in a Computer Science career?

    - – Yes

    - – No

    - – I am not sure

- Rate your subject knowledge in Computing

    - – scale of 1 (poor) to 5 (outstanding)

- Look at the skills below and decide how important they are for a computer scientist, on a range of 0 (not required) to 6 (essential):

    - – Mathematics

    - – Writing skills

    - – Body Language Analysis

    - – Sense of Humour

    - – Lateral Thinking (challenging convention where necessary; considering the ridiculous)

    - – 'Situational Analysis ("what is the REAL problem here?" skill)

    - – People Skills

    - – Persistence

- Project Management

- Time Management

- Electronics Knowledge

- Web/Internet skills

• Did you ever consider Computer Science as a subject to study?

- Yes

- No

• Have you ever carried out any computer science related activities?

- Yes and it made me LESS interested in the subject

- Yes and it made me MORE interested in the subject

- Yes and it didn't change my mind about the subject

- Other

• Are you familiar with the topics offered in computing courses at your level?

- Yes

- No

• Which Computer Science career would you consider to be the most important for the UK's future economy?

- Software development

- Data analyst

- Web developer

- IT consultant

- IT network manager

- Teacher

- User Experience Design (front end developer)

- Entrepreneur

- Inventor

- IT Sales

- Product Manager

- I don't know

- Other

- Do you think that hearing a talk from someone with a career in computer science would help change your mind?

  - scale of 1 (very unlikely) to 5 (highly likely)