Surveying undergraduate graduate education challenges, successes, and strategies from a departmental perspective

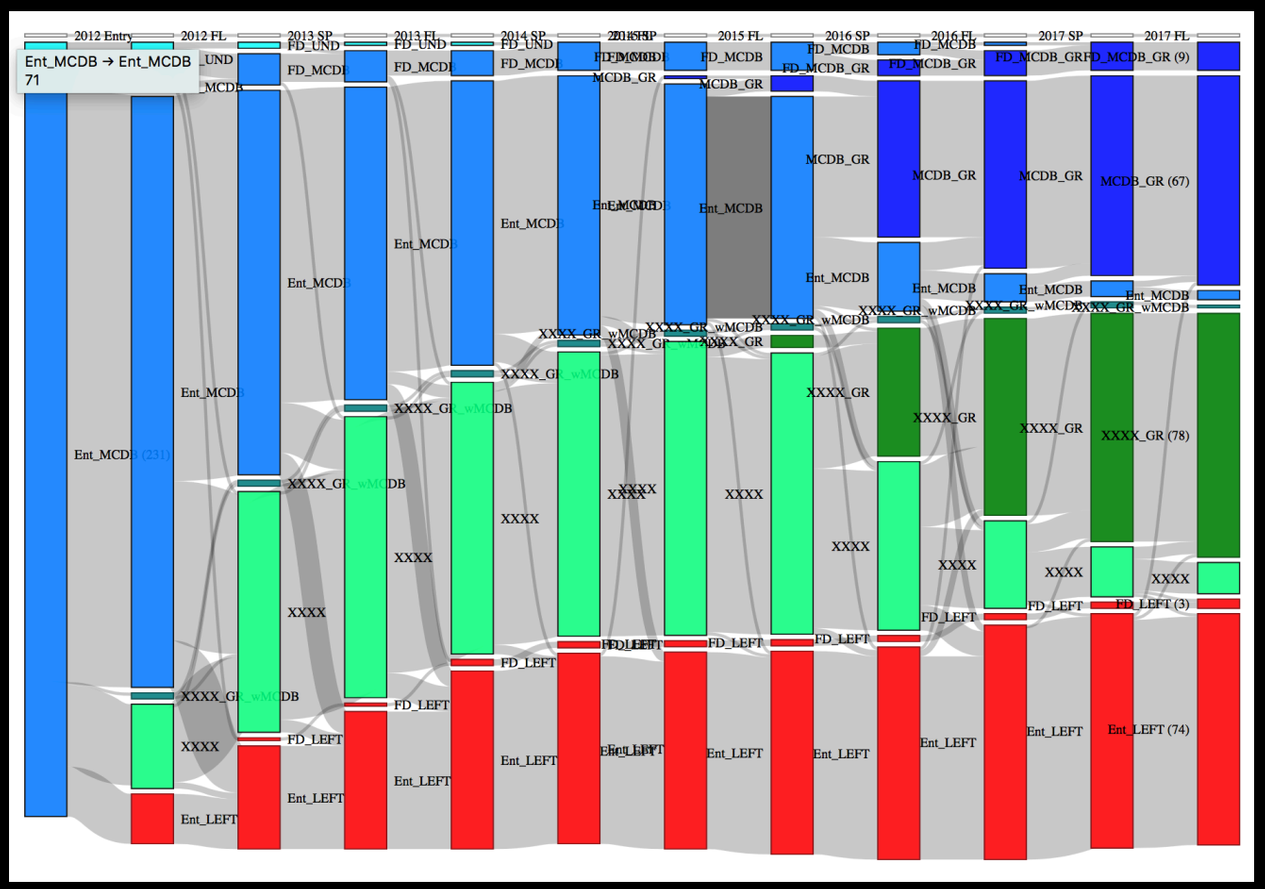
Valerie Otero - School of Education
Mike Klymkowsky - MCD Biology
inspired through collaboration with
Andy Martin - EBio
Ali Oran & Rob Stubbs - Institutional Research

Tools to characterize department (major) demographics & dynamics

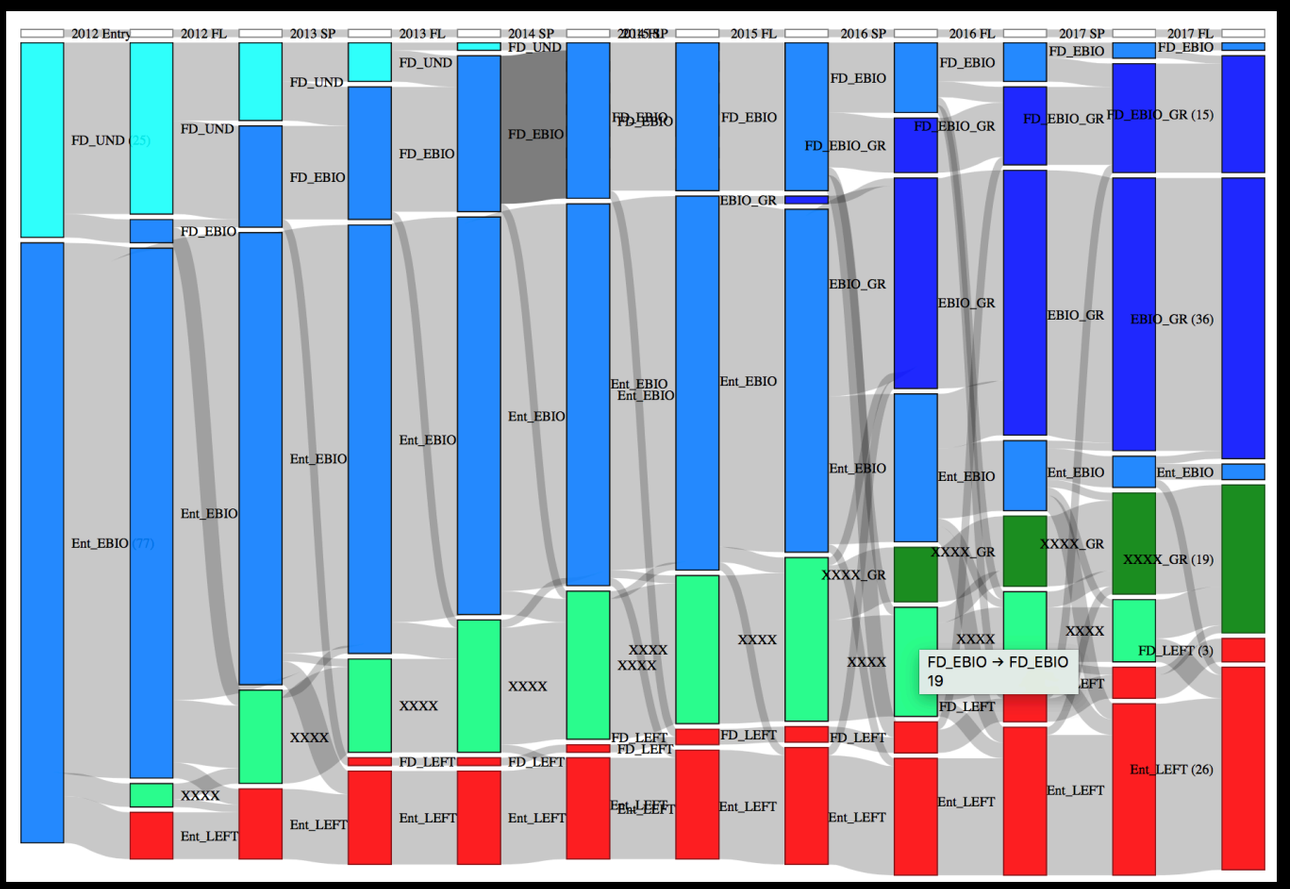
Tableaux

https://public.tableau.com/profile/university.of.colorado.boulder.ir#!/vizhome/all_years_gr_ug/UGStudents

Natives, immigrants & refugees



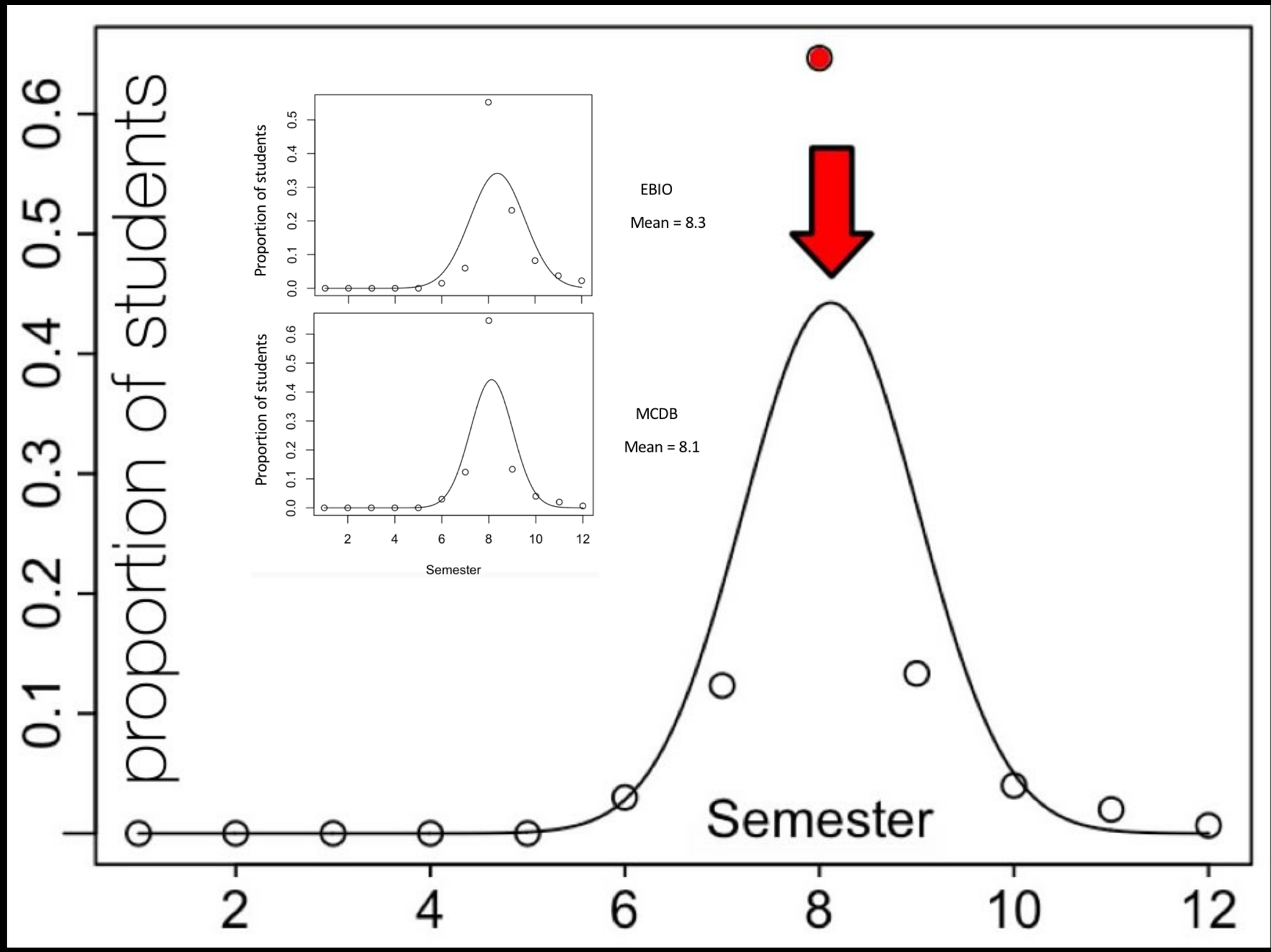
MCDB



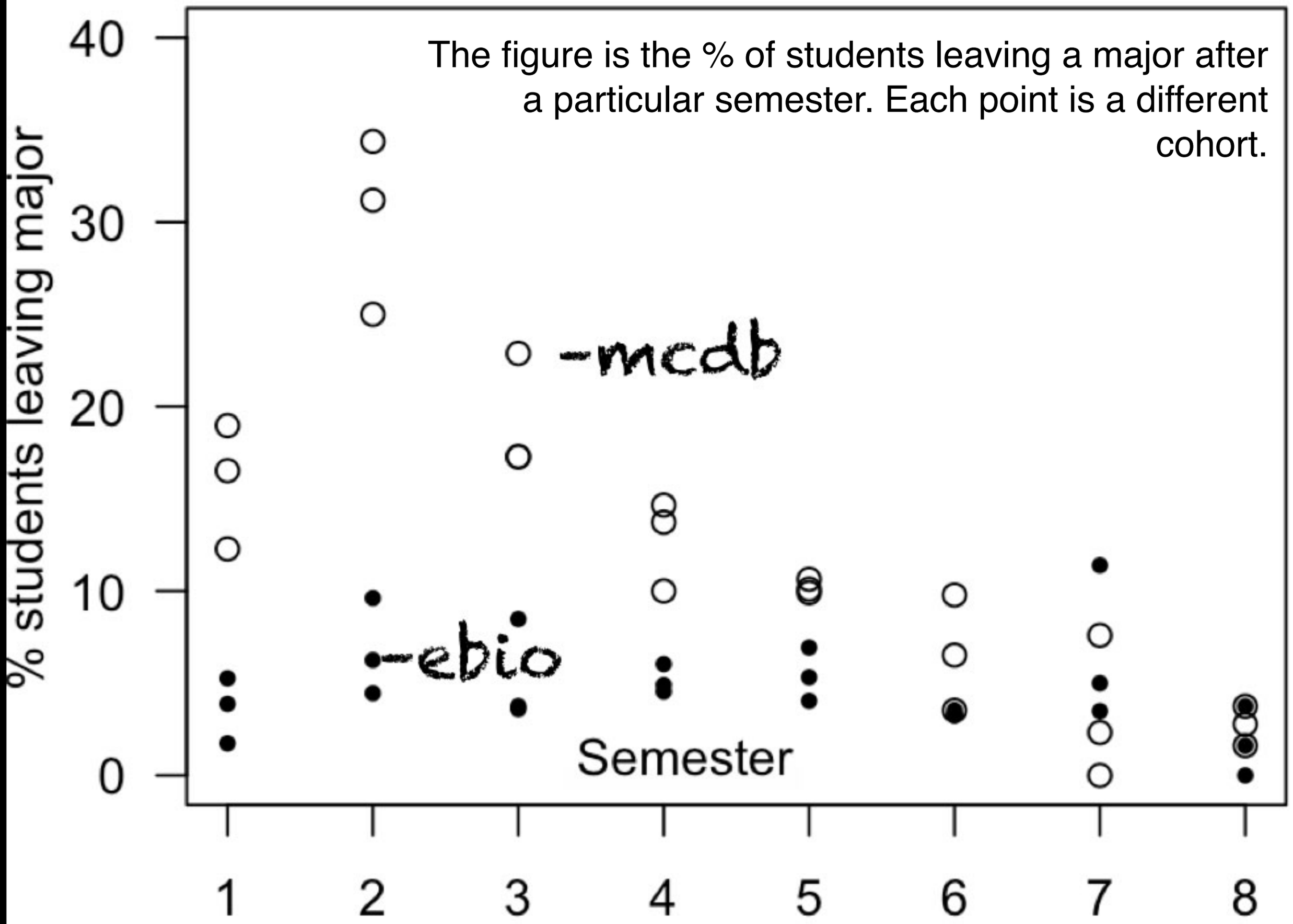
EBIO

GO HTML: http://virtuallaboratory.colorado.edu/student-flow-graphics.htm

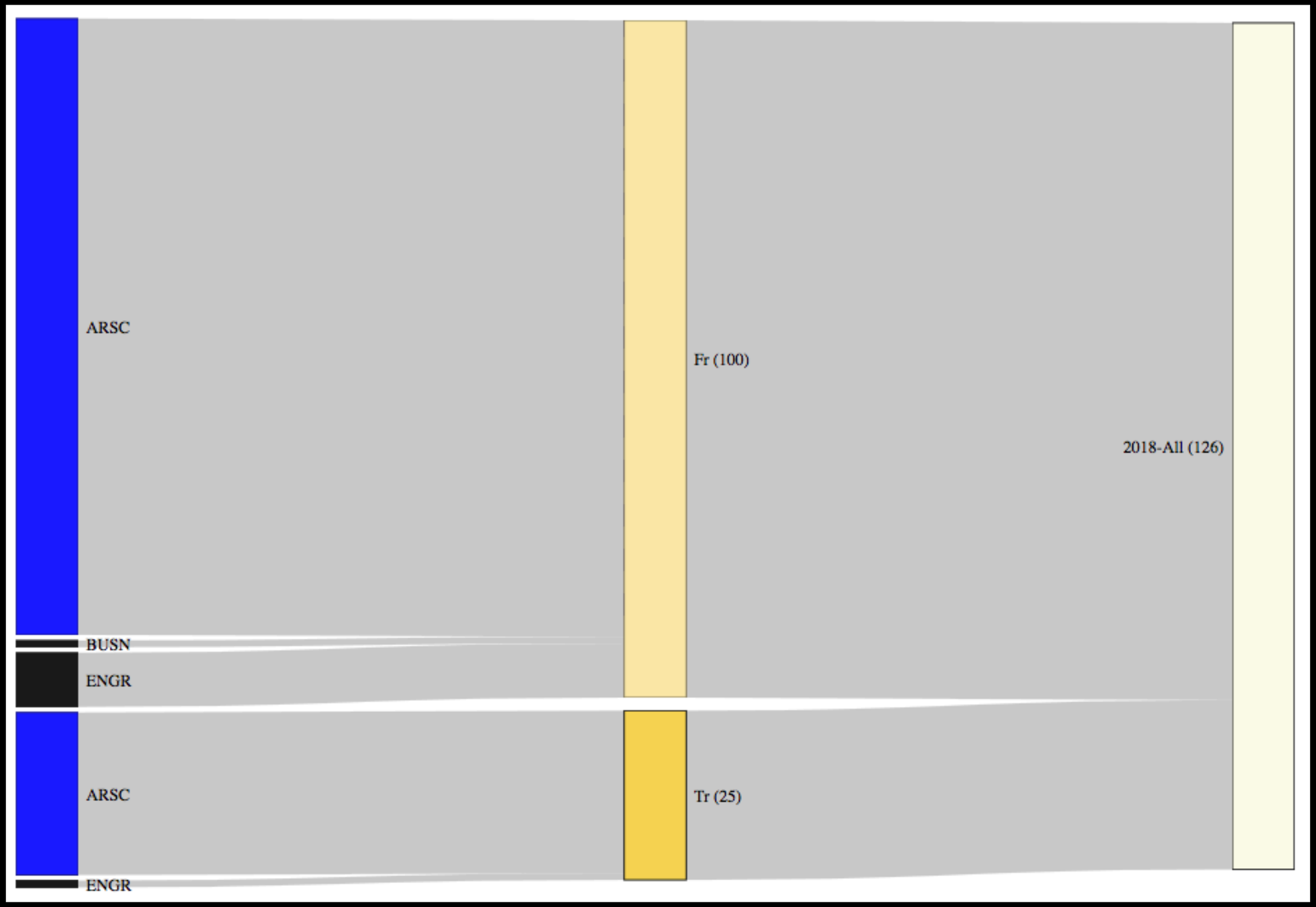
From Andy Martin - The solid line represents the expected for normally-distributed data; in MCDB there is a larger than expected spike at 8 semesters (four years) suggesting that the major is well structured and students that stay in the major get out when expected.



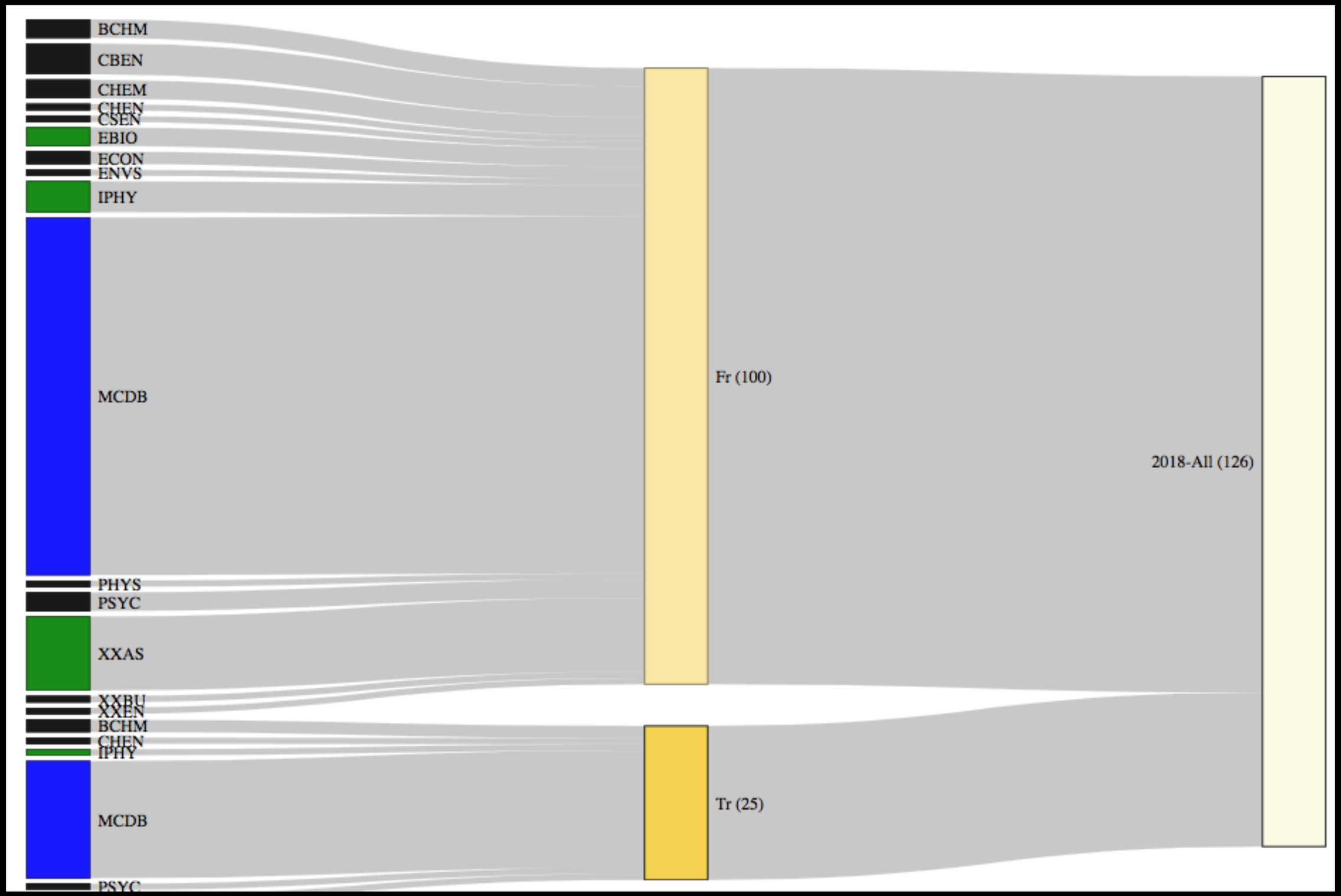
The figure is the % of students leaving a major after a particular semester. Each point is a different cohort.



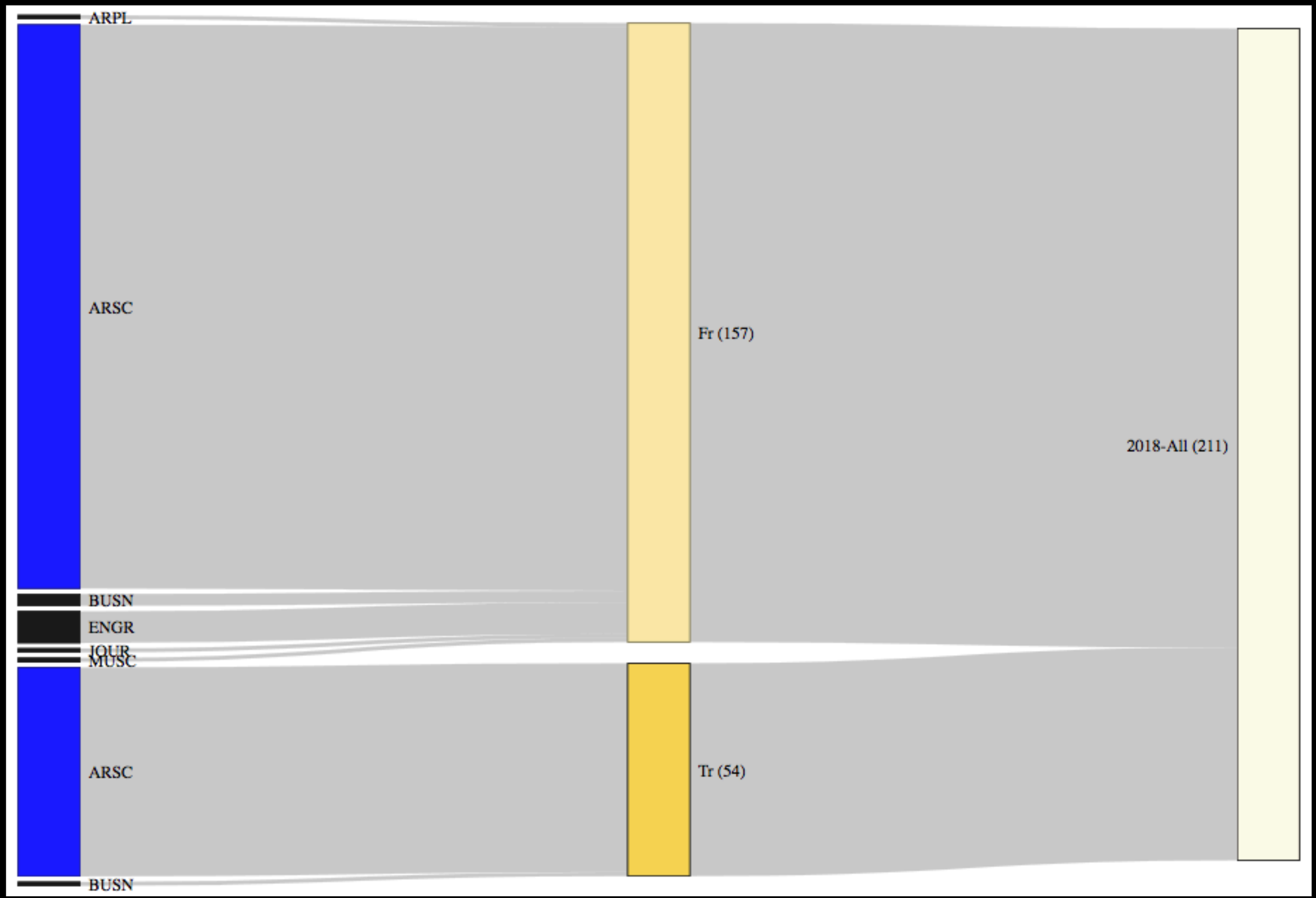
Look back analyses



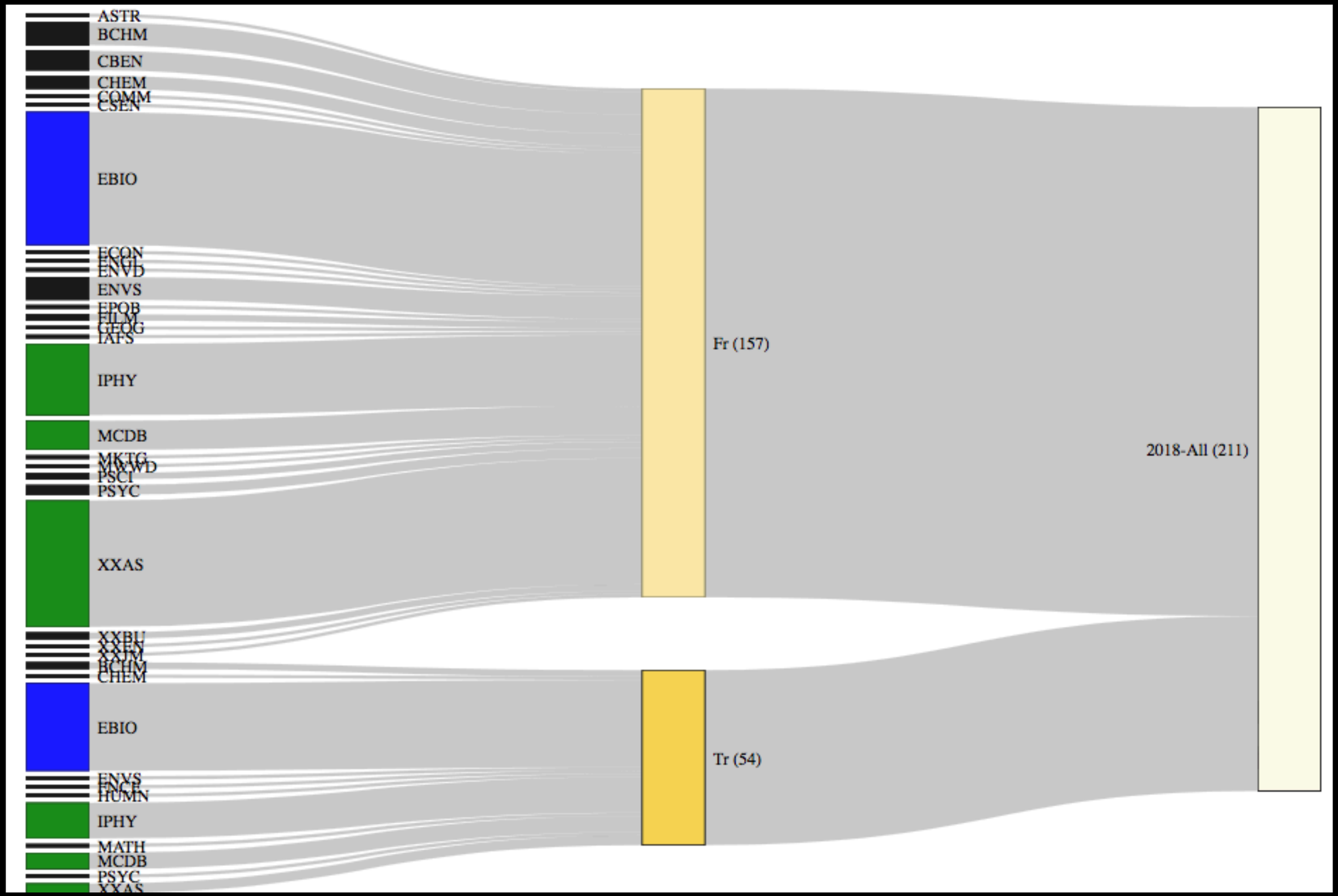
mcdb


BCHM
CBEN
CHEM
CHEN
CSEN
EBIO
ECON
ENVS
IPHY
MCDB
PHYS
PSYC
XXAS
XXBU
XXEN
BCHM
CHEN
IPHY
MCDB
PSYC
Fr (100)
Tr (25)
2018-All (126)

EBIO


ARPL
ARSC
BUSN
ENGR
JOUR
MUSC
ARSC
BUSN
Fr (157)
Tr (54)
2018-All (211)

EBIO


ASTR
BCHM
CBEN
CHEM
COMM
CSEN
EBIO
ECON
ENGL
ENVD
ENVS
EPOB
FILM
GEOG
IAFS
IPHY
MCDB
MKTG
MWWD
PSCI
PSYC
XXAS
XXBU
XXEN
XXFM
BCHM
CHEM
EBIO
ENVS
ENGL
HUMN
IPHY
MATH
MCDB
PSYC
XXAS
Fr (157)
Tr (54)
2018-All (211)

Ali Oran and Rob Stubbs

Tools to characterize department (major) demographics & dynamics

Tableaux

Natives, immigrants & refugees

Monitoring (student learning) outcomes

Are course learning goals
reflected in exam questions?

RESEARCH ARTICLE

Characterizing College Science Assessments: The Three-Dimensional Learning Assessment Protocol

OPEN ACCESS

Citation: Laverty JT, Underwood SM, Matz RL, Posey LA, Carmel JH, Caballero MD, et al. (2016) Characterizing College Science Assessments: The Three-Dimensional Learning Assessment Protocol. PLoS ONE 11(9): e0162333. doi:10.1371/journal.pone.0162333

The 3D-LAP

3D-LAP provides criteria for each dimension

Developing and Using Models

Student is given or asked to construct a mathematical, graphical, computational, symbolic, or pictorial representation and use it to explain or predict an event, observation, or phenomenon.

1. Question gives an **event, observation**, or **phenomenon** for the student to explain or make a prediction about.
2. Question gives a representation or asks student to **construct a representation**.
3. Question asks student to **explain** or make a **prediction** about the event, observation, or phenomenon.
4. **Question asks student to provide the reasoning that links the representation to their explanation or prediction.**

Science Advances
AAAS
Manuscript

Evaluating the Extent of a Large-Scale Transformation in Gateway Science Courses

(short) Evaluating a Transformation in Science Courses

Rebecca L. Matz[1,*], Cori L. Fata-Hartley[2], Lynmarie A. Posey[3], James T. Laverty[4], Sonia M. Underwood[5], Justin H. Carmel[5], Deborah G. Herrington[6], Ryan L. Stowe[3], Marcos D. Caballero[7], Diane Ebert-May[8], Melanie M. Cooper[3]

a) Introductory cell and molecular biology (BS161)

b) Introductory organismal and population biology (BS162)

c) General chemistry (CEM141 & 142)

d) Introductory physics (PHY183, 184, 231 & 232)

Fraction of exam points that are 3D

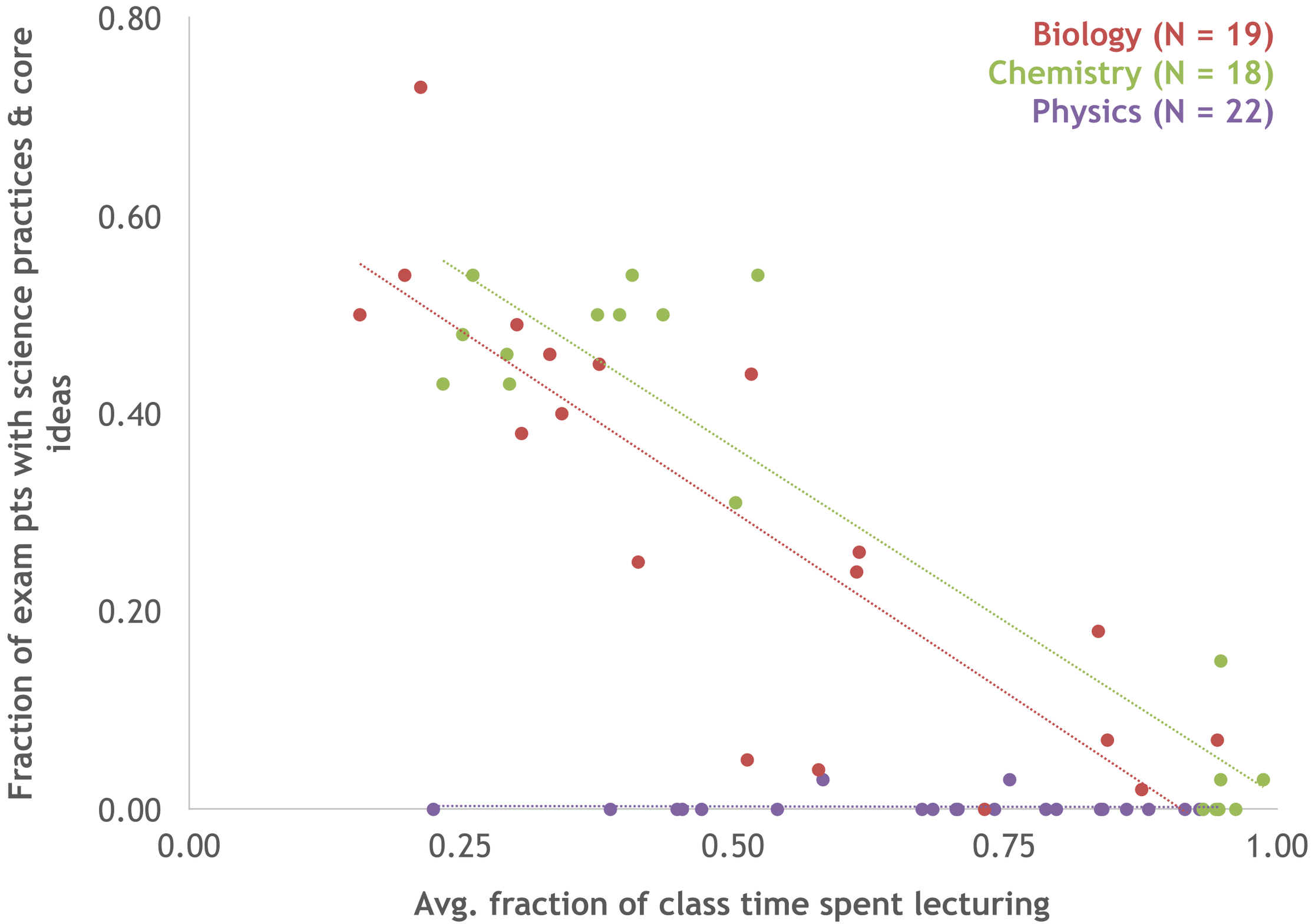
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

0
1
2
3

Year

Is there a correlation between 3D-learning and active learning?

from Cooper et al - 2018 - MSU AAU group



New campus wide STEM ED certificate:

Jeff Writer & Julie Andrews

Coursework

Course Title	Course Number	Credits
Step 1: Inquiry Approaches to Teaching *Or* Becoming a Learning Assistant	EDUC 2020 EDUC 4610	1 2
Step 2: Inquiry-Based Lesson Design	EDUC 2030	2
Knowing and Learning in Mathematics and Science *Or* Race, Culture, and Identity in STEM	EDUC 4050 EDUC 2800	3
(any two, additional courses will be added as necessary) Teaching and Learning Biology Teaching and Learning Chemistry Teaching and Learning Earth Systems Teaching and Learning Physics Teaching and Learning Design Teaching K12 Mathematics: Geometry and Measurement Teaching K12 Mathematics: Probability and Statistics	 EDUC/MCDB 4811 EDUC 4822 EDUC 4833 PHYS 4810 GEEN 4400 EDUC 5830 EDUC 5840	 3 3 3 3 3 3 3
Total		**12-13 credits**