



November 2019

Testing a Content-Neutral Adaptive Learning Platform in Introductory Statistics Courses

Evaluation Findings From Fall 2018

Urban Institute Study Team

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Summary

I. Student Characteristics

II. Impacts on Students

III. Insights from Surveys and Acrobatiq Data

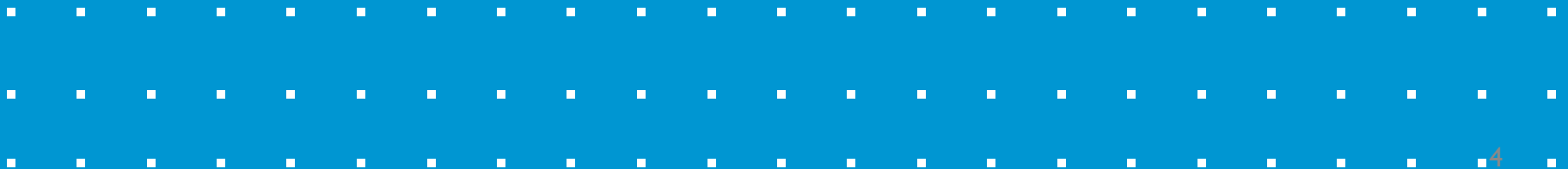
- Student course experience
- Instructors

IV. Appendix

Survey & statistical research methods inform the study

- Quantitative research to describe intervention & estimate impacts
 - Descriptive statistics within & across colleges
 - Multivariate regression
 - Fall 2017: 20 matched pairs, 12 same instructor & 8 different instructors
 - Spring 2018: 27 matched pairs, 20 same instructor & 7 different instructors
 - Fall 2018: No matched pairs
- Survey research
 - Instructor survey (pilot and traditional)
 - Student survey (pilot and traditional)
- IRT analysis of common final assessment

Student Characteristics



Fall 2018 participation

- **5 colleges total**
 - 2-year: 3 colleges
 - 4-year: 2 colleges
- **Students enrolled in study: 1,256 (pilot: 791; Traditional: 465)**

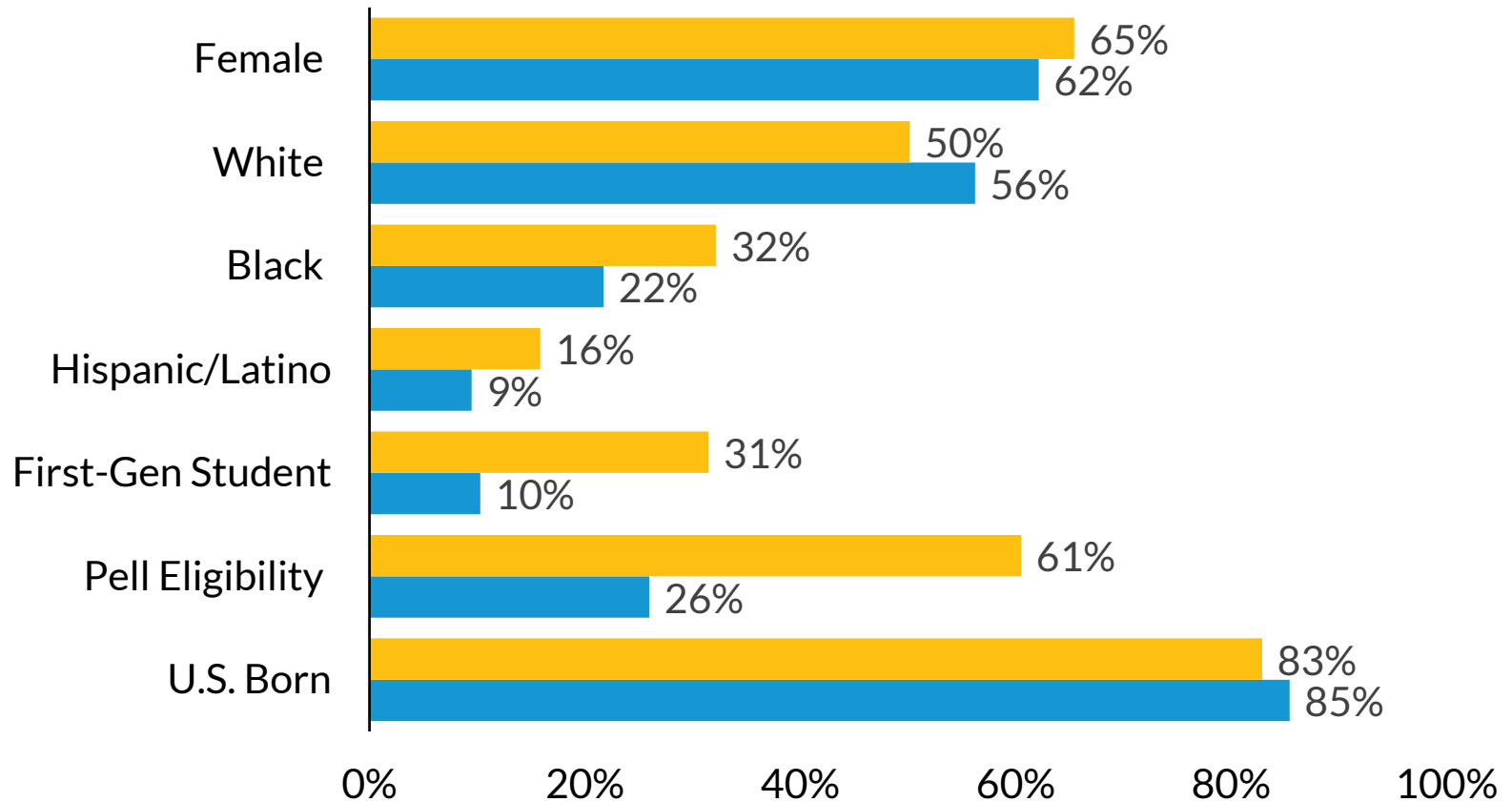
2-year	4-year	All
515	741	1,256

- **27 sections total**
 - Pilot: 20
 - Traditional: 7
- **Participating instructors: 18**

2-year students older; more likely to be first-gen and Pell eligible

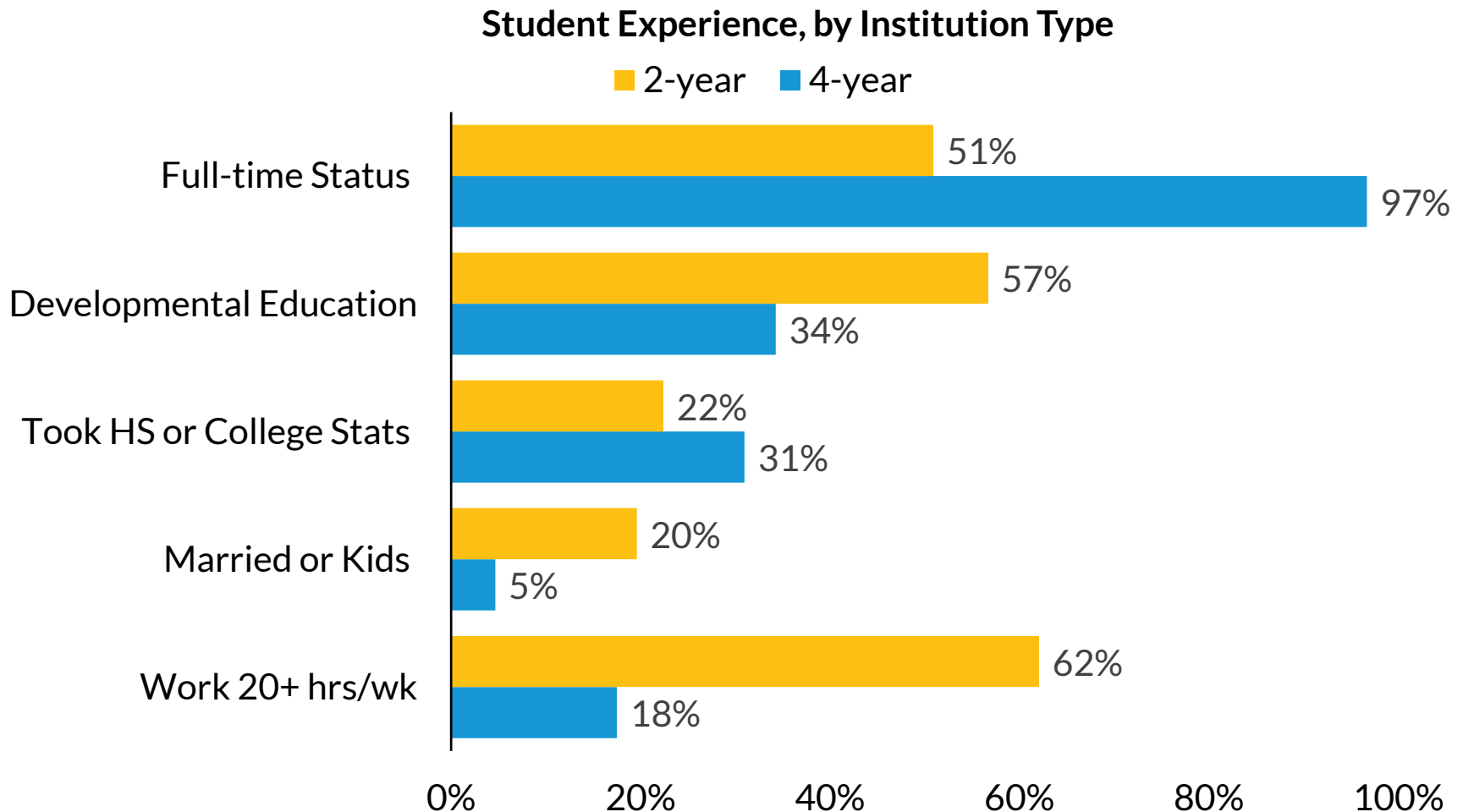
Student Characteristics, by Institution Type

■ 2-year ■ 4-year



Mean Age: 2-year colleges: 24; 4-year colleges: 21

4-year students more likely to go to school full time and have prior stats experience



Impacts on Students

Model

Outcomes

Grade
GPA

C or Better
Not DFW

Statistics
Competency
IRT Ability

Satisfaction
5-Point Scale

Controls

Demographics

Socioeconomic
status

Prior Math and
English
Experience

Prior College
Performance

Enrollment
Status

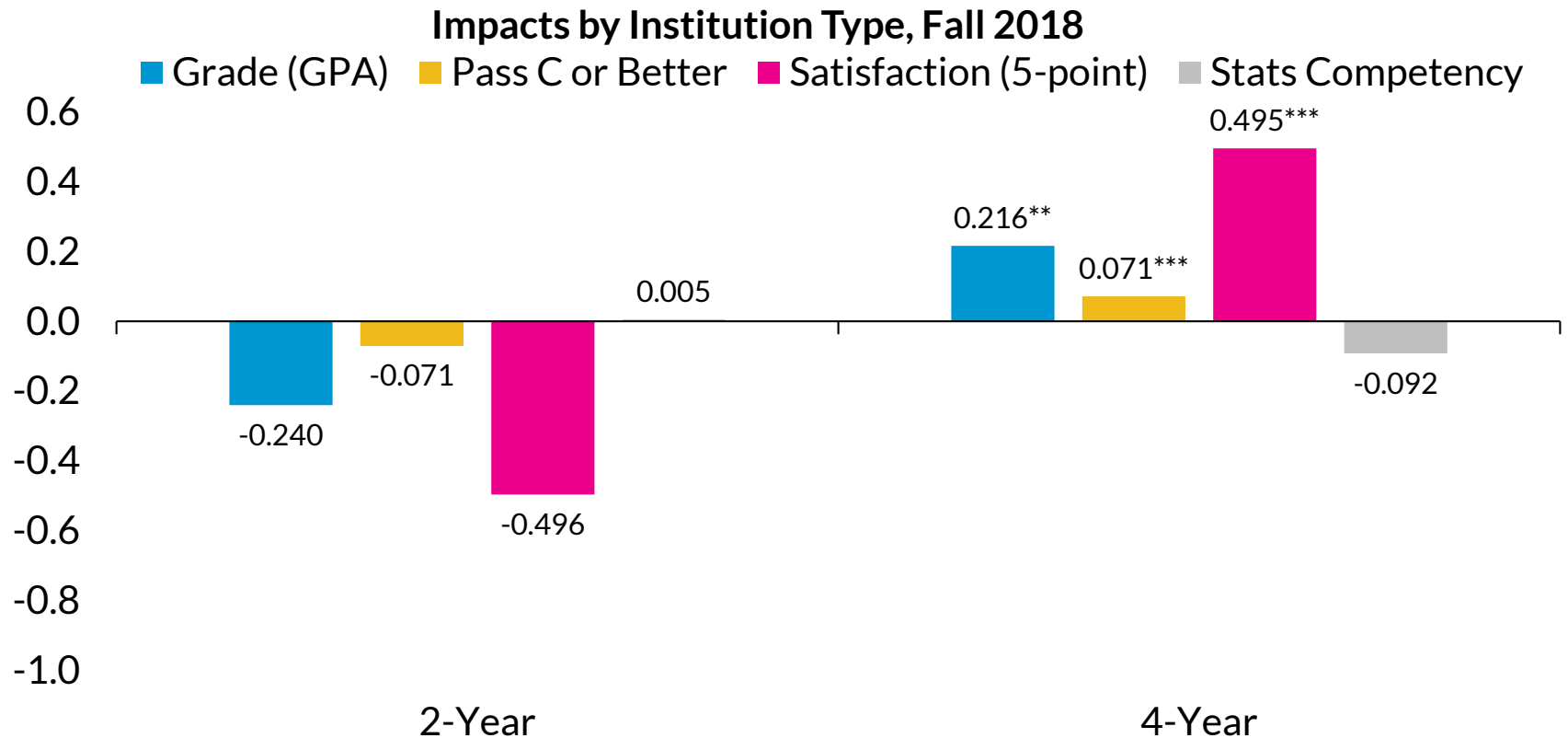
Course
Characteristics

Baseline:
Attitude, Self-
Efficacy, Aptitude

Multivariate Regression Analysis

All institutions equally weighted in pooled analyses

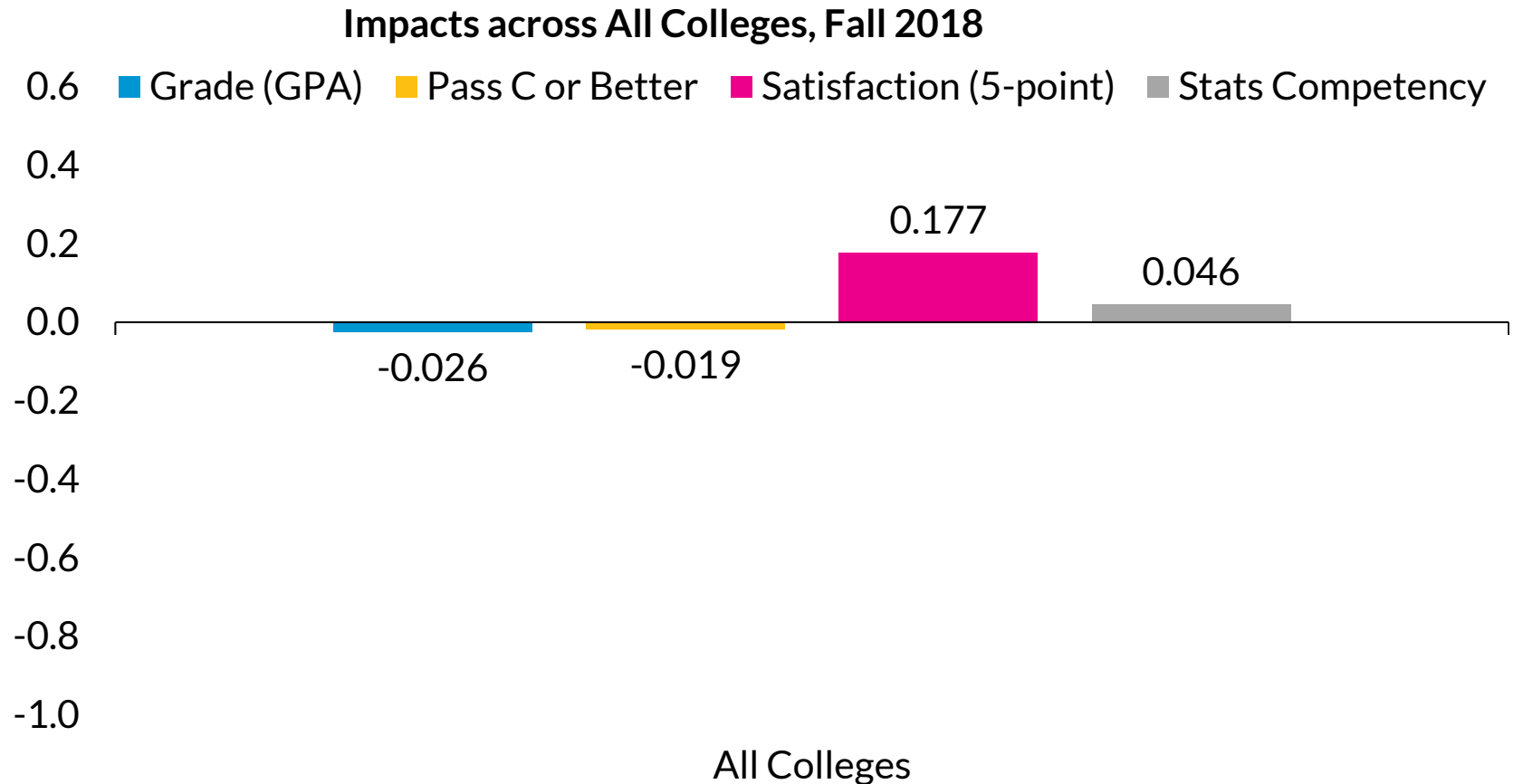
Impacts for grade, pass with C or better, and satisfaction are only positive at 4-year colleges; the story is mostly neutral at 2-year colleges



Scales: GPA points for *Grade*; percentage points of probability for *C or Better*; std. dev. from the mean for *Statistics Competency*; points out of 5 for *Satisfaction*

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

Fully aggregated impacts are not significant

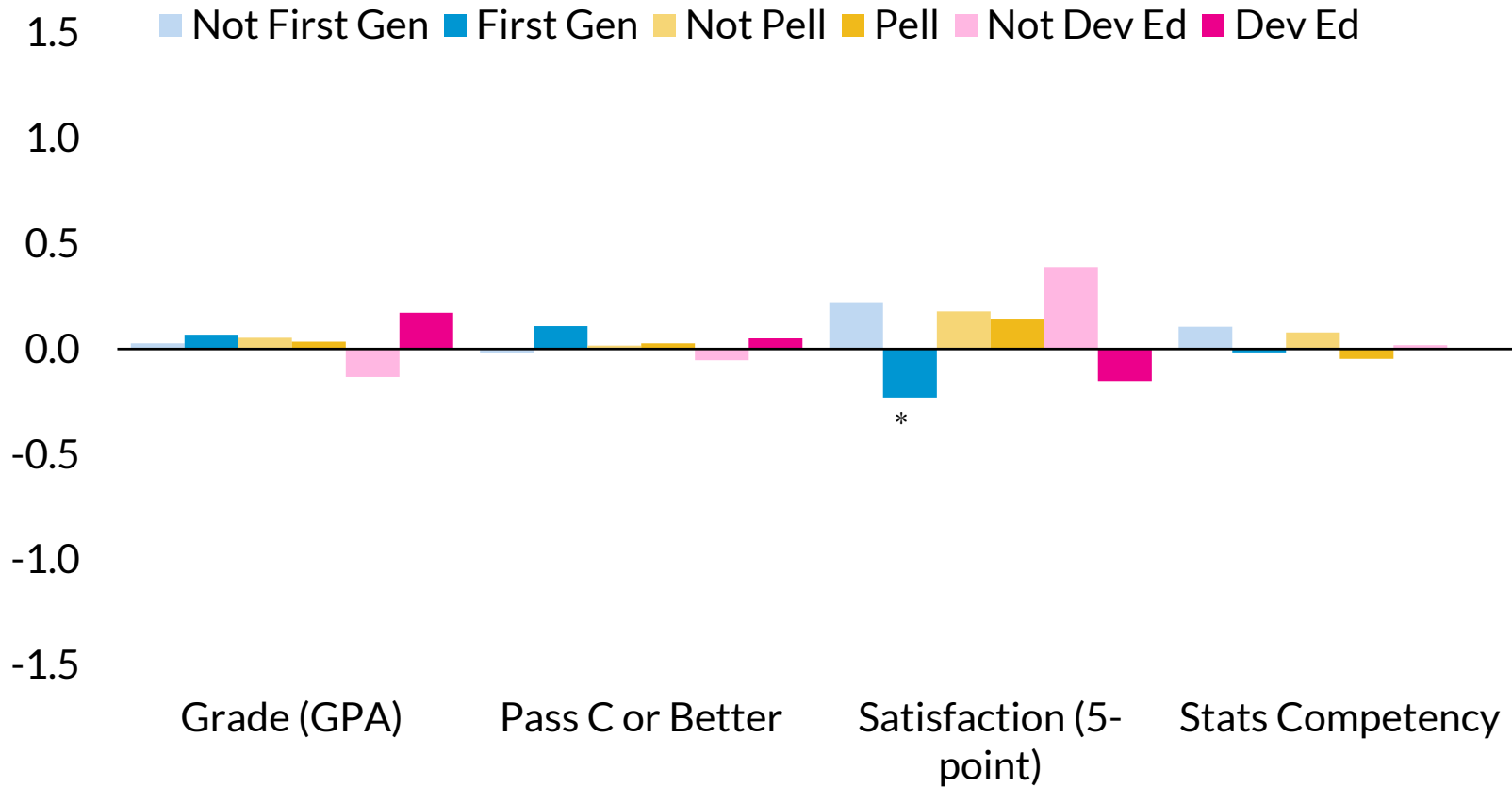


Scales: GPA points for *Grade*; percentage points of probability for *C or Better*; std. dev. from the mean for *Statistics Competency*; points out of 5 for *Satisfaction*

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

Across all colleges, students in key subgroups who may be less prepared are not harmed by participating, but first gen students are less satisfied

Impacts on Key Subgroups across All Colleges, Fall 2018



Scales: GPA points for *Grade*; percentage points of probability for *C or Better*; std. dev. from the mean for *Statistics Competency*; points out of 5 for *Satisfaction*

Note: Asterisks represent significant differences in impact estimates across subgroups (e.g., “not first gen” compared with “first gen”). * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

Components of satisfaction differ by institution type

Component	All	2-Year	4-Year
Satisfaction with Tool	-	-	-
Quality of Instruction	++***	+	+***
Instructor Availability	+**	+	+
Activities Were Engaging	++***	+	+**
Activities Helped Comprehension	+	-	+
Amount Learned	-	-	+***
Difficulty of Course (neg. attribute)	-	+	--***
Interest in Subject	+	--	++***
Future Math Classes	+**	+	+**

* p<0.10 ** p<0.05 ***p<0.01 One symbol represents direction of impact estimate, each additional (+) or (-) symbol represents a magnitude of 0.33-point impact on a five-point scale.

Insights from Surveys and Acrobatiq Data

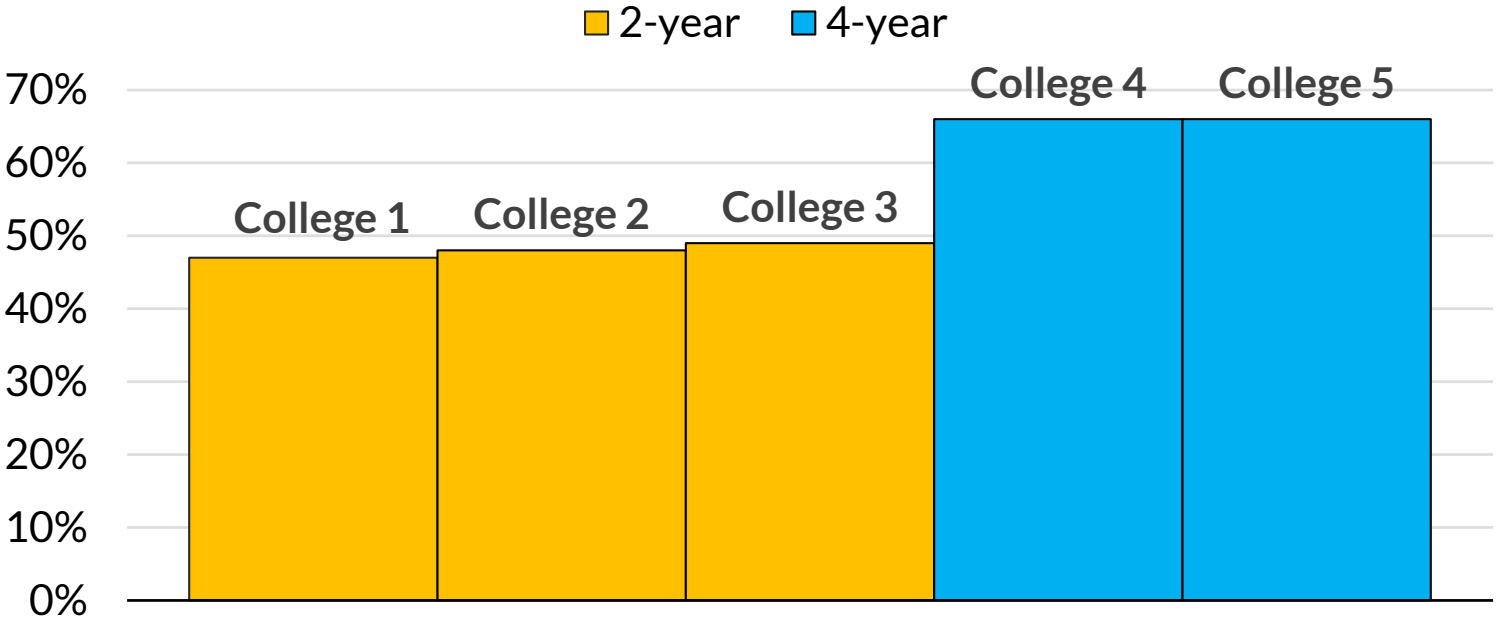
Student Course Experience

2-year college students reported more hours spent outside of class regardless of treatment status and pedagogy type; 3 hours more than peers in pilot sections

Fall 2018	Flipped Class	Partially Flipped Class	Not Flipped Class
Pilot students at 2-year institutions	8	6	--
Traditional students at 2-year institutions	6	--	4
Pilot students at 4-year institutions	5	--	--
Traditional students at 4-year institutions	4.5	4	--

Overall, 4-year college students completed 18% more activities in the Acrobatiq tool on average, compared to peers at 2-year colleges

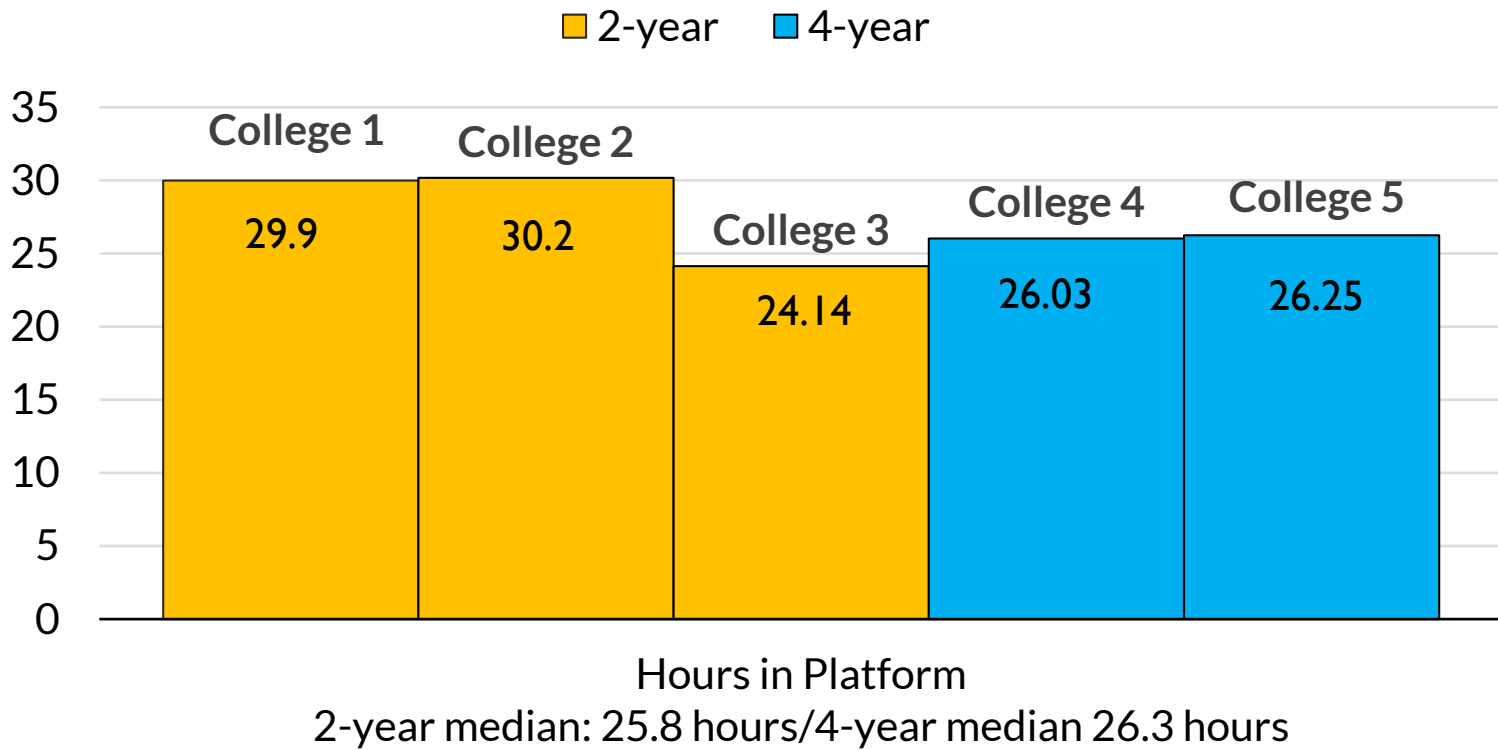
Student Engagement with Acrobatiq by College (medians)



Percent Activities Completed
2-year median: 48%/4-year median: 66%

However, median hours spent in Acrobatiq tool at MC and CCBC higher than UMBC and UMCP

Student Engagement with Acrobatiq by College (medians)



2-year subgroups follow a similar pattern, with more hours spent in the tool and lower percent activities completed

2-year Institutions	Hours in tool	Percent activities completed
Pell Eligible	31.4	47%***
Not Pell Eligible	31.1	46%***
Dev Ed	32.2	46%
No Dev Ed	29.6	48%
First Gen	34.6	50%
Not First Gen	29.9	47%

4-year Institutions	Hours in tool	Percent activities completed
Pell Eligible	29.4	55%***
Not Pell Eligible	29.0	62%***
Dev Ed	27.5	61%
No Dev Ed	31.9	60%
First Gen	27.4	55%
Not First Gen	29.2	61%

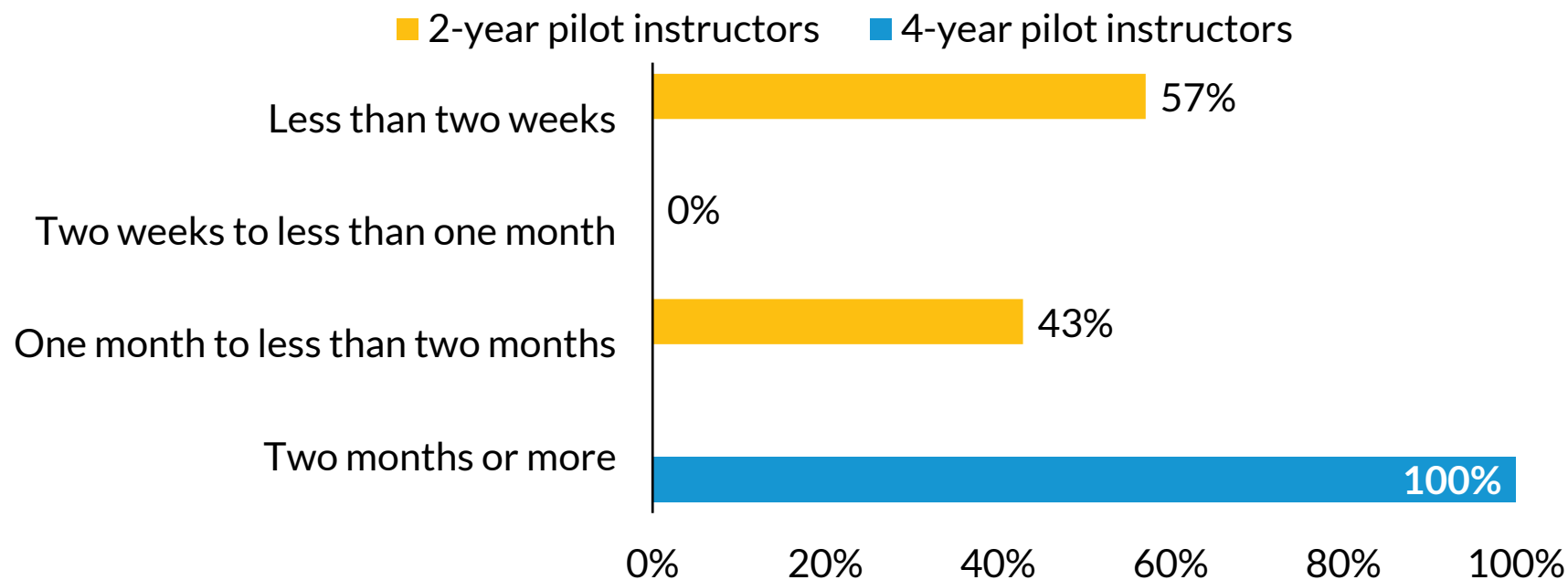
* p<0.10 ** p<0.05 ***p<0.01

Instructors

Time to prep for ALiS pilot course

Instructor-reported hours spent engaging with course curriculum or preparing materials to align with the textbook	Pilot instructors	Traditional instructors
Average prep time before the start of the semester, in hours	34.75	23.57

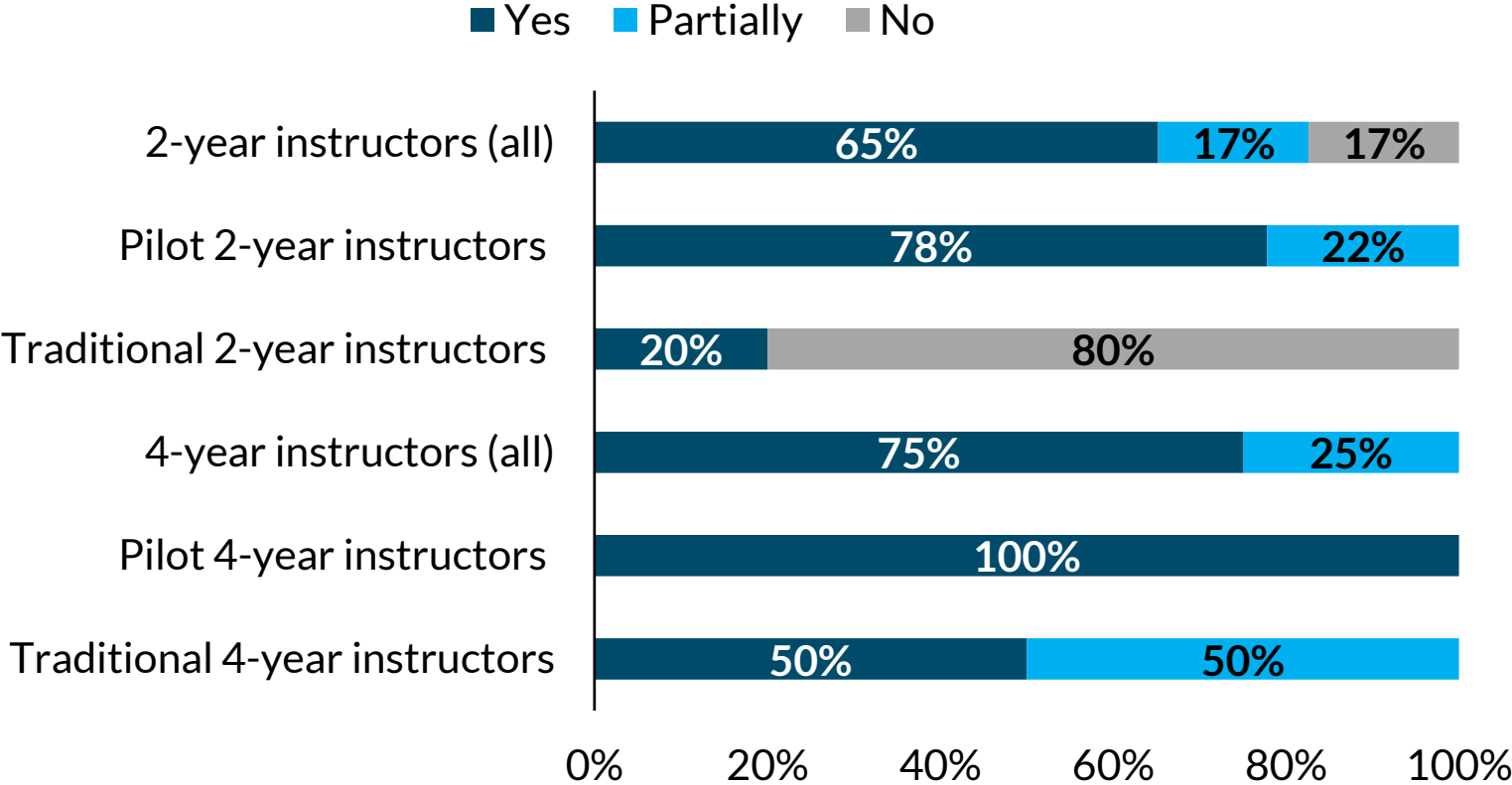
Pilot instructor reported time to prep for course prior to start of semester



Note: Pilot instructor-reported time to prep is asked of new instructors to the ALiS course only

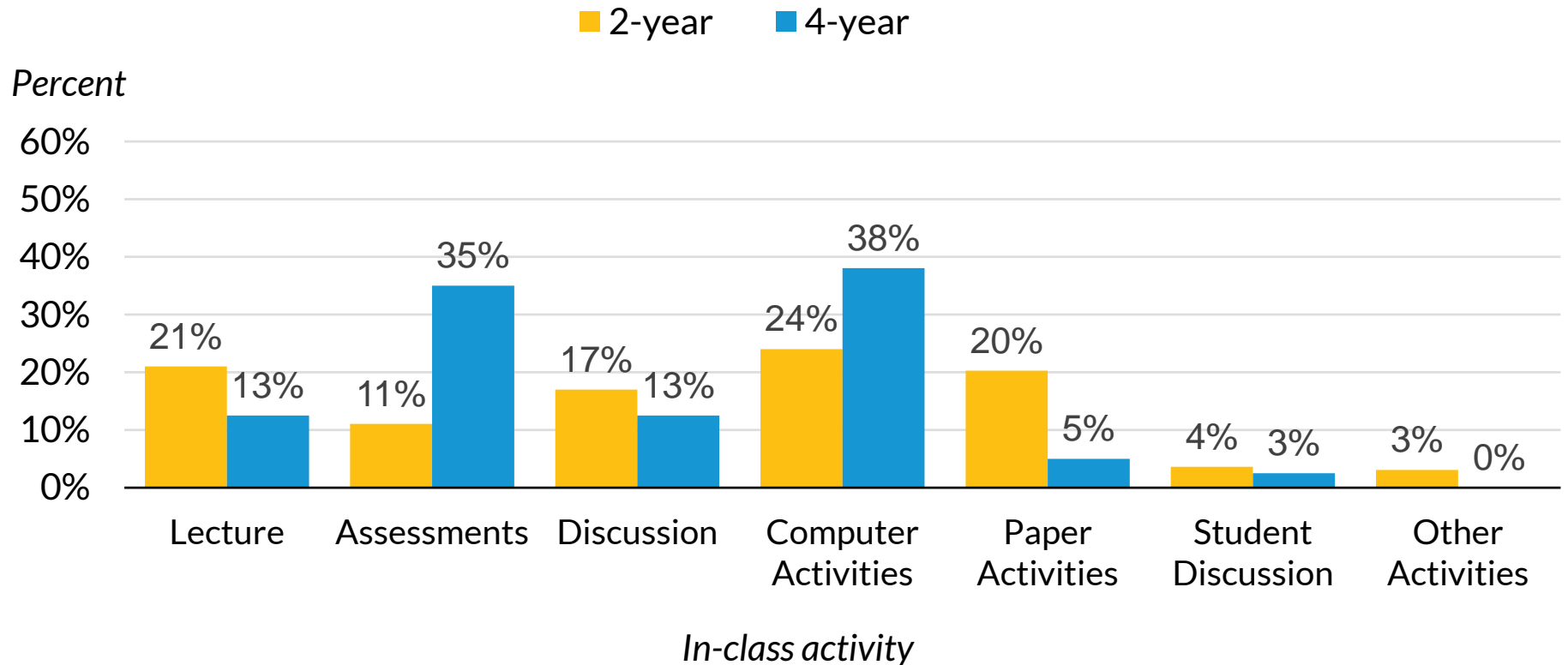
Pilot instructors more likely to utilize flipped classroom across both 2 and 4-year colleges

Use of flipped classroom pedagogy in Fall 2018, by treatment status and institution type



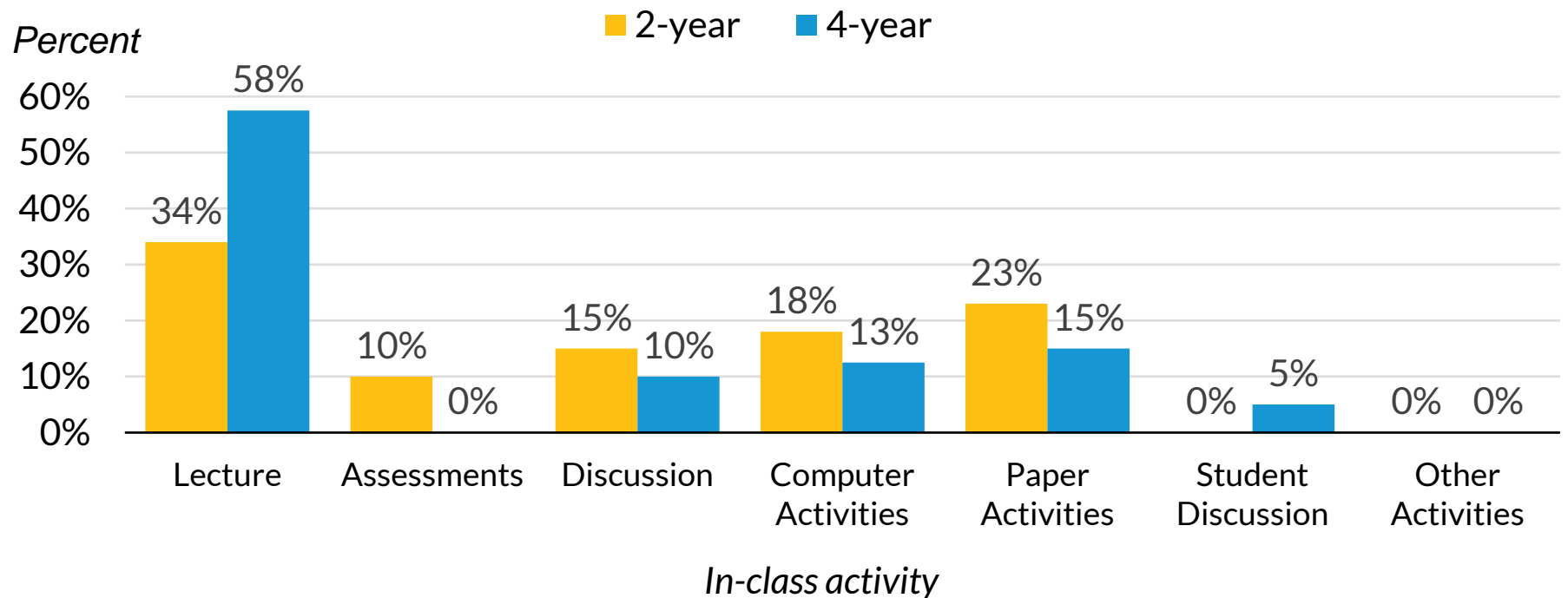
In-class time varies considerably by institution type, with 4-year college instructors using more in-class time for computer activities and assessments

Instructor-reported percentage of in-class time spent on activities in pilot sections, by institution type



There is more lecture, less discussion, and less assessment in traditional sections when compared to pilot sections (see previous slide), though differences by institution type remain

Instructor-reported percentage of in-class time spent on activities in traditional sections, by institution type



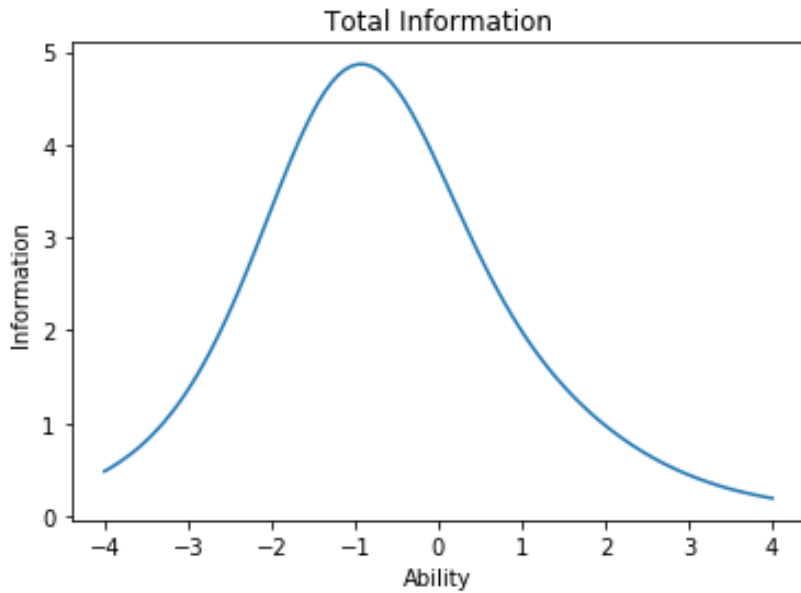
Instructor Survey Reflections

- **Some instructors felt there may be more meaningful interaction and engagement with statistics** via participation in the pilot course
- **Pilot instructors had positive things to say about the CCG**, but not all seemed to take advantage of it as a resource
- **Student willingness to participate** remains a problem for students who do not wish to learn statistics in a flipped classroom setting
- **Reading comprehension and reading speed** remain a concern for instructors in the pilot course; some instructors said the ALiS intervention only works for the right type of student, e.g., highly motivated, independent learners
- **Errors in the Acrobatiq platform** persist, while the overall experience working in the tool has become more streamlined over time
- *For more insight from the survey about the instructor experience in fall 2018, including descriptive statistics of first-time and returning pilot instructor use of the Acrobatiq platform and dashboard, please see [this link](#)*

Appendix

Item Response Theory (IRT) Analysis Results

Fall 2018 Assessment



Discrimination & Difficulty – Fall 2018

