

(79.6%) and non-pairing students (78.2%) was not statistically significant. Williams and Kessler have proposed “pair pressure” as a possible explanation for higher completion rates among paired versus unpaired students [8]. According to Williams and Kessler, students who work in pairs may be more likely to complete programming courses because of the shared responsibility that results from collaborative partnerships. As a consequence, paired students may remain in the class for the sake of their partner. Although this is a plausible explanation, it is not supported by this data. The fact that in our study there was no difference in pass rates between pairers who completed the course and non-pairers who completed the course suggests that it was not simply the case that pairers were more likely to “stick it out,” but rather a larger proportion of paired students were able to master enough of the course material to pass.

We followed those students who passed the introductory programming course for one full academic year beyond the intro course. Consequently this analysis was limited to the 321 students still enrolled at UCSC three quarters after taking and passing the intro course.

Among the students intending to pursue a computer science-related major at the start of the introductory programming class, successfully passed the class with a “C” or better, and were still enrolled at UCSC a full year later (N=238; 187 men and 51 women), a significantly higher percentage of the students who had paired had gone on to attempt the subsequent programming course (Introduction to Data Structures) within a year (84.9%), than had the non-pairing students (66.7%). Separate analyses by gender of the effect of pairing on whether the subsequent course was attempted within a year revealed about an 18% difference between pairers and non-pairers for both women and men (73.8% of paired women vs. 55.6% of non-paired women, and 88.0% of paired men vs. 69.4% of unpaired men). The pairing effect was statistically significant for men but not for women. The increase in the percentage of students associated with pairing appears to be quite similar for men and women. The fact that this difference was statistically significant for men but not women is most likely attributable to the relatively small number of women (51 compared to 186 men) in this part of the study.

Among students who attempted the Data Structures course, the students from the pairing sections were more likely to pass on their first attempt (65.5% vs. 40.0%). That is, students who paired in the introductory programming course were more likely to attempt the subsequent programming class and more likely to pass it than those who learned to program independently. This is particularly significant because students in the Data Structures course were required to complete all programming assignments individually. This indicates that there is not a problem with a significant number of weak students passing the introductory course with the help of their

	Female		Male		All	
	Pair	Solo	Pair	Solo	Pair	Solo
% that persisted in the course and took the final	88.1	79.5	91.7	81.5	90.8	80.4
% of students taking the final that passed the class with C or better	74.2	74.2	81.3	79.5	79.6	78.2
% of passers that took the 2nd programming course within 1 year	61.1	50.0	81.2	66.1	76.7	62.2
% of passers that took the 2nd course within 1 year—restricted to those indicating a planned CS related major at start of intro course	73.8	55.6	88.0	69.4	84.9	66.7
% of those taking the 2nd course that passed it on the first attempt	68.3	44.4	64.6	37.5	65.5	40.0
% of passers still at UCSC 1 year later that declared a CS major	46.3	11.1	59.5	41.1	56.9	33.8
% of passers still at UCSC 1 year later that declared a CS major—restricted to those indicating a planned CS related major at start of intro course	59.5	22.2	74.0	47.2	70.8	42.2

Shaded numbers indicate statistically significant differences.

Comparison of completion rates, pass rates, and persistence in the major.

partner, only to fail in the next course where they must program alone. The difference in pass rates between pair and non-pair students was similar for men (64.6% vs. 37.5%) and women (68.3% vs. 44.4%), although for the women the difference was not statistically significant.

Among the students initially intending a computer science major, and who passed the introductory course and remained at UCSC for at least a year, the pairing students were also more likely to have declared a computer science-related major one year after completing the introductory programming class. This was the case for both women and men. Women who paired were more likely than women who worked independently to be in a computer science related major (59.5% vs. 22.2%). Similarly, pairing men were also more likely to have declared a computer science related major one year later than men who worked alone (74% vs. 47.2%).

Interestingly, the same pattern of results was observed among all students who successfully completed the introductory programming course and were still enrolled at UCSC a year later, regardless of whether they had initially been planning to major in one of the computer science-related majors. Pairers