Comparing student experience in two introductory programming courses

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Goals

In 2016/17, CS introduced a new introductory programming course intended to better support non-cs majors (CPSC 103).

We want to:

- Understand who enrolls in which introductory programming course, from which disciplines, and why they enroll
- compare CPSC 110 and CPSC 103 students' attitudes towards learning CS
- evaluate students' experience and performance in their introductory programming course

Why?

1. Understand similarities and differences of students who enroll in CPSC 103 and 110
2. Contribute to evaluating how well CPSC 103 meets non-major students' needs
3. Help measure success of introductory programming courses
4. Inform revisions to the courses
5. Help students and advisors:
   - determine which introductory programming course would best suit a particular student;
   - put a student's experience in that course into context

Course designs

CPSC 103 **Introduction to Systematic Program Design**	**CPSC 110** **Computation, Programs and Programming**
Designed for non-majors	Required for CS Majors
3 credits; no pre-requisites	4 credits; no pre-requisites
W2016/17 Enrolment: 204 students 2 sections (pilot-size)	W2016/17 Enrolment: 1381 students 9 sections
Intended to be widely accessible Taught using Python	Intended to be widely accessible Taught using student languages (BSL, ISL, ASL)
1.5 hour lecture + 1 hour tutorial/week, online course modules, text-based	3 hour lecture + 3 hour lab/week online course modules with videos
Pre-class assessment online Problem Sets Flexible data-analysis project	Pre-class assessment via clickers Problem Sets Graded in-lab exercises

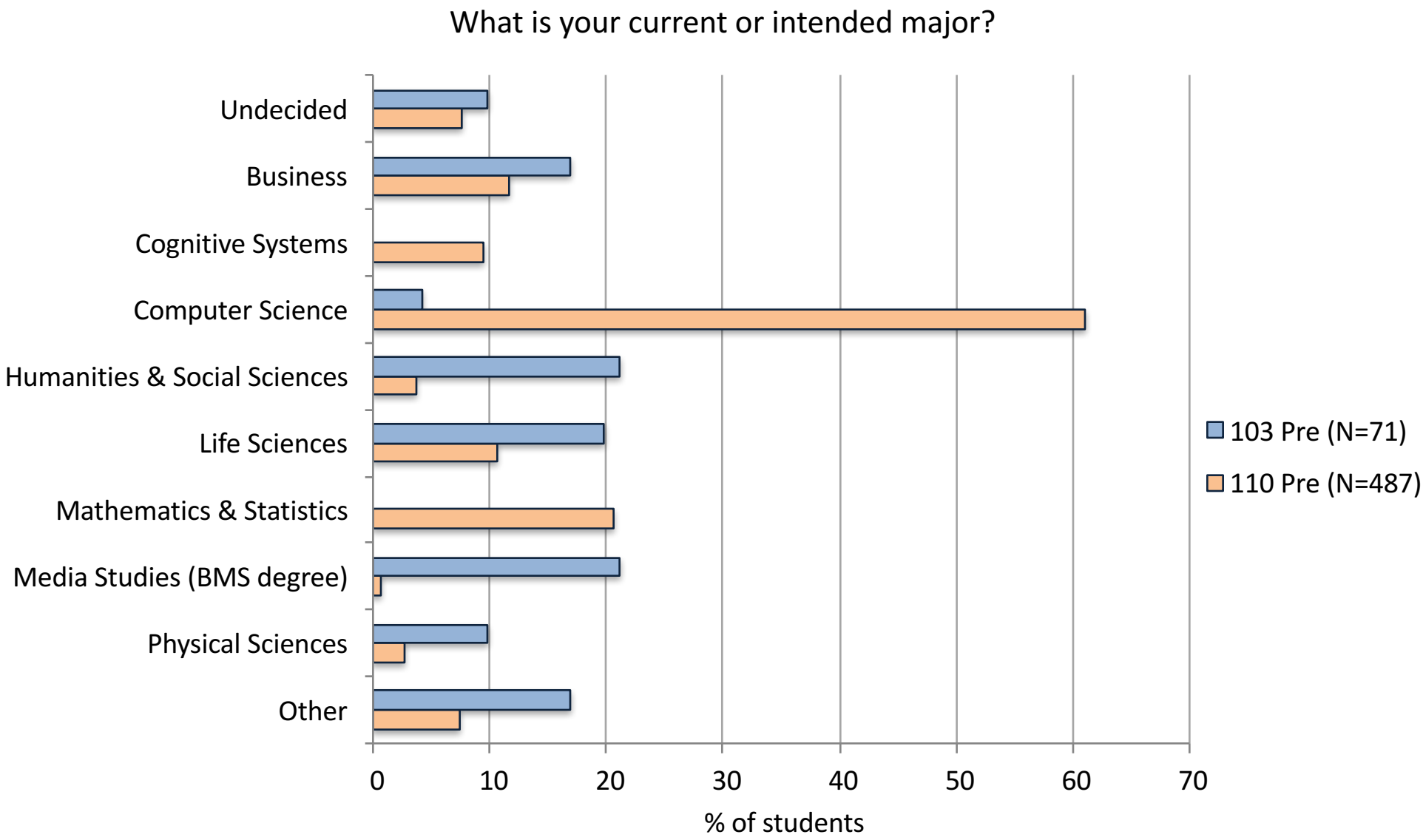
Methods and measures

- Pre- & post-term surveys (2016W1)
  - CPSC 110 & 103
  - Student attitudes towards CS
  - Computing Attitudes Survey

    B. Dorn and A. E. Tew. (2015). Empirical Validation and Application of the Computing Attitudes Survey. *Computer Science Education*, 25(1):1-36.
  - Reasons for taking CS, goals for course
  - Satisfaction with course, perception of developed skills
  - Helpfulness of specific course resources

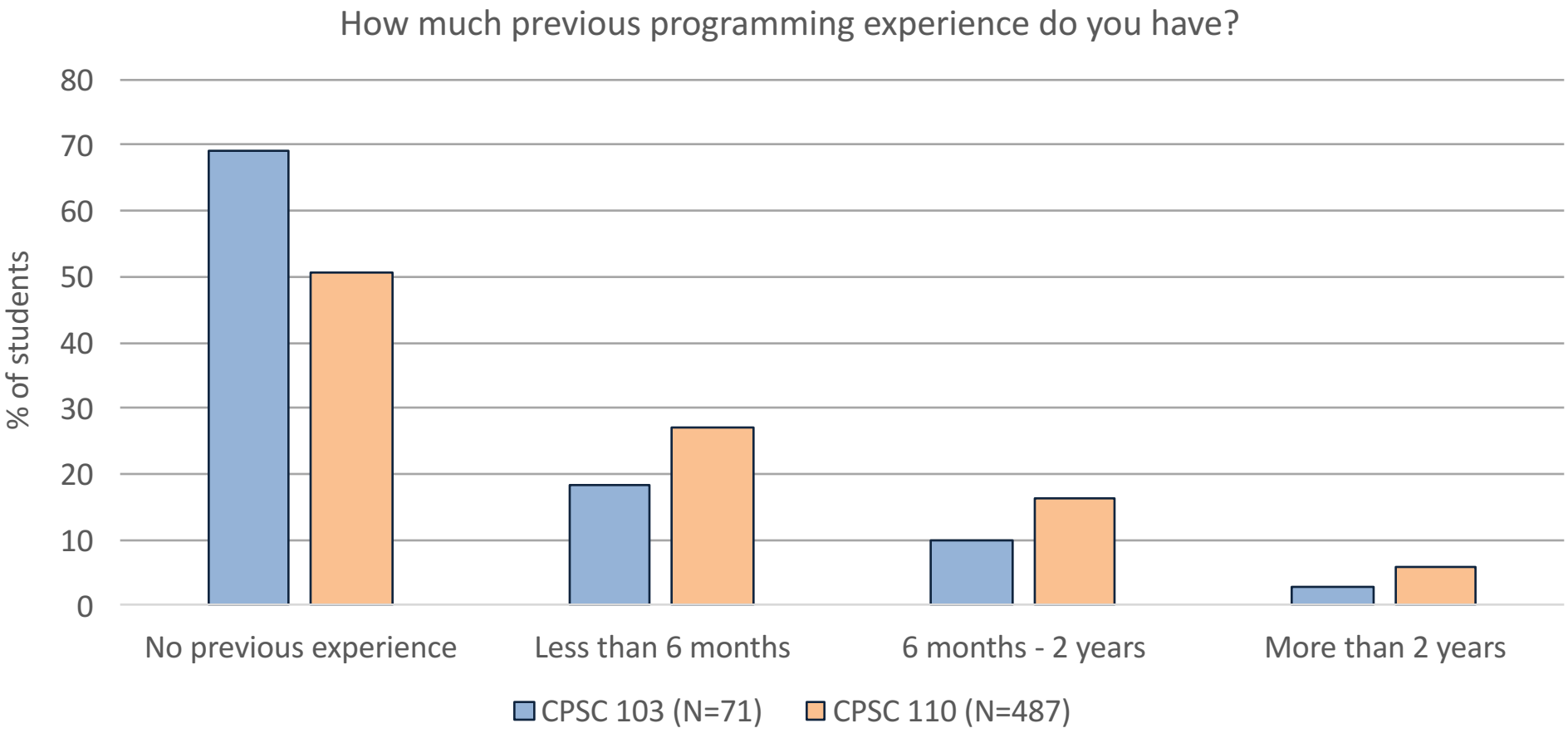
Early results: CPSC 103, 110 (2016W1)

Who are our students? Current or Intended major



Early results: CPSC 103, 110 (2016W1)

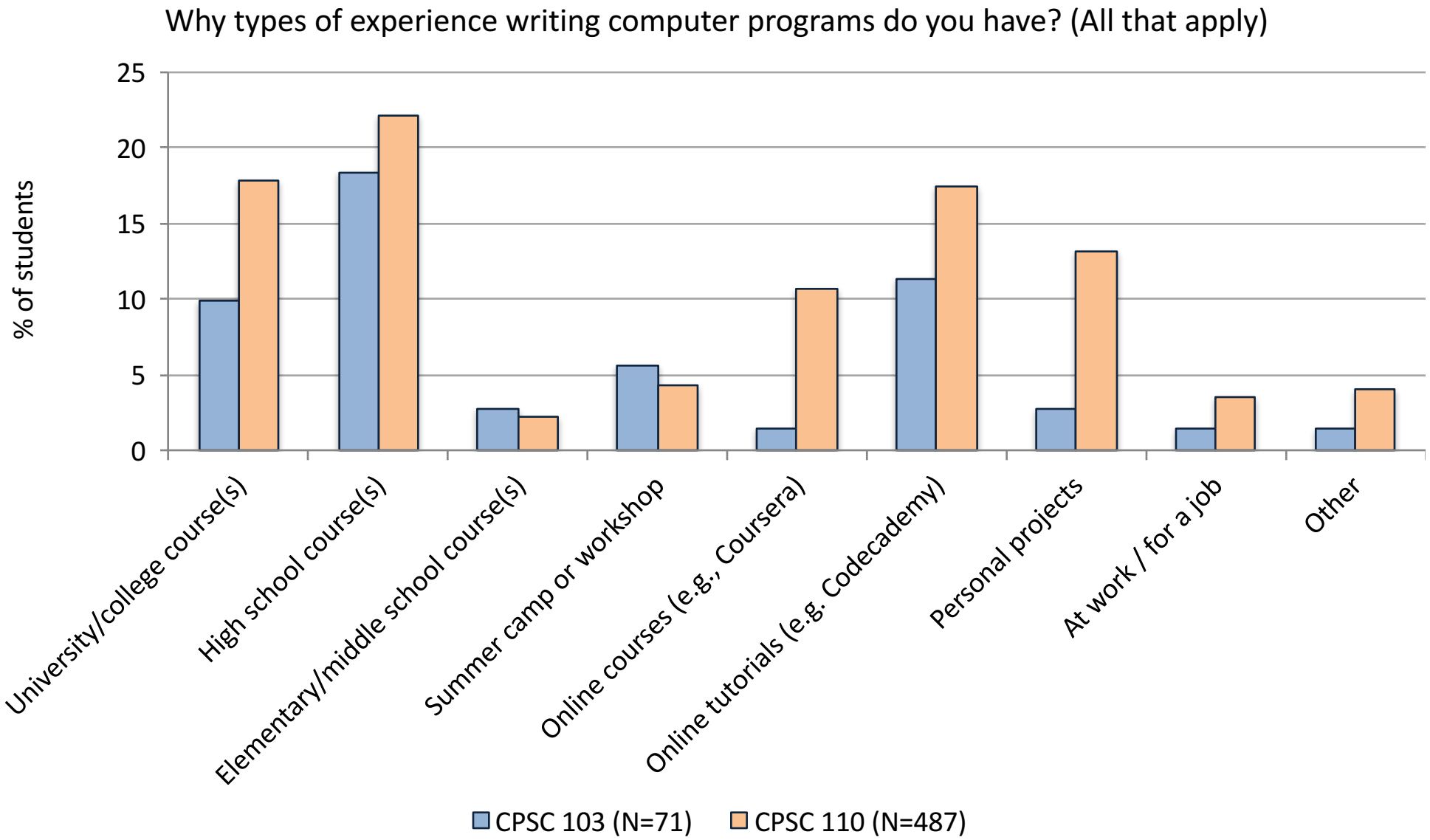
Who are our students? Prior Programming Experience



Over half of students in both 110 and 103 have no experience.
A much larger proportion of 110 students have some experience.

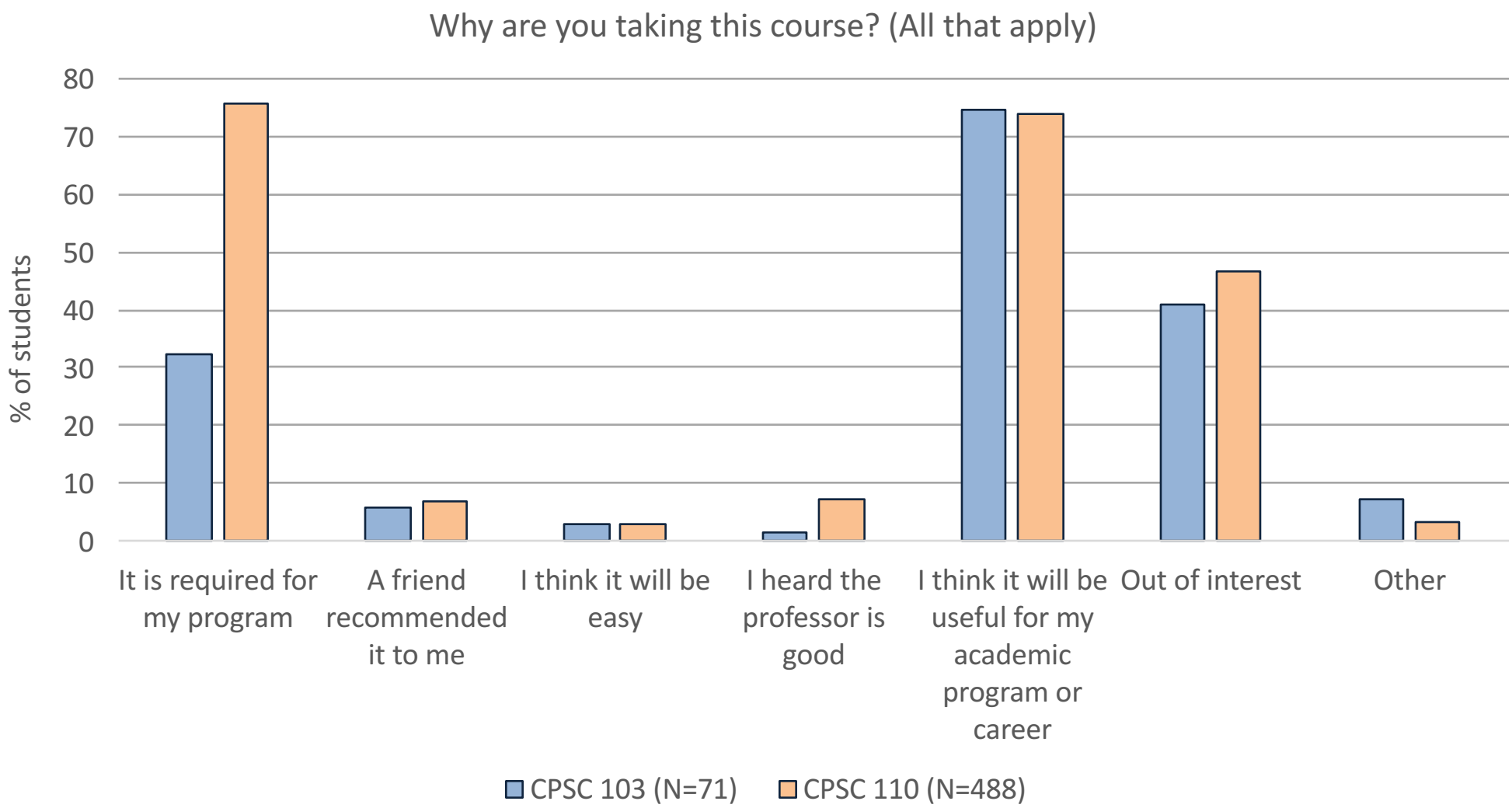
Early results: CPSC 103, 110 (2016W1)

Who are our students? Type of Programming Experience



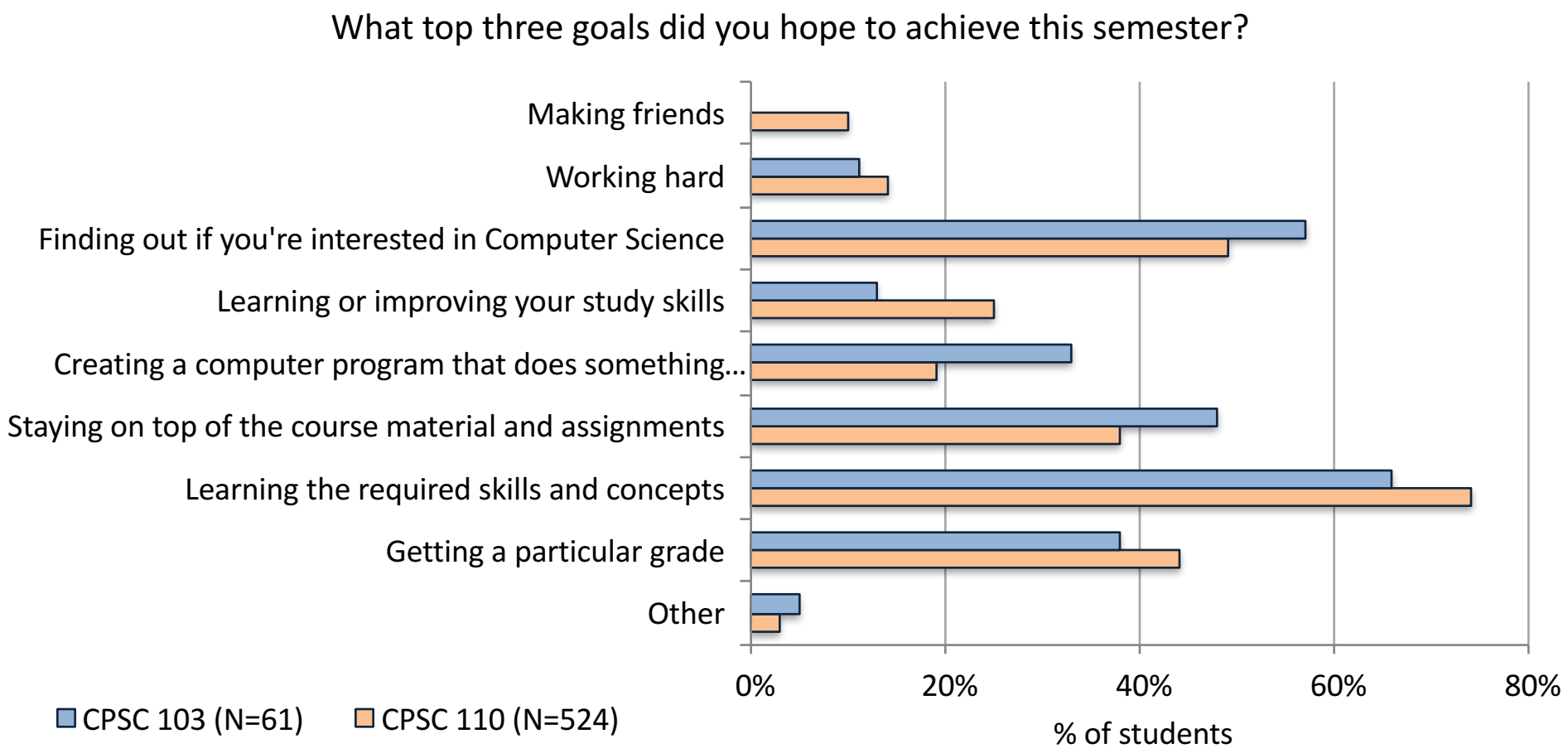
Early results: CPSC 103, 110 (2016W1)

Motivations for taking CPSC 103, 110



Early results: CPSC 103, 110 (2016W1)

Goals students hope to achieve

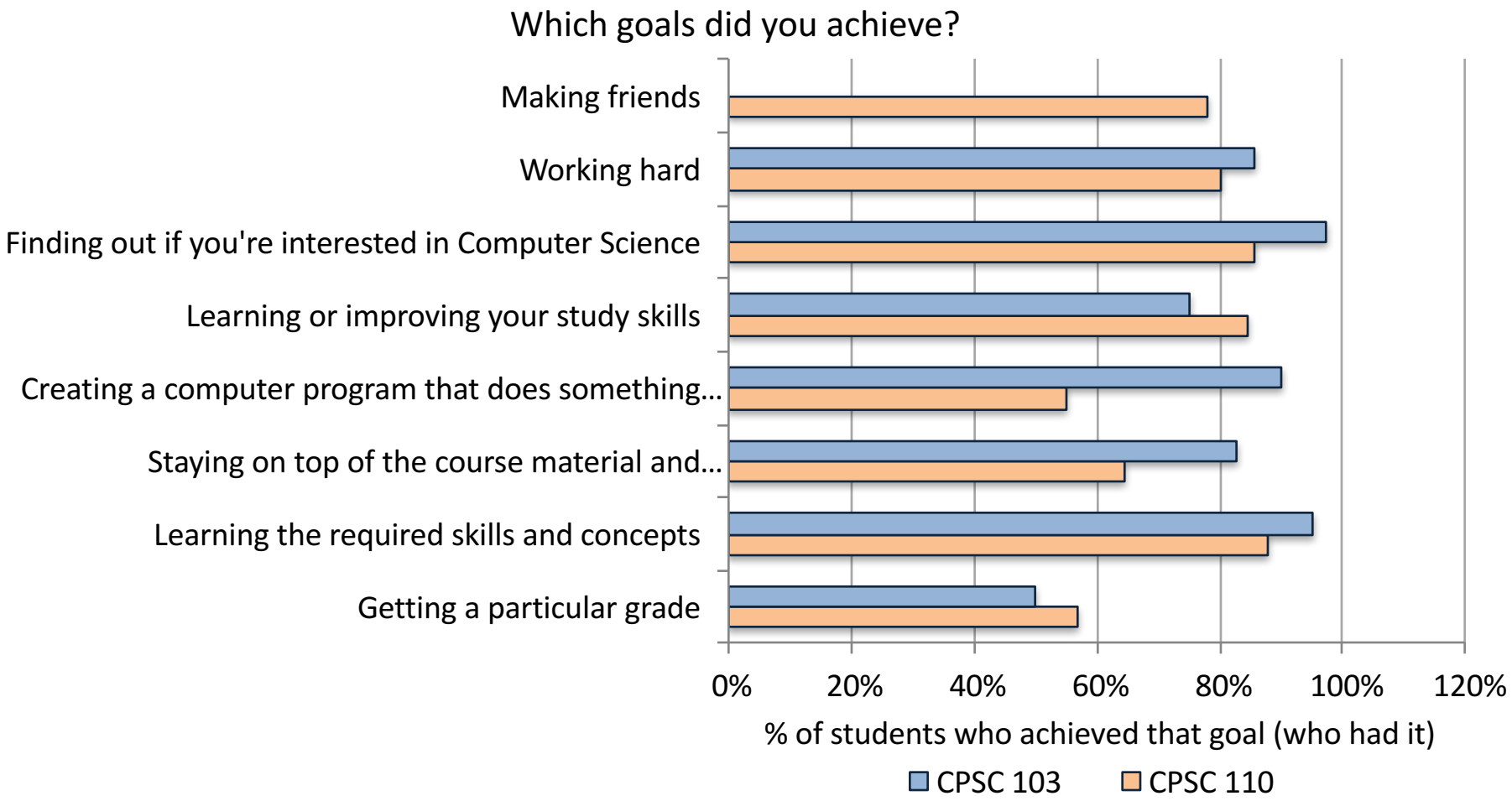


More 103 students wanted to create something useful and stay on top of the material

110 students were more likely to want to achieve a particular grade, make friends, and learn/improve their study skills

Early results: CPSC 103, 110 (2016W1)

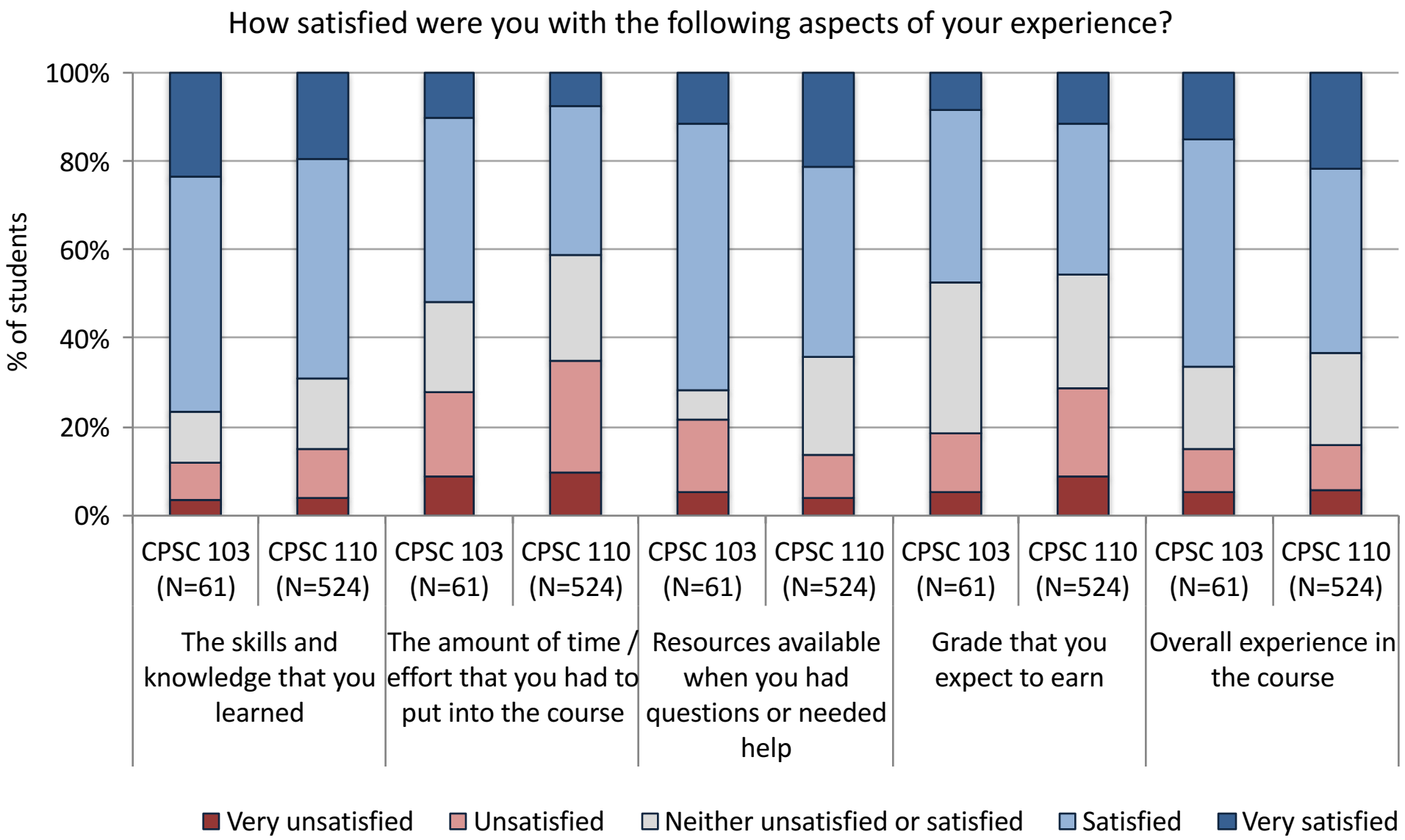
Goals achieved by end of semester



A notably larger proportion of the 103 students who wanted to stay on top of the material / assignments, and to create something useful, achieved those goals

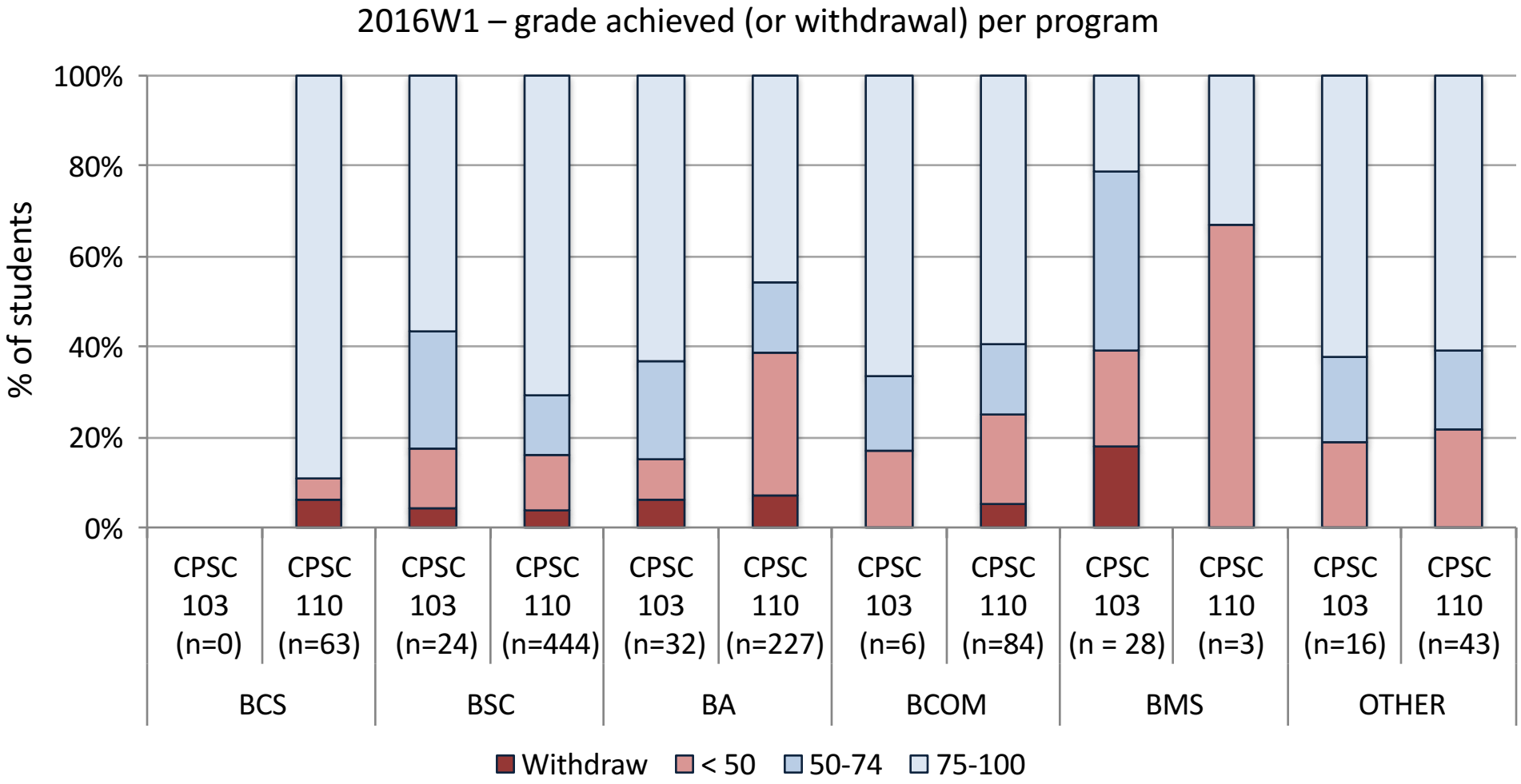
Early results: CPSC 103, 110 (2016W1)

How satisfied are students?



Early results: CPSC 103, 110 (2016W1)

Student outcomes

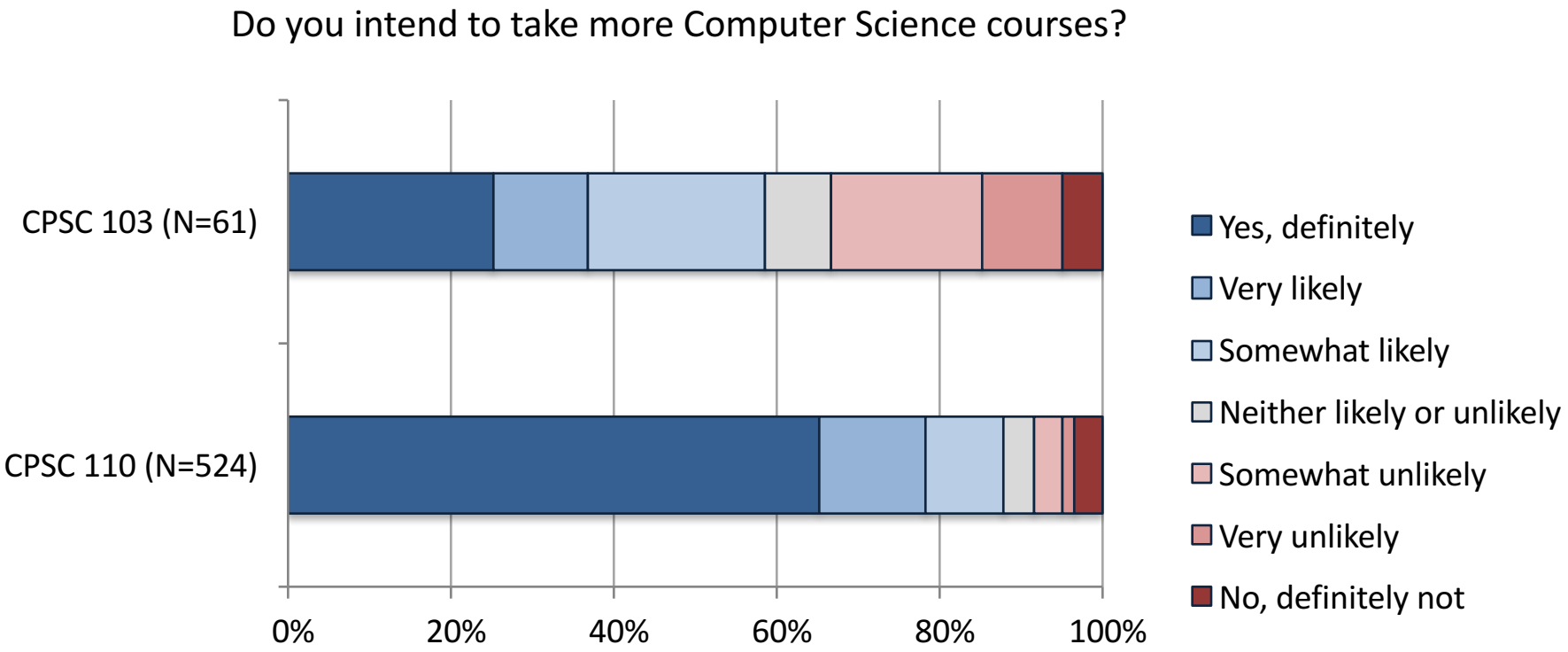


Failure and withdrawal rates for BA students are much lower in CPSC 103, while rates for BSc and BCOM students are similar.

BMS students continue to struggle more than other groups in both courses.

Early results: CPSC 103, 110 (2016W1)

Interest in taking more CS



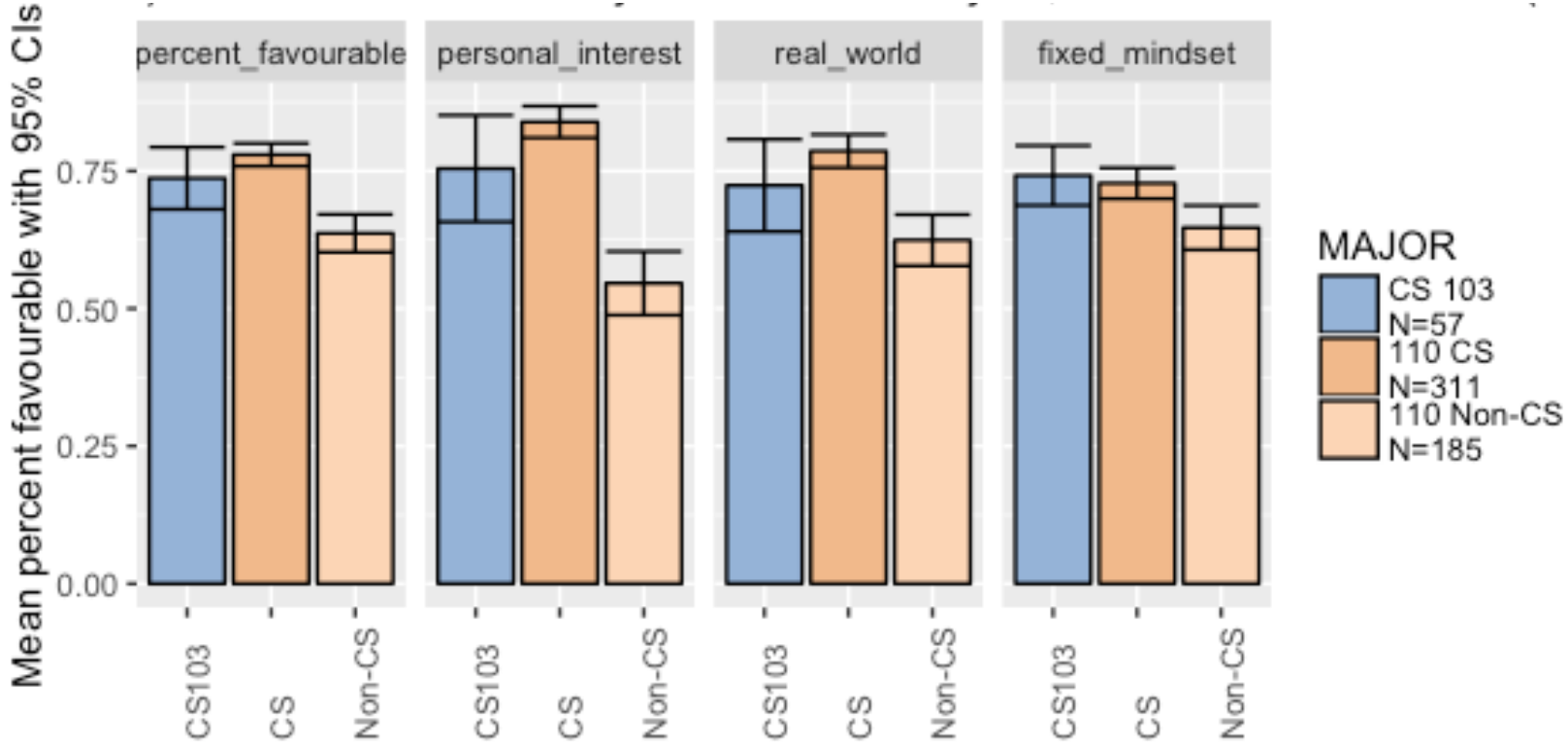
Many 103 students do want to take more CS after completing the course.

We plan to investigate how this breaks down by intended major or degree program.

Early results: CPSC 103, 110 (2016W1)

end-of-term expert attitudes

Agreement with expert-like attitudes on a survey of attitudes towards computing



Measured using a series of questions from the Computing Attitudes Survey[1]

Non-CS majors in CPSC 110 showed much lower expert-like attitudes in their interest towards computing, and on connections between computing and the real world. However, their scores are also appear lower than previous terms – we plan to investigate possible causes for this difference.

1 – Dorn and Tew/ Empirical Validation and application of the Computing Attitudes Survey. *Computer Science Education, 2015.*

Discussion / Next Steps

- Overall, experiences and satisfaction very similar on many measures, despite differences in prior experience
- Non-majors in the BA program in CPSC 103 appear to have better outcomes
  - outcomes for students in most other degree programs more similar between CPSC 110 and CPSC 103
- Next steps in our analysis:
  - investigate how experiences and satisfaction may differ more by major or degree program
  - expand analysis to data currently being collected for this terms' offerings, and from the 2015 offerings of CPSC 110.