

Findings about students' resources and impact

This survey presents our findings on the role of the internet in programming, and we would appreciate your feedback. This survey is anonymous and contains five sections with 54 Likert-scale questions, eight multiple choices questions, and one free text question. It takes approximately 10-15 minutes to complete.

The first section contains the demographic questions. Then, we summarize the findings of our interviews in the following sections: the choices of resources in the second section, the experience with the Stack Overflow in the third section, the use of online code in the fourth section, and the perceived memory impacts in the final section.

Section 1: Your Demographics

- 1. In which year you were born?**
- 2. What is your gender?**
 - a. Woman
 - b. Man
 - c. Non-binary
 - d. Prefer not to disclose
 - e. Prefer to self-describe
- 3. What is your current year of study?**
 - a. Undergraduate-Year 1.
 - b. Undergraduate-Year 2.
 - c. Undergraduate-Year 3.
 - d. Undergraduate-Year 4 (Integrated MSc).
- 4. Which university you are studying at? (Choose from a list of UK Universities)**
- 5. Which of the following best describes your programming experience before starting your degree program? (Multiple answers allowed)**
 - a. Hobby programmer.
 - b. Completed programming internship.
 - c. Casual employment in a programming-related role (including voluntary or charity work).
 - d. Full time employment in a programming-related role.
 - e. Prior study of computer science for a qualification.
 - f. No prior programming experience.
- 6. When did you write your first line of code (in any programming language)?**
 - a. Less than 1 year ago.
 - b. At least 1, but less than 2 years ago.
 - c. At least 2, but less than 3 years ago.
 - d. At least 3, but less than 5 years ago.
 - e. 5-9 years ago.
 - f. 10-14 years ago.
 - g. 15-19 years ago.
 - h. 20+ years ago.
- 7. In which programming language would you consider yourself to be most proficient? (open-ended question)**

8. When did you write your first line of code in the language with which you are most proficient?

- a. Less than 1 year ago.
- b. At least 1, but less than 2 years ago.
- c. At least 2, but less than 3 years ago.
- d. At least 3, but less than 5 years ago.
- e. 5-9 years ago.
- f. 10-14 years ago.
- g. 15-19 years ago.
- h. 20+ years ago.

9. How would you describe your competency in the language with which you are most proficient?

- a. Beginner.
- b. Between Beginner and Intermediate.
- c. Intermediate.
- d. Between Intermediate and Expert.
- e. Expert.

Section 2: Resources You Use When Programming

From our interviews, we found multiple resources used by the programmers and want to check it apply to you. It includes online and non-online resources.

10. Which of the following resources do you use when programming? (Choices are: Frequently / Occasionally / Rarely or Never)

- a. Books.
- b. Websites.
- c. Friends / Colleagues.
- d. Course tutors.
- e. Existing codebases (code you have written or worked with in the past).

11. Which of the following websites do you use when programming? (Choices are: Frequently / Occasionally / Rarely or Never)

- a. GitHub.
- b. Quora.
- c. Reddit.
- d. Stack Overflow.
- e. Programming language documentation (e.g. <https://docs.python.org/>, <https://docs.oracle.com/en/java/>).
- f. Tutorial Websites (e.g. <https://www.w3schools.com>, <https://www.geeksforgeeks.org>).

12. How do you access information from these websites when programming? (Choices are: Frequently / Occasionally / Rarely or Never)

- a. I visit the site directly.
- b. I use a search engine with the intention of finding content from a specific website.
- c. I use a search engine and click whichever results look most relevant.

Note: Contingency questions survey-proceed to Section 3 just when the answer to Q11d in Section 2 was frequently or occasionally and skip to the Section 4 if else.

Section 3: Your Experiences of Stack Overflow

The Stack Overflow website was predominant website in our interview research. Questions about the experience when using the website are provided.

13. Comparing to three years ago, I used Stack Overflow

- a. Less than I used to.
- b. More less than I used to.
- c. About the same

14. To what extent do you agree with the following statements about the Stack Overflow website? (Choices are: Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree)

- a. When searching for programming-related concepts on the web, the Stack Overflow website is the most dominant result.
- b. I cannot program without the Stack Overflow website.
- c. I can find what I am looking for on Stack Overflow.
- d. I find it hard to tell if the question and/or answers on Stack Overflow are relevant to my programming tasks.
- e. I prefer to use the most upvoted solutions on the Stack Overflow website.
- f. I take the author's reputation into account when deciding how likely the answer will help.
- g. I can identify poor quality solutions on Stack Overflow because they will have been down voted.
- h. Having multiple different solutions, and others' comments on those solutions, is very helpful to me.
- i. I find that different answers and/or comments conflict with each other.
- j. I am wary when reading unaccepted answers on Stack Overflow website.

Section 4: Your Use of Code Snippets

The use of the websites involves using the online code. These questions carry the behaviours observed in the interview study to gain more in-depth information.

15. How often do you copy and paste a source code snippet from the web?

- a. I do this most days.
- b. I do this at least three times a week.
- c. I do this at least weekly.
- d. I do this at least once a month.
- e. I do this rarely or never.

16. To what extent do you agree with the following statements about the code snippets you find on the web? (Choices are: Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree)

- a. I trust code snippets found on the web.
- b. I copy code snippets to make up for gaps in my experience / knowledge.
- c. I copy code snippets only if I fully understand their contents.
- d. I copy code snippets only if they are consistent with my own code quality standards
- e. Copying and pasting code hinders programmers' understanding and learning
- f. Copying and pasting code from websites reduces code quality.

- g. The majority of online code snippets are of good quality.

17. To what extent have you found the following to be present in code snippets on the web? (Choices are: I have encountered this problem myself / I am aware that this is a problem but have not encountered it myself / I am unaware of or don't think this is a problem)

- a. Outdated code: code that does not work with the current version of a language or library.
- b. Not working: code that does not compile or does not run.
- c. Not commented: undocumented code.
- d. Answers in complex or non-practical way: inefficient or overly complex code (the problem could be solved much more simply another way).
- e. Fragments incomplete code: insufficient or incomplete code.
- f. Dreadful code: code that is difficult or impossible to incorporate into an existing project.
- g. Redundant code.
- h. Code produce unwanted or unexpected outputs: code with extraneous output (e.g. unwanted prints).
- i. Security issues.
- j. Code contains bugs: code with incorrect output (e.g. $5 + 1 = 7$).

Section 5: Memory Questions

We have noticed some perceived impact on the programmers' memory which help developed the following questions.

18. To what extent do you agree with the following statements about human memory when programming? (Choices are: Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree)

- a. Having a good memory is critical to successful programming.
- b. I have a good memory for programming concepts and syntax.
- c. When solving a new programming problem, I am able to remember similar problems I have solved in the past.
- d. It is faster to remember programming-related information than it is to look it up.
- e. I can program non-trivial applications using my memory alone.
- f. Being unable to remember programming concepts bothers me.

19. To what extent do you agree with the following statements about remembering content you find on the web? (Choices are: Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree)

- a. There is no need to try and remember programming concepts because websites are always available.
- b. If I have previously solved a problem using the web, I will be able to solve the same problem in the future without looking up the information again.
- c. If I have previously solved a problem using the web, I will remember where to find the information needed to solve the problem next time.
- d. Looking at programming content on the web confirms what I already know or reminds me of something I had forgotten.

- e. The more I use programming content on the web, the less I remember.
- f. Programming content on the web is for reference not learning.