UCI

Divergent Pathways: New Measurements of Undergraduate Success

Center for Studies of Higher Education
U.C. Berkeley
March 3, 2020

Richard Arum
UCI School of Education

UCI

Presentation Outline

I. Project Motivations
II. Next Generation Undergraduate Success Measurement System
    A. Administrative Data
    B. LMS Data
    C. Performance Assessments, Surveys, Experiential Sampling
III. Sample and Descriptive Data from Academic, Social, Psychological and Civic Measures
IV. Next Steps and Measurement System Dissemination

UCI

Higher Education Challenges

- Individuals and society increasingly dependent on expanded higher education opportunities, but U.S. falling behind other countries.
- U.S. higher education model is expensive, constraining expansion to serve more diverse students.
- Structural problems have contributed to *institutional underperformance* in student completion and learning (particularly for underrepresented minority groups).
- Public opinion is growing less supportive of higher education and skeptical of its management, value and quality.

UCI

Data-Driven Institutional Improvement Paradox

- Higher education has been at the forefront of developing and promoting data-driven institutional improvement efforts for governments, policy makers, firms, non-profit organizations and K-12 schools.

- The higher education sector is a laggard at adopting data-driven approaches internally.

- Technological changes are greatly accelerating the capacity to deliver, measure and improving educational processes.

UCI

A Strategic Opportunity at UCI

- UCI has gained a national reputation for being the leading research university that has done the most to serve diverse undergraduate students well
  - #1 on *The New York Times'* College Access Index
  - #1 in *Money* magazine's Best Colleges
  - #3 in Forbes best public university value
  - #7 in public universities in *US News and World Report* Rankings
- UCI is at the forefront of educational science
  - New School of Education based on social, behavioral and improvement science
  - Depth of faculty expertise and interest
- UCI institutional leadership, faculty and students supportive of data-driven improvement efforts

UCI

Project Goals

- Develop new measures of undergraduate experiences and outcomes
- Inspire and inform efforts to improve institutional performance and advance educational equity
- Promote deeper understanding of educational processes and clearer identification of value in educational investments (particularly liberal arts education, broadly defined)

UCI

Research Design

- UCI undergraduate students (N=1,248)
  - Freshmen (797)
  - Continuing Juniors (270)
  - Transferring Juniors (181)
- Longitudinal design for two years (intention to track four years: freshmen to graduation; juniors for two years post-graduation)
- Convenience sampling this year (intention to add new cohort of freshmen/juniors next year)
- Participant incentives (full sample $50 per year for surveys and performance assessments; subsample also receives independent study credit)
- Data de-identified; research methods reviewed/approved by UCI human subject protection committee

UCI

Data Sources

Strand 1
- Administrative data
- Student Affairs

Strand 2
- Learning Management Systems (LMS)

Strand 3
- Performance Assessments
- Surveys
- Experience Sampling

Rachel Baker
Assistant Professor of Education

Mark Warschauer
Professor of Education and Informatics

Jacquelynne Eccles
Distinguished Professor of Education and Psychology

Richard Arum
Dean of the School of Education and Professor of Education, Sociology, Criminology and Society

UCI

Project Team

Faculty

- Richard Arum (PI)
- Rachel Baker (Lead)
- Michael Dennin (co-PI)
- Nia Dowell
- Jacque Eccles (Lead)
- Jutta Heckhausen
- Mark Warschauer (Lead)
- Charles E. Wright
- Di Xu

Affiliated Faculty

- Peter Bearman
- Christian Fischer
- Julia Moeller

Post-Doc

- Luise von Keyserlingk

Graduate Student Researchers

- Hye Rin Lee
- Xunfei Li
- Gabe Orona
- Remy Pages
- Renzhe Yu

Data Warehouse Developer & Lab Manager

- Don Mathew
- Katsumi Yamaguchi-Pedroza

Undergraduate Researchers

- Cassie Chung
- Ariana Hansen
- Christopher Martinez
- Annalisa Raphael
- Jonathan Trujillo

Funded by the Andrew W. Mellon Foundation; endorsed by the ASUCI Student Senate

UCI

Strand 1

Administrative Data

- Admission Records
  - Academic history (high school GPA, AP course records, etc.)
  - Demographics (gender, race and ethnicity, etc.)
  - Family background (parental education, family income, etc.)
- College Records
  - Academic standing (cumulative units, probation, etc.)
  - Course-taking pathways (course-level transcripts)
  - Membership in special programs (honors program, study abroad, etc.)

→ *Developing new measures of course-level peer composition*

UCI

Strand 2

Learning Management Systems (Canvas)

- Clickstream data
  - Logs of students' visits to any course page
- Discussion forum data
  - Logs of students' actions within the forums
  - Content of discussion posts
- Assignment and quiz data
  - Gradebook
  - Students' textual submissions (with metadata)
- Course design data
  - Course syllabi
  - Structures of the course space
  - Usage of different Canvas functions

→ *Developing new measures of academic engagement, including conscientiousness, pacing, peer and faculty interation*

UCI

Strand 3

Full Sample

Assessment 1, Fall 2019
Performance Tests,
Core Survey

(6) End of Term Surveys, AY2019-2020, AY2020-2021
Course Experiences and Plans

Assessment 2, Spring 2021
Performance Tests,
Core Survey

Performance Assessments:

- Critical Thinking – ETS
- Collaborative Problem-Solving – ETS
- Confirmation Bias – ETS
- Perspective Taking – ETS
- Civic Online Reasoning – Sam Wineburg

Core Survey:

- College Expectations
- Course choices and Study Behavior
- Educational and Occupational Aspirations
- Political Affiliations
- Social Network
- Ability Beliefs
- Mental Health
- Personality
- …

UCI

Strand 3

Full Sample

Assessment 1, Fall 2019
Performance Tests,
Core Survey

(6) End of Term Surveys, AY2019-2020, AY2020-2021
Course Experiences and Plans

Assessment 2, Spring 2021
Performance Tests,
Core Survey

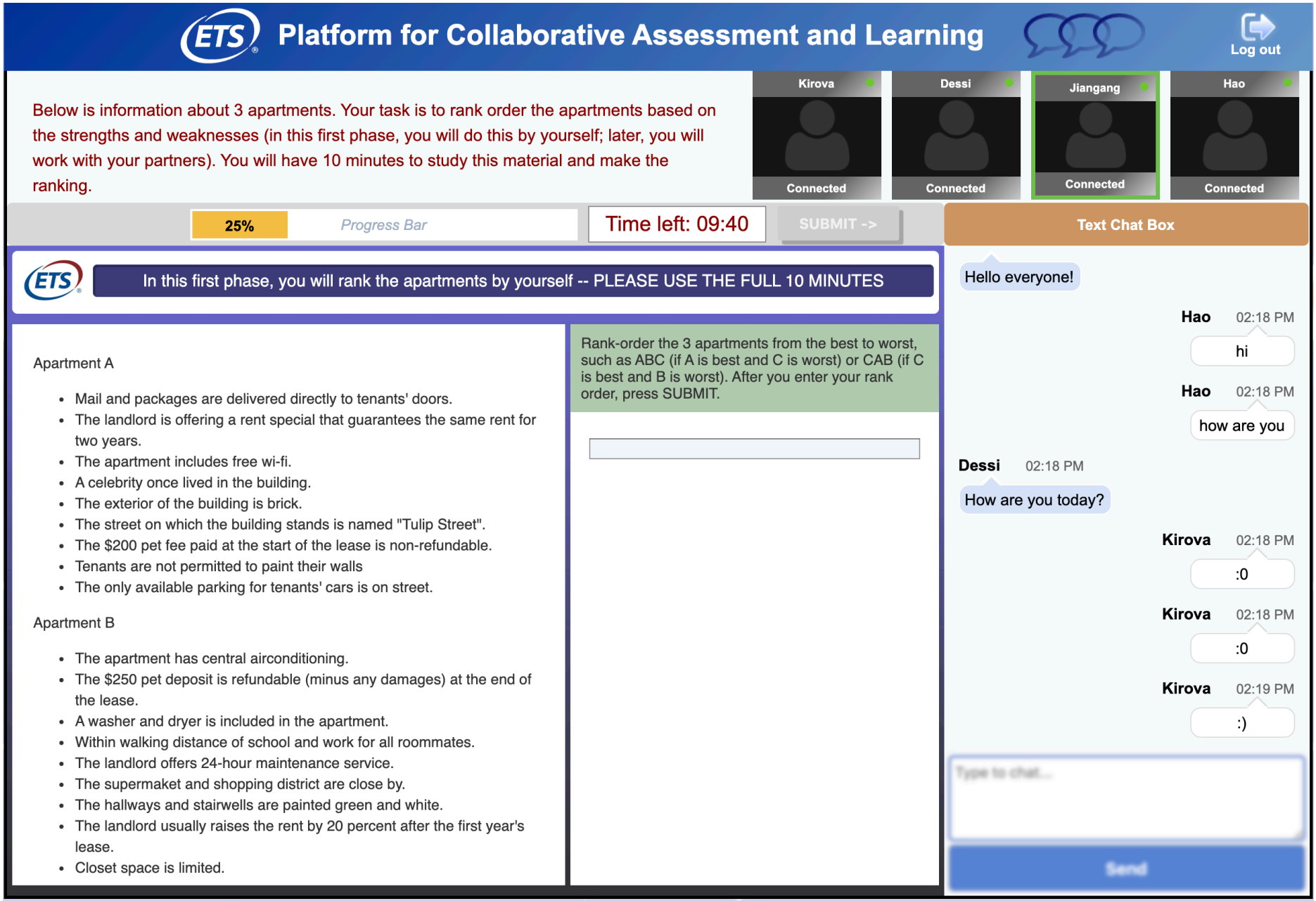
Performance Assessments:

- Critical Thinking – ETS
- Collaborative Problem-Solving – ETS
- Confirmation Bias – ETS
- Perspective Taking – ETS
- Civic Online Reasoning – Sam Wineburg

Core Survey:

- College Expectations
- Course choices and Study Behavior
- Educational and Occupational Aspirations
- Political Affiliations
- Social Network
- Ability Beliefs
- Mental Health
- Personality
- …

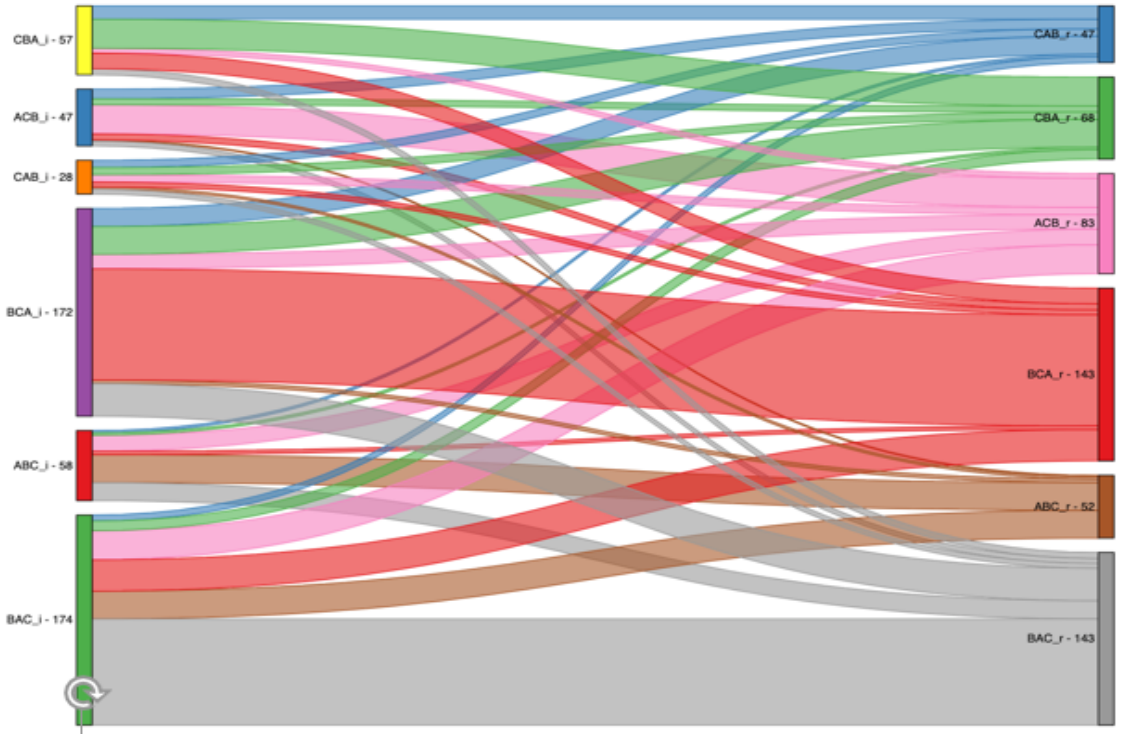
ETS Collaborative Problem Solving



ETS Collaborative Problem Solving

Response changes – all teams

- This Sankey plot shows the changes from initial (left) to revised responses (right).
- The width of the band indicate the number of people.
- The labels on the plot is named as: response string_initial/revise – number of people
- Example: CBA_i – 57: there are 57 people entered CBA in their initial response



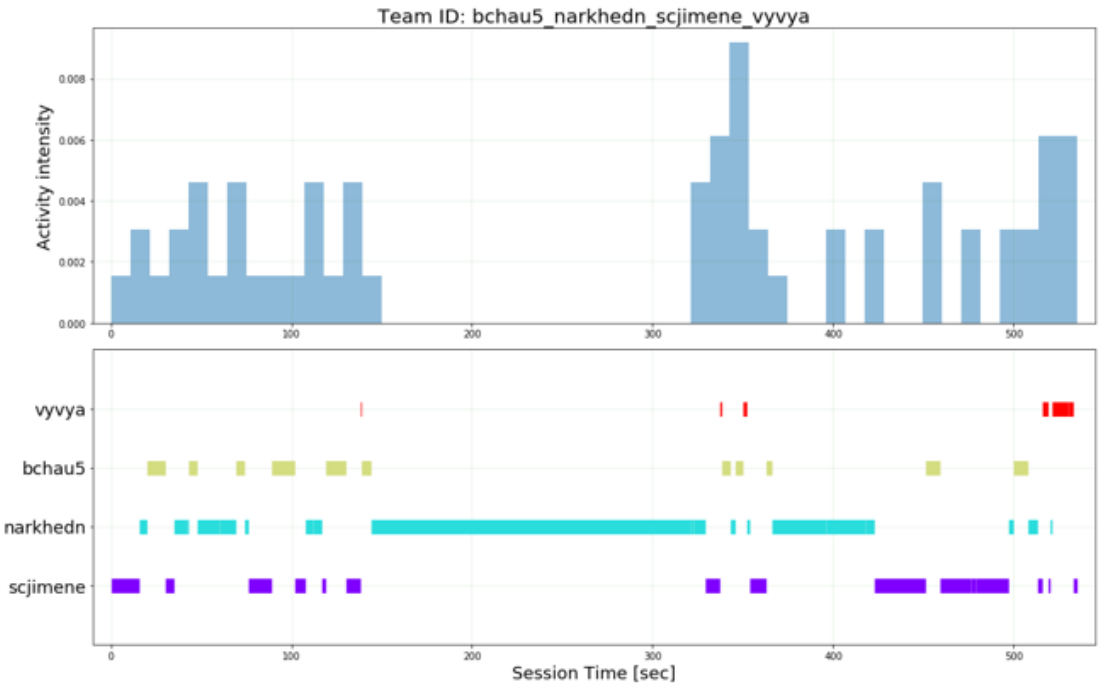
Initial score
BCA - > 2; BAC -> 1; else -> 0

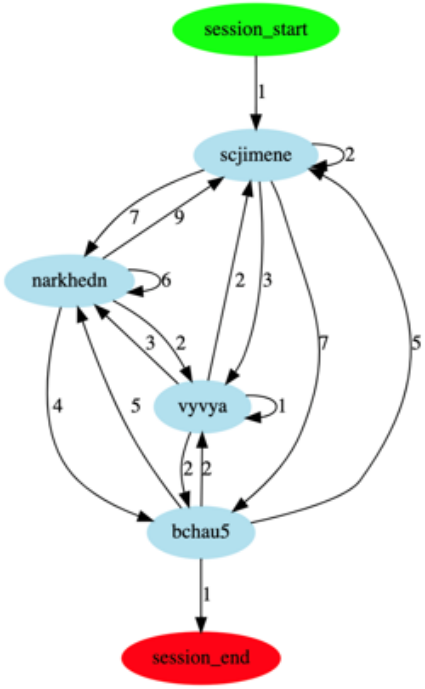
Revised score
ACB -> 2; ABC -> 1; else ->0

ETS Collaborative Problem Solving

Within team interaction example

A team that has a lot of social interaction before tackling the task





ETS Collaborative Problem Solving

Communication contents

UCI

Strand 3

Sub-Sample (N = 350)

Weekly Surveys

- Course related ability beliefs and values
- Learning behavior
- Academic activities
- Non academic activities
- Social network
- Social belonging
- Mental health
- Discrimination
- …

Experience Sampling

- Administered on Smartphones
- 50 x 3min surveys
- Administered at random time points across the term
- **Questions:**
  - Where are you?
  - What are you doing?
  - With whom are you with?
  - How are you feeling?

UCI

Strand 3

Sub-Sample (N = 350)

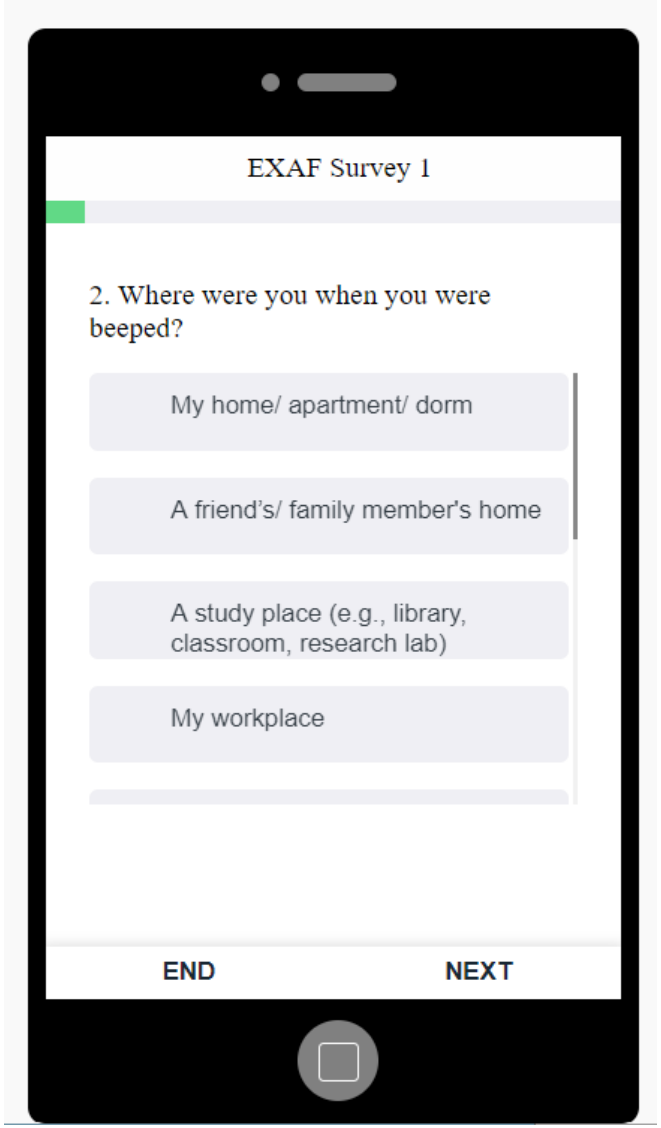
Weekly Surveys

- Course related ability beliefs and values
- Learning behavior
- Academic activities
- Non academic activities
- Social network
- Social belonging
- Mental health
- Discrimination
- …

Experience Sampling

- Administered on Smartphones
- 50 x 3min surveys
- Administered at random time points across the term
- **Questions:**
  - Where are you?
  - What are you doing?
  - With whom are you with?
  - How are you feeling?

Experience Sampling



Weighted Study Sample and UCI Freshman/Junior Population

	Weighted Study Sample	UCI Freshman/Junior Population
Female	66%	56%
Male	34%	44%
Not First Generation	46%	49%
First Generation	54%	51%
(min – max)	(0-100%)	(0-100%)

Note. For weighted study sample: Female n = 832, Male n = 414, Not First Generation n = 560, First Generation n = 688 ; For Mellon pool: Female n = 6533, Male n = 5108, Not First Generation n = 5970, First Generation n = 5757.

Weighted Study Sample and UCI Freshman/Junior Population

	Weighted Study Sample	UCI Freshmen/Junior Population
Asian / Asian American	36%	34%
Hispanic / Latino	34%	26%
White, non-Hispanic	16%	13%
International student	8%	19%
Other/ undeclared	6%	7%
(min – max)	(0-100%)	(0-100%)

Note. For weighted study sample: Asian / Asian American n = 473, Hispanic / Latino n = 422, White n = 174, International Student n = 96, Other n = 83; For Mellon pool: Asian / Asian American n = 4020, Hispanic / Latino n = 3105, White n = 2211, International Student n = 1541, Other n = 850.

Weighted Study Sample and UCI Freshman/Junior Population

	Weighted Study Sample	UCI Freshman/Junior Population
Biology and Health Sciences	25%	20%
STEM (non Bio/Health)	25%	27%
Social/Appl. Soc. Sciences	36%	36%
Humanities and Arts	8%	9%
Undeclared	6%	7%
(min – max)	(0-100%)	(0-100%)

Note. For weighted study sample: Biology and Health Sciences n = 334, STEM (non Bio/Health) n = 299, Social/Appl. Soc. Sciences n = 422, Humanities and Arts n = 94, Undeclared n = 99; For Mellon pool: Biology and Health Sciences n = 2376, STEM (non Bio/Health) n = 3201, Social/Appl. Soc. Sciences n = 4234, Humanities and Arts n = 1051, Undeclared n = 865.

Social (Network): Incoming Friends at UCI

	Proportion having incoming friends at UCI
Asian / Asian American	77%
Hispanic / Latino	67%
White, non-Hispanic	50%
International student	54%
Other/ undeclared	59%
Not First Generation	63%
First Generation	71%
(min – max)	(0 - 100%)

Note. Asian / Asian American n = 352, Hispanic / Latino n = 297, White n = 119, International Student n = 54, Other n = 68.

Social (Network): Incoming Friends at UCI

	Proportion having incoming friends at UCI
Biology and Health Sciences	75%
STEM (non Bio/Health)	69%
Social/Appl. Soc. Sciences	63%
Humanities and Arts	49%
Undeclared	70%
(min – max)	(0 - 100%)

Note. Biology and Health Sciences n = 255, STEM (non Bio/Health) n = 206, Social/Appl. Soc. Sciences n = 296, Humanities and Arts n = 61, Undeclared n = 71.

Mental Health Distress and Social Support

	Mental Health Distress	W2 Faculty Support	W6 Faculty Support	W2 Peer Support	W6 Peer Support
Biology and Health Sciences	13%	58	58	68	67
		(2)	(2)	(3)	(3)
STEM (non Bio/ Health)	19%	54	48	64	63
		(3)	(3)	(3)	(4)
Social/ Appl. Soc. Sciences	14%	60	57	61	63
		(2)	(2)	(2)	(2)
Humanities and Arts	22%	55	54	50	49
		(7)	(7)	(7)	(7)
Undeclared	24%	51	49	58	58
		(4)	(5)	(5)	(5)
Not First Generation	14%	57	55	60	59
		(2)	(2)	(2)	(2)
First Generation	17%	58	55	65	65
		(2)	(2)	(2)	(2)
(min - max)		(0 - 100)	(0 - 100)	(0 - 100)	(0 - 100)

Note. Mental health distress from K10 screening instrument for psychological distress by Kessler et al. (2002); faculty and student support measures derived from 7 items about social belonging/ feeling comfortable to ask for support of peers; 6 items about confidence to get/ feeling comfortable to ask for support of faculty. Mean (S.E.). Biology and Health Sciences – mental health n = 91, week 2 n = 203, week 6 n = 77; STEM (no Bio/Health) mental health n = 65, week 2 n = 62, week 6 n = 53 ; Social/ Appl. Soc. Sciences mental health n = 133, week 2 n = 122, week 6 n = 118; Humanities and Arts mental health n = 18, week 2 n = 17, week 6 n = 16; Undeclared – mental health n = 29, week 2 n = 27, week 6 n = 28.

Reported Stress

	Academic	Relation-ship	Practical	Health	Discrim-ination	Sexual Orientation	Language & Cultural Issues
Bio and Health Sciences	3.9	1.8	2.3	2.5	0.3	0.4	0.5
	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.2)	(0.2)
STEM (non Bio/Health)	3.7	1.8	2.2	2.3	0.7	0.6	1.0
	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)	(0.2)
Soc./Appl. Soc. Sciences	3.5	1.5	2.5	2.2	0.4	0.3	0.6
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)
Humanities and Arts	4.0	1.7	3.1	3.2	0.3	0.3	0.4
	(0.4)	(0.3)	(0.4)	(0.6)	(0.1)	(0.1)	(0.2)
Undeclared	3.9	1.3	2.8	2.2	0.5	0.4	0.8
	(0.3)	(0.3)	(0.4)	(0.3)	(0.2)	(0.2)	(0.3)
Not First Generation	3.7	1.7	2.2	2.5	0.4	0.3	0.6
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)
First Generation	3.7	1.6	2.6	2.3	0.5	0.4	0.7
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
(min - max)	(0 - 7)	(0 - 7)	(0 - 7)	(0 - 7)	(0 - 7)	(0 - 7)	(0 - 7)

Note. Adapted student stress inventory, originally by Stallman and Hurst (2016), 15 items about perceived stress in different areas: academic, relationship, practical, parenting, health, discrimination, sexual orientation, language/cultural issues. Mean (S.E.). Biology and Health Sciences n = 80, STEM (non Bio/Health) n = 55, Social/ Appl. Soc. Sciences n = 119, Humanities and Arts n = 16, Undeclared n=29.

Academic Ability, Behaviors and Course Experiences

	Term GPA	Critical Thinking	Hours Each Class Studying Per Week	Class-Time on Groupwork	Other Class-Time Not Lecturing	Rely on Counselor to Decide Major
Biology and Health Sciences	3.0	163.4	7	4%	16%	67
	(0.8)	(0.45)	(0.39)	(0.63)	(1.26)	(1.76)
STEM (non Bio/Health)	3.1	165.3	6	6%	15%	70
	(0.7)	(0.53)	(0.41)	(1)	(1.4)	(1.9)
Social/Appl. Soc. Sciences	3.3	163.7	6	5%	16%	65
	(0.7)	(0.44)	(0.51)	(0.51)	(1.02)	(1.67)
Humanities and Arts	3.5	165.7	6	4%	21%	63
	(0.6)	(0.98)	(0.75)	(0.92)	(3.97)	(3.4)
Undeclared	2.9	162.1	8	4%	18%	73
	(0.8)	(1.23)	(1.33)	(1.16)	(3.46)	(2.53)
Not First Generation	3.4	166	5.8	5%	17%	64
	(0.6)	(0.37)	(0.26)	(0.55)	(1)	(1.43)
First Generation	3.0	162.5	7	4%	16%	70
	(0.8)	(0.34)	(0.42)	(0.62)	(0.97)	(1.19)
(min – max)	(1-4)	150-180	0-65	0-62	0-100	0-100

Note. Means and (Standard Errors). Term GPA: Biology and Health Sciences n = 340, STEM (non Bio/Health) n = 298, Social/Appl. Soc. Sciences n = 431, Humanities and Arts n = 94, Undeclared N = 99; CT: Health Sciences n = 180, STEM n = 148, Social Sciences & Applied Social Sciences n =195, Arts & Humanities n = 31 ", Undeclared n = 36; Hours Studying: Health Sciences n = 133, STEM n = 105, Social Sciences & Applied Social Sciences n = 155, Arts & Humanities n = 27 ", Undeclared n = 28; Non-lecturing/Groupwork: Health Sciences n = 127, STEM n = 103, Social Sciences & Applied Social Sciences n = 151, Arts & Humanities n = 26 ", Undeclared n = 27; Counselor: Health Sciences n = 248, STEM n = 202, Social Sciences & Applied Social Sciences n = 285, Arts & Humanities n = 56 ", Undeclared n = 70.

Academic Ability, Behaviors and Course Experiences

	Term GPA	Critical Thinking	Hours Each Class Studying Per Week	Class-Time on Groupwork	Other Class-Time Not Lecturing	Rely on Counselor to Decide Major
Freshman	3.1	163.8	6	4%	17%	71
	(0.8)	(0.3)	(0.27)	(0.43)	(0.82)	(0.98)
Transfer Junior	3.2	163.9	8	4%	15%	65
	(0.7)	(0.7)	(0.82)	(0.87)	(1.84)	(2.25)
Continuing Junior	3.3	165.7	6	5%	18%	48
	(0.6)	(0.68)	(0.42)	(0.98)	(1.76)	(3.07)
(min – max)	(1-4)	150-180	0-65	0-62	0-100	0-100

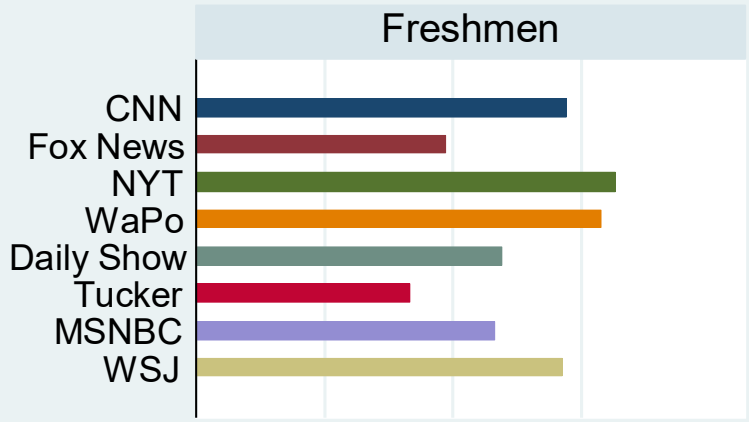
Note. Means and (Standard Errors). Term GPA: Freshman n = 796, Transfer Junior n = 181, Continuing Junior n = 270; CT: Freshman n = 421, Transfer Junior n = 94, Continuing Junior n = 75; Hours Studying: Freshman n = 292, Transfer Junior n = 92, Continuing Junior n = 64; Non-lecturing/Groupwork: Freshman n = 281, Transfer Junior n = 89, Continuing Junior n = 64; Counselor: Freshman n = 585, Transfer Junior n = 159, Continuing Junior n = 117.

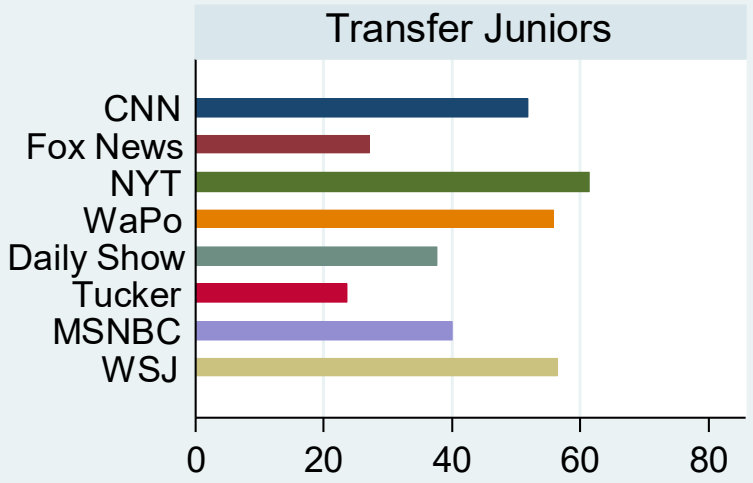
Civic Online Reasoning & Civic Attitudes

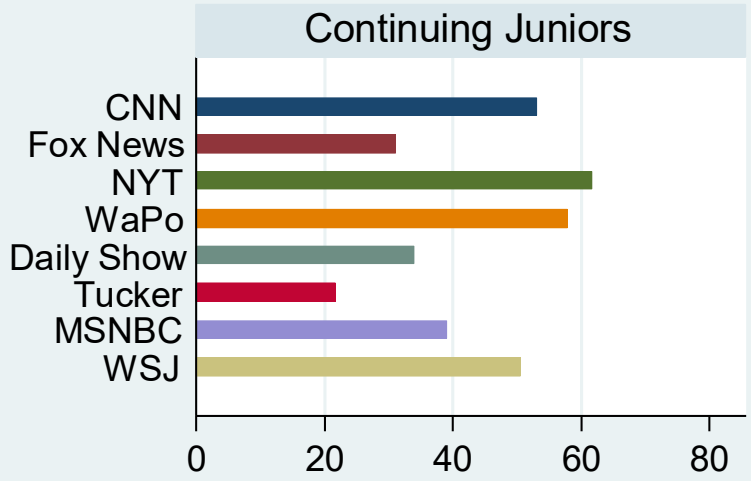
	Civic Online Reasoning	Liberal Orientation	Value Civic Commit.	Value Environ. Commit.	Civic Awareness	Liberal News Consumption	Cons. News Consumption
Freshmen	-.05	62	46	70	40%	27%	13%
	(.05)	(.75)	(1.19)	(.97)			
Transfer Juniors	.16	62	51	72	51%	38%	26%
	(.11)	(1.66)	(2.33)	(1.97)			
Cont. Juniors	.06	61	52	71	48%	28%	13%
	(.11)	(1.89)	(2.73)	(2.13)			
First Generation	-.10	62	47	71	39%	26%	13%
	(.05)	(.88)	(1.32)	(1.09)			
Not First Gen.	.12	62	48	70	47%	33%	18%
	(.06)	(.95)	(1.50)	(1.20)			
(min – max)		(0 - 100)	(0 - 100)	(0 - 100)			

Note. **Civic Online Reasoning** tasks (Wineburg et al. @ SHEG): standardized average over 6 scores (2 tasks, 3 raters; each scored from 0 to 2; **N = 595**). Civic Online Reasoning Rubric Split: *Mastery* = 17%; *Emerging* = 38%; *Beginning* = 45%. Survey Items (**N = 864**). **Political Positioning** *"How would you characterize your political views?"* (0 = Completely Conservative; 100 = Completely Liberal); **Political Decisions** *"How important is it to you to influence political decisions?"*; **Societal/Environ. Problems** *"How important is it to you to contribute to solving problems in society or the environment?"* (0 = Not at all important; 100 = Most important); **Political Affairs** *"How often do you intentionally keep up-to-date with political affairs and events?"*; **Liberal/Conservative News** *"How often do you seek news from liberal/conservative news outlets?"* (0 = Once a month or less; 1 = Once a week or more). Mean (S.E.). Freshmen – Civic Online Reasoning n = 426; Survey n = 584. Transfer Juniors – Civic Online Reasoning n = 95; Survey n = 163. Continuing Juniors – Civic Online Reasoning n = 74; Survey n = 117. The Civic Online Reasoning score was standardized (mean = 0; standard deviation = 1).

How much do you believe that the following sources are trustworthy?







Note. Question asked during Week 3 of Fall 2019. N = 283; Freshmen n=198; Transfer Juniors n=56; Continuing Juniors n=29.

Not at all trustworthy (= 0) / Extremely trustworthy (= 100)

UCI

Next Steps and Measurement Dissemination

- Expand the study longitudinally and with new cohorts
- Move from descriptive results to multivariate analysis that will generate project findings on educational value and support institutional improvement efforts
- Scale use/disseminate new measures through collaborations with external partners
  - Gardner Institute – enhance data driven improvement efforts in broad access institutions
  - University of Michigan – College and Beyond II
  - International Researcher Convening – UCI, June 8-9, 2020

UCI

richard.arum@uci.edu