Minding the Grades

Lessons Learned From Building a Class Performance Dashboard

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UNIVERSITY OF HOUSTON

Background

- University of Houston

  - Founded in 1927

  - Flagship of the University of Houston System

  - Public, Tier One research university

  - 277 undergraduate, graduate and professional programs
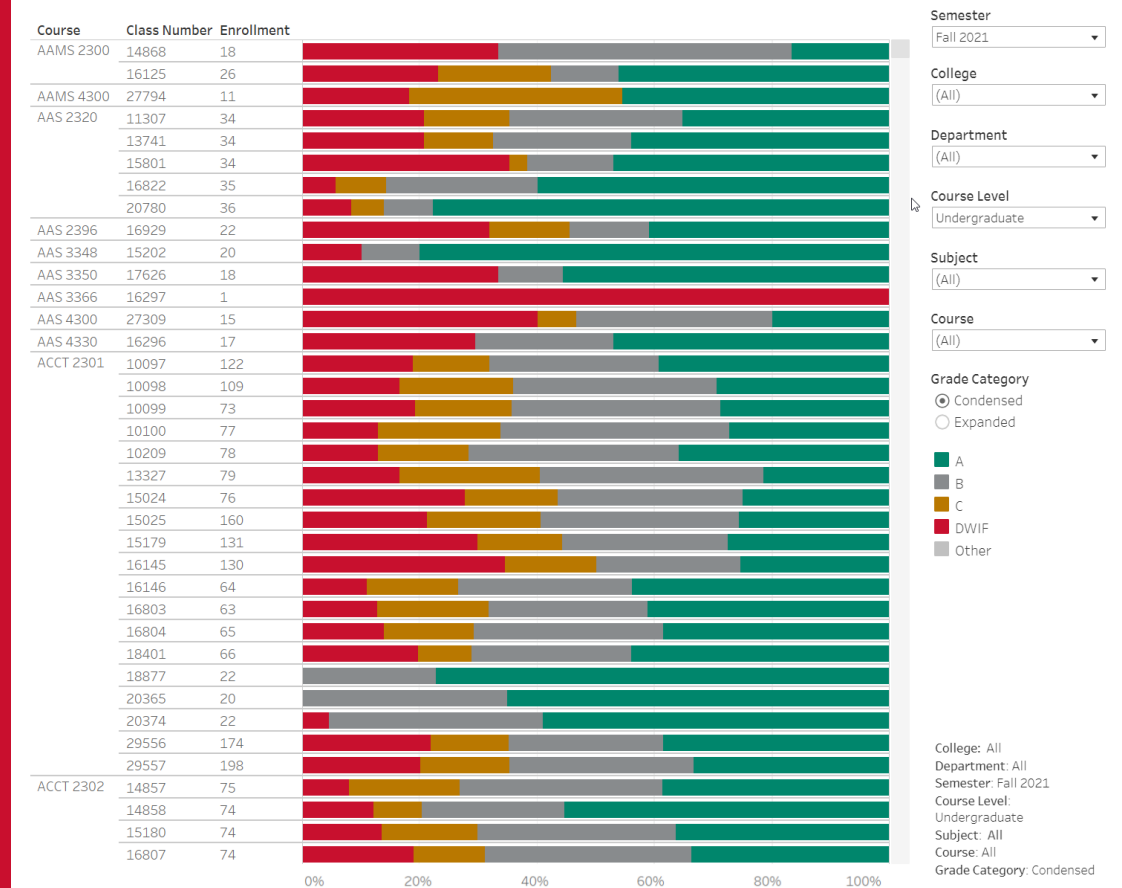
  - Fall 2022 enrollment: 46,700

Background

- The IR Office's Responsibilities

- Dashboards:
    - Statistical Handbook
    - By the Numbers

- No dashboard on student grades or DWIF rate.

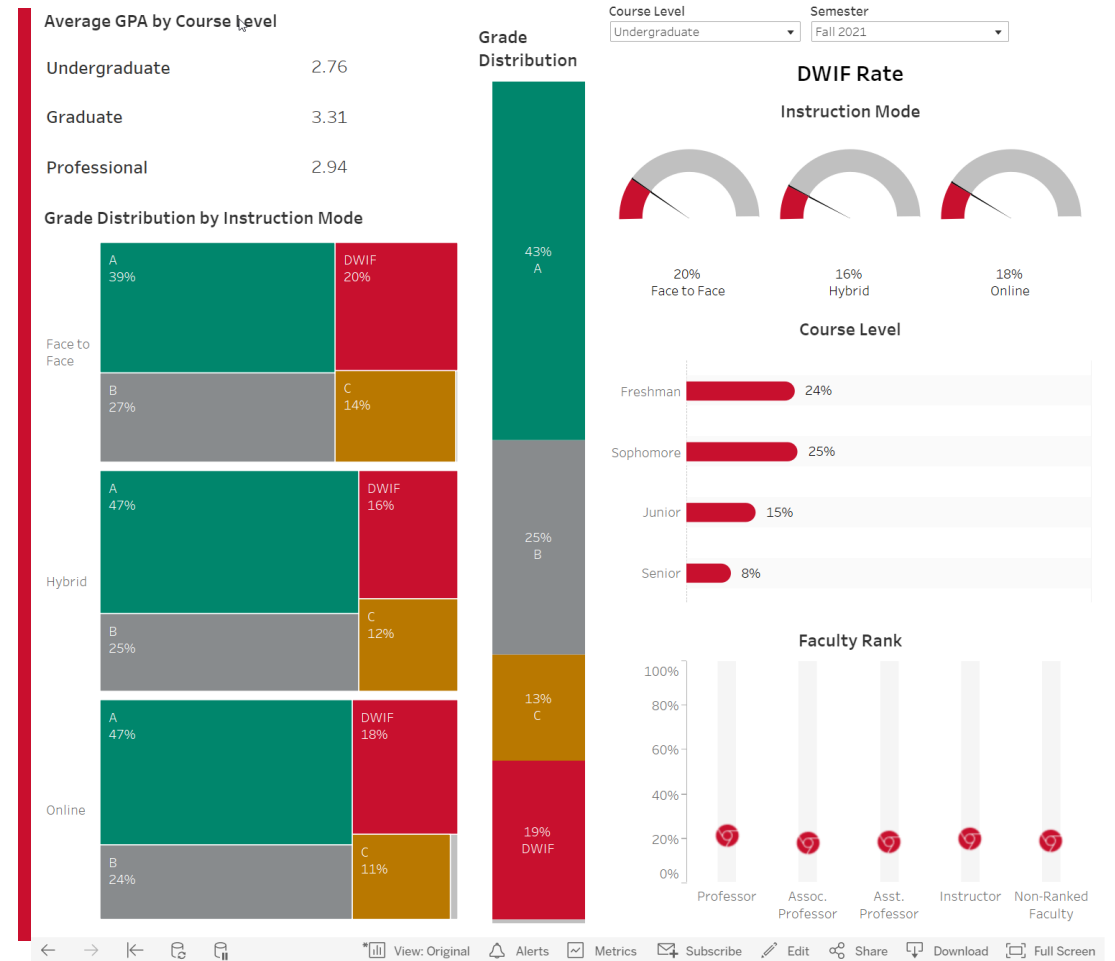- But many requests about such information from within and without.
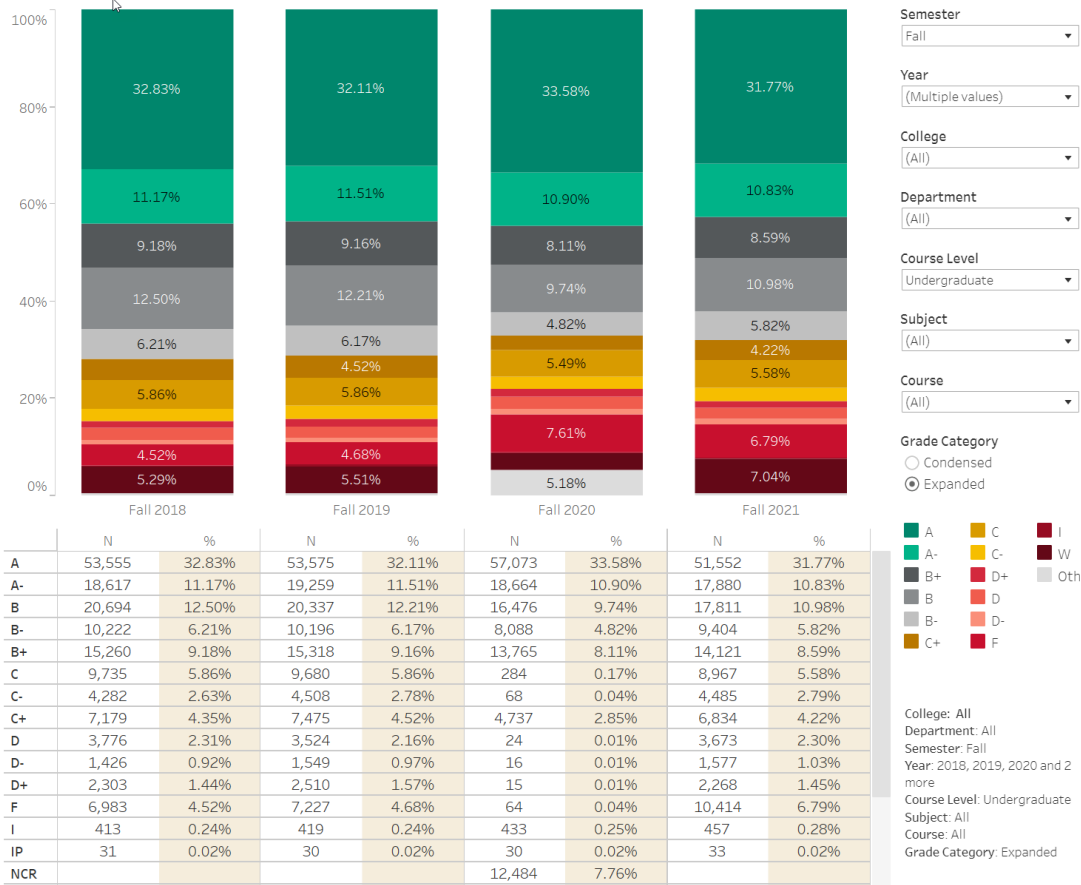
Background

- Creation of a Data Warehouse (DW)

- DW has PeopleSoft data:
  - enrollment data from Summer 2000 onward
  - admissions data from Fall 2010 onward
  - CB data from Fall 2007 onward

- A result of collaboration between the data warehouse team and the IR Office.

Course Grade Distribution Trend (Expanded)
N is number of course enrollments, % is percent of total course enrollments

	Fall 2018 N	%	Fall 2019 N	%	Fall 2020 N	%	Fall 2021 N	%
A	53,555	32.83%	53,575	32.11%	57,073	33.58%	51,552	31.77%
A-	18,617	11.17%	19,259	11.51%	18,664	10.90%	17,880	10.83%
B	20,694	12.50%	20,337	12.21%	16,476	9.74%	17,811	10.98%
B-	10,222	6.21%	10,196	6.17%	8,088	4.82%	9,404	5.82%
B+	15,260	9.18%	15,318	9.16%	13,765	8.11%	14,121	8.59%
C	9,735	5.86%	9,680	5.86%	284	0.17%	8,967	5.58%
C-	4,282	2.63%	4,508	2.78%	68	0.04%	4,485	2.79%
C+	7,179	4.35%	7,475	4.52%	4,737	2.85%	6,834	4.22%
D	3,776	2.31%	3,524	2.16%	24	0.01%	3,673	2.30%
D-	1,426	0.92%	1,549	0.97%	16	0.01%	1,577	1.03%
D+	2,303	1.44%	2,510	1.57%	15	0.01%	2,268	1.45%
F	6,983	4.52%	7,227	4.68%	64	0.04%	10,414	6.79%
I	413	0.24%	419	0.24%	433	0.25%	457	0.28%
IP	31	0.02%	30	0.02%	30	0.02%	33	0.02%
NCR					12,484	7.76%		

Semester: Fall
Year: (Multiple values)
College: (All)
Department: (All)
Course Level: Undergraduate
Subject: (All)
Course: (All)

Grade Category
○ Condensed
● Expanded

A   C   I
A- C- W
B+ D+ Oth
B   D
B- D-
C+ F

College: All
Department: All
Semester: Fall
Year: 2018, 2019, 2020 and 2 more
Course Level: Undergraduate
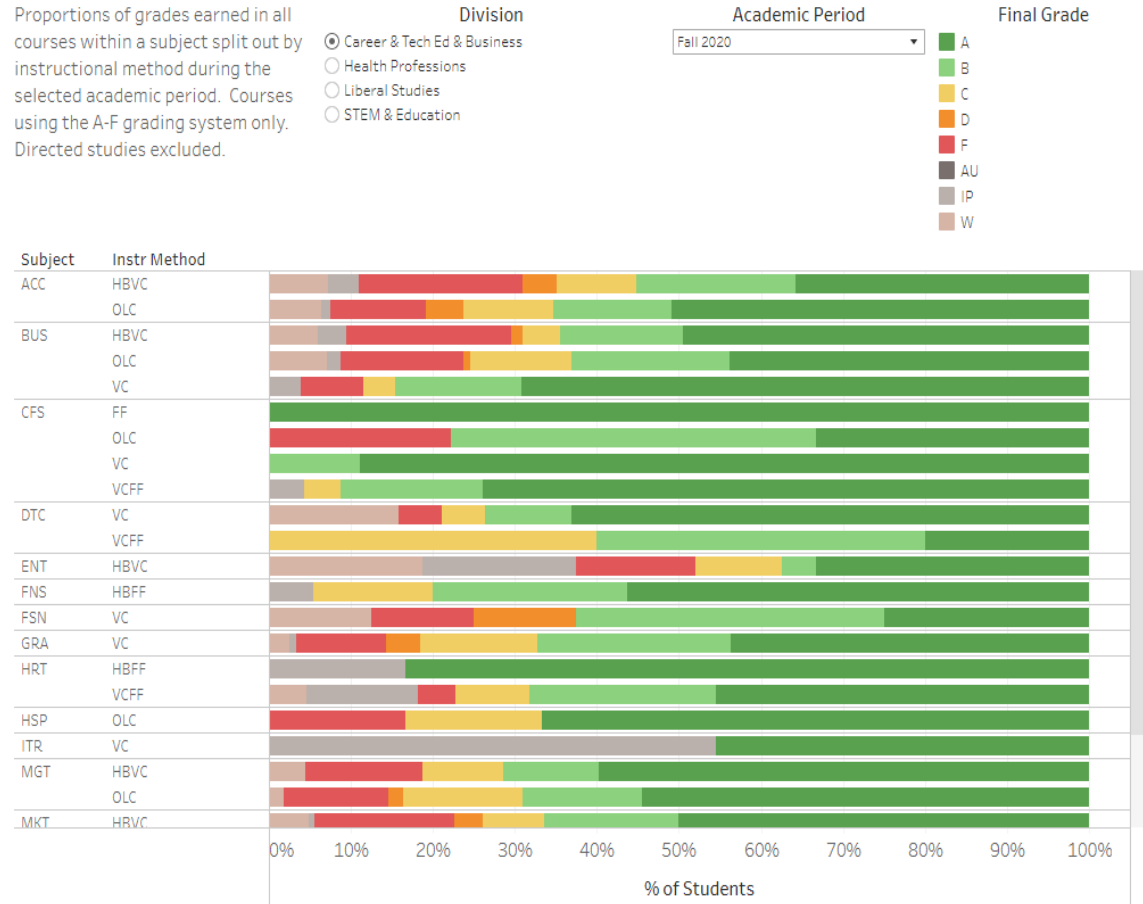Subject: All
Course: All
Grade Category: Expanded

Stage 1: What did we want to show?

- Looked to other universities for ideas and inspiration.

- Reviewed previous ad hoc data requests.

- Contacted other institutions.

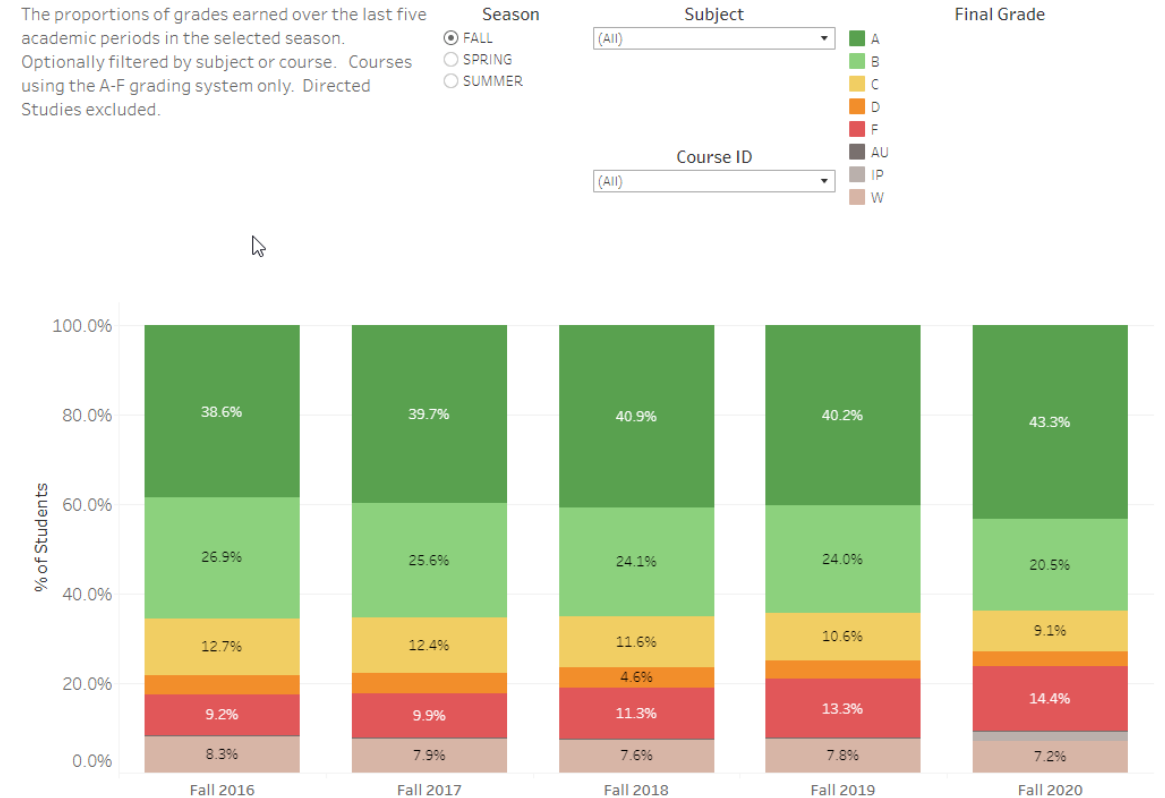- Narrowed down to DWIF rate and grade distribution.

1 *Learn from others!*

Examples we found:

Examples we found:

Course Name	A		B		C		DFW	
	N	%	N	%	N	%	N	%
ENG-W 131	11,115	33%	15,546	46%	4,776	14%	2,429	7%
MATH-M 118	5,360	16%	9,580	29%	8,086	24%	10,075	30%
PSY-P 101	9,143	35%	8,512	33%	4,630	18%	3,230	12%
BUS-K 201	6,237	29%	7,151	33%	3,663	17%	4,340	20%
BUS-A 100	6,817	32%	4,915	23%	2,782	13%	6,560	31%
ECON-E 201	3,840	19%	6,624	32%	4,487	22%	5,654	27%
MATH-M 119	2,168	12%	5,411	29%	4,750	26%	6,051	33%
BUS-T 175	10,687	79%	2,081	15%	302	2%	445	3%
BUS-L 201	3,518	26%	6,182	46%	2,525	19%	1,139	9%
SOC-S 100	4,926	39%	4,665	37%	1,695	13%	1,284	10%
BUS-C 104	6,023	54%	4,580	41%	307	3%	271	2%
BUS-G 202	4,068	37%	4,503	41%	1,766	16%	695	6%
PSY-P 102	4,581	42%	3,542	33%	1,625	15%	931	9%
COLL-C 103	4,650	44%	3,310	31%	1,260	12%	1,327	13%
HISP-S 250	2,953	30%	4,487	45%	1,751	18%	780	8%
BUS-A 201	2,710	28%	3,494	36%	2,058	21%	1,534	16%

Flow from C103 to C117

The nodes (bars) in the diagram to the right sometimes overlap when the information is filtered or unfiltered. They can be "left-click-dragged" to new positions for better node and link visibility

B+ or higher

C- thru B/S

DFW

Not Taken

B+ or higher

C- thru B/S

DFW

Not Taken

Course Grade Distribution Trend (Condensed)
N is number of course enrollments, % is percent of total course enrollments

	Fall 2018		Fall 2019		Fall 2020		Fall 2021	
	N	%	N	%	N	%	N	%
A	72,172	44.00%	72,834	43.62%	75,737	44.48%	69,432	42.60%
B	46,176	27.88%	45,851	27.54%	38,329	22.67%	41,336	25.40%
C	21,196	12.84%	21,663	13.17%	18,308	10.98%	20,286	12.59%
DWIF	23,342	14.75%	24,050	15.18%	26,990	16.77%	29,308	18.97%
Other	905	0.53%	848	0.49%	8,645	5.10%	744	0.44%
Grand Total	163,791	100.00%	165,246	100.00%	168,009	100.00%	161,106	100.00%

Stage 2: What was available in our data?

- Took us a while to understand the data.

- Some examples of the challenges:

  - Class attribute table

  - Learn about rarely used class attributes

  - Snapshots not in sync.

Stage 2: What was available in our data?

- More Challenges:
    - Grading policy changes due to COVID.
    - Courses with both lecture and lab component: grades and credits go to lecture.
    - Courses with "non billable hours" as the course credit level.
    - Courses missing college, department, or instructor information
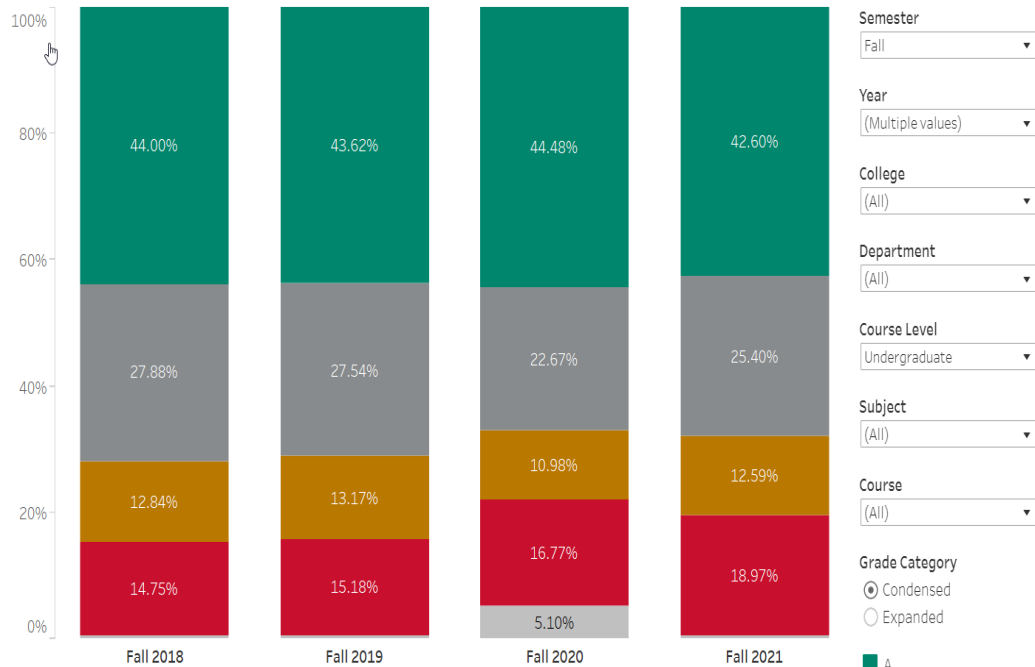

Course Grade Distribution Trend (Condensed)
N is number of course enrollments, % is percent of total course enrollments

	N	%	N	%	N	%	N	%
	Fall 2018		Fall 2019		Fall 2020		Fall 2021	
A	3,000	36.28%	3,028	35.24%	3,852	46.99%	3,530	39.96%
B	3,657	44.07%	3,725	44.31%	3,051	37.05%	3,468	38.75%
C	784	9.33%	786	10.27%	398	4.59%	745	8.25%
DWIF	114	1.33%	120	1.45%	109	1.27%	185	2.07%
Other	819	8.99%	768	8.72%	1,076	10.11%	1,100	10.97%
Grand Total	8,374	100.00%	8,427	100.00%	8,486	100.00%	9,028	100.00%
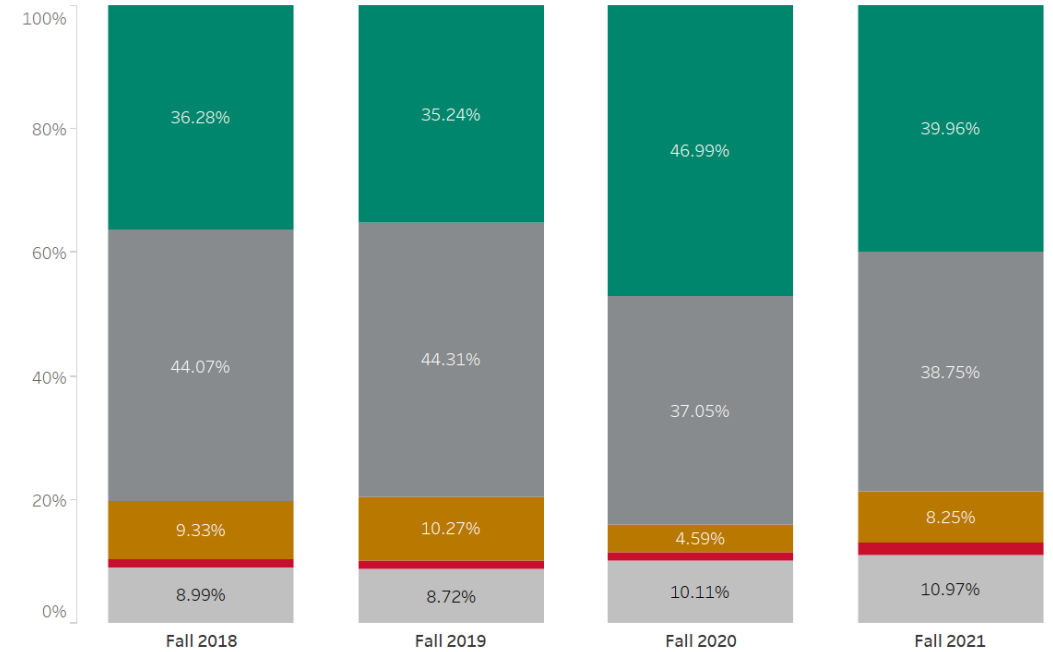
Stage 2: What was available in our data?

- More Challenges:
  - Numbers from the DW vs. CB reports
  - Old courses with nonstandard grades
  - Courses with multiple associated faculty

2 *Make it a team effort!*

Course Grade Distribution (Expanded)
*Other grades include IP, NP, P, S, U and missing grades.
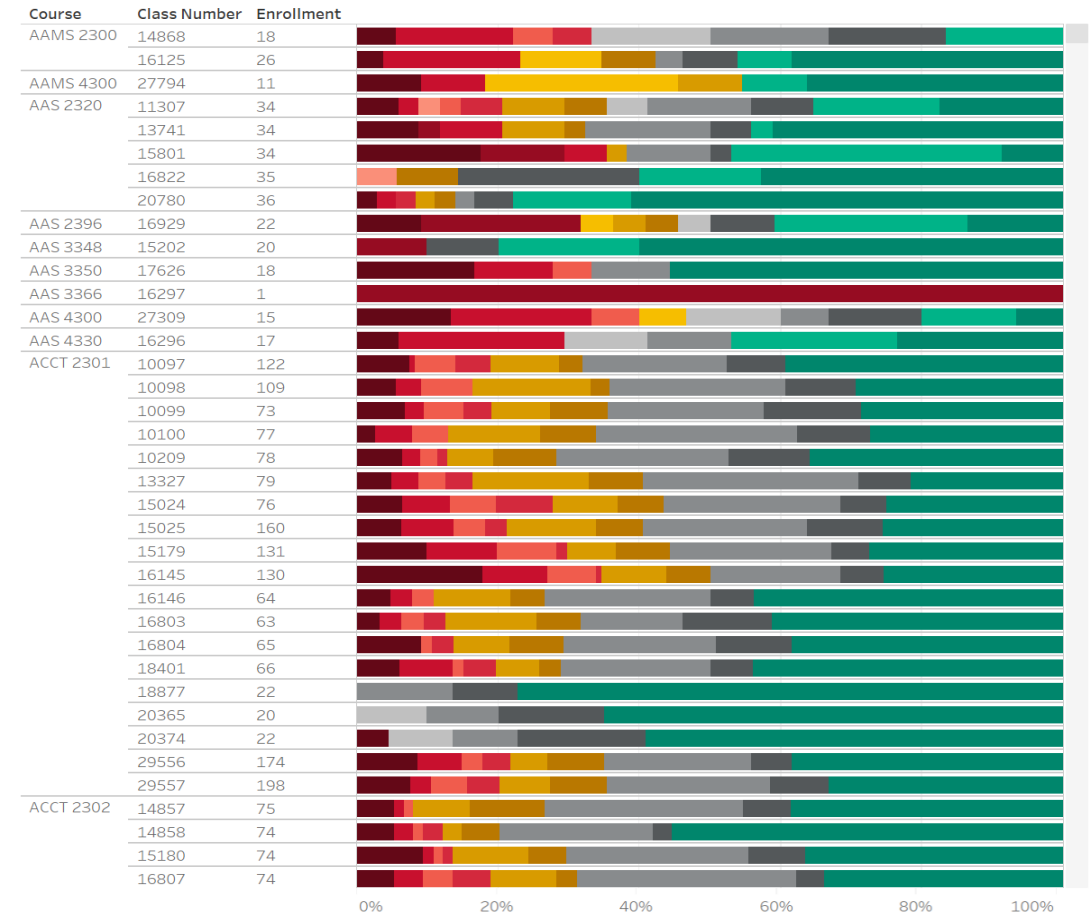
Average GPA and DWIF Rate by Course Level
Hover over instruction mode header and click on [+] to expand to see the detailed breakdown
* N is number of course enrollments, % is percent of total course enrollments
* Teaching assistants are not included in faculty data.

Course Level	Avg. GPA
Freshman	2.58
Sophomore	2.50
Junior	2.93
Senior	3.16

DWIR Rate
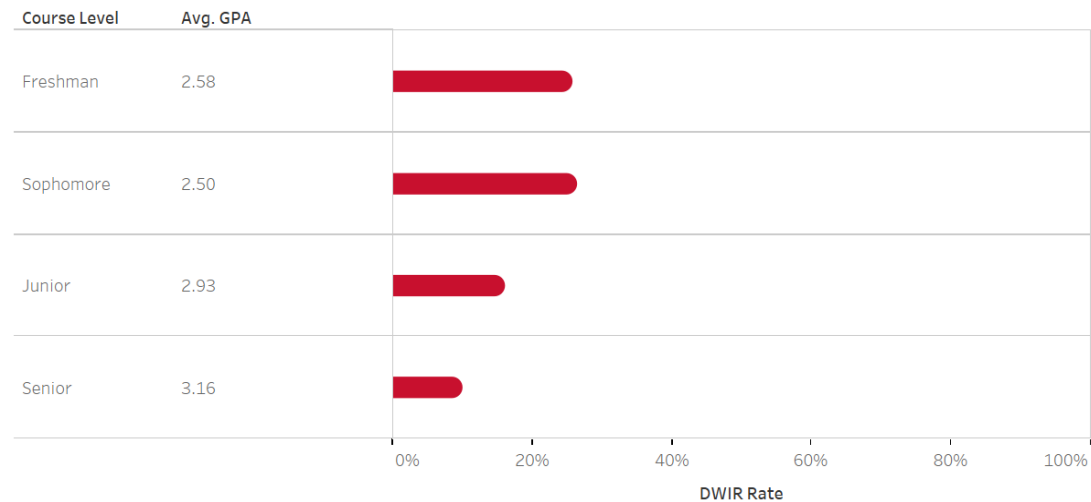
Course Level	N	%	DWIF Rate	Avg. GPA
Senior	27,608	17.14%	8.45%	3.16
Junior	48,492	30.10%	14.53%	2.93
Freshman	46,034	28.57%	24.20%	2.58
Sophomore	38,972	24.19%	24.86%	2.50
Grand Total	161,106	100.00%	18.97%	2.76

Stage 2: What was available in our data?

- Like making human friends, we
  - Read everything about it.
  - Asked people familiar with it to share what they know.
  - Were suspicious when it looked too perfect to be true.
  - Understood that knowing it could take some time.

3 *Make friends with your data!*

Stage 3: How did we wrangle the data into what we needed?

- Our Flow
  - Data preparation done in SAS
  - The logic then shared with the data warehouse team.
  - Tableau extract created in a test environment.
  - Errors/issues ironed out iteratively
  - Tableau extract created in the production environment

4 *Obtain proof of concept in a statistical program!*

Course DWIF Rate Trend
N is number of course enrollments.

Course	Fall 2018	Fall 2019	Fall 2020	Fall 2021
AAMS 2300	7.7%	12.5%	10.3%	27.3%
AAMS 4300	0.0%	0.0%		18.2%
AAMS 4397			0.0%	
AAS 2320	12.0%	14.8%	8.0%	17.9%
AAS 2396	17.6%	9.1%	0.0%	31.8%
AAS 3307			0.0%	
AAS 3310	26.3%	52.9%		
AAS 3330		31.6%	15.8%	
AAS 3348	0.0%	14.8%	20.0%	10.0%
AAS 3350		14.3%	0.0%	33.3%
AAS 3354		17.4%		
AAS 3366	0.0%	100.0%	25.0%	100.0%
AAS 3394	14.9%	26.7%	0.0%	
AAS 4300				40.0%
AAS 4330	20.6%	24.2%	6.7%	29.4%
AAS 4377			50.0%	
ACCT 2301	17.6%	19.2%	4.0%	19.8%
ACCT 2302	14.4%	18.2%	2.3%	14.7%
ACCT 3366	49.2%	51.8%	24.9%	30.3%

Average Course GPA by Semester

Course	Spring 2020	Spring 2021	Fall 2020	Fall 2021
COMM 4398	3.54	3.87	3.40	3.86
COMM 4399		4.00		
COMM 6300	3.20	3.63		
COMM 6305			3.96	3.46
COMM 6310			3.69	3.72
COMM 6326			3.74	
COMM 6335				3.87
COMM 6336		3.62		
COMM 6338	3.33			
COMM 6345			3.55	
COMM 6350		3.61		
COMM 6363		3.07		
COMM 6370			3.90	3.37

Stage 3: How did we wrangle the data into what we needed?

- Issues to Address:
  - Nulls in different data fields
  - College and department aliases (updating alias tables)
  - Subject and catalog number changes due to TCCNS
  - Add or replace data fields (e.g., off_campus not differentiating)

5 *Test! Test! Test some more!*

Stage 4: Did our dashboard ideas work with test data?

- Two-way Iterative in nature

- Dashboard issues addressed through weekly Tableau meetings.

- Data issues addressed with the data warehouse team.

6   *It is not a linear process!*

Average GPA and DWIF Rate by Faculty Rank

Hover over instruction mode header and click on [+] to expand to see the detailed breakdown
* N is number of course enrollments, % is percent of total course enrollments
* Teaching assistants are not included in faculty data.

Faculty Rank	Avg. GPA
Professor	2.60
Assoc. Professor	2.74
Asst. Professor	2.72
Instructor	2.87
Non-Ranked Faculty	2.77
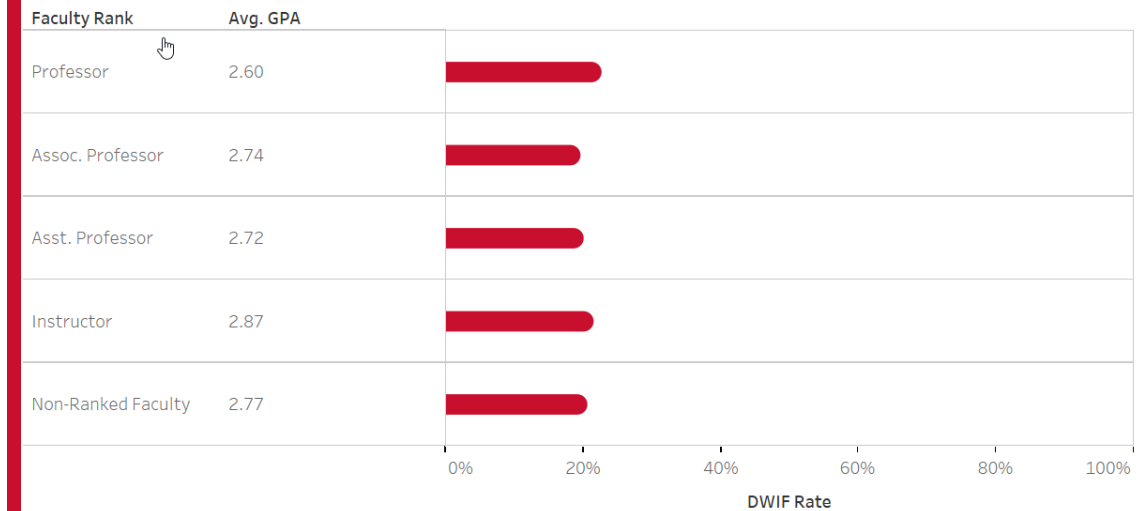
DWIF Rate

Faculty Rank	N	%	DWIF Rate	Avg. GPA
Instructor	15	0.01%	20.00%	2.87
Non-Ranked Faculty	111,613	72.79%	19.09%	2.77
Assoc. Professor	17,509	11.42%	18.09%	2.74
Asst. Professor	9,144	5.96%	18.56%	2.72
Professor	15,054	9.82%	21.15%	2.60
Grand Total	153,335	100.00%	19.15%	2.75

Stage 4: Working the dashboard through test data

- Some issues:
  - Bar in bar vs. regular bar chart?
  - Generic charts vs. fancy charts?
  - How much detail? (custom table)
  - Multiple metrics in one dashboard? (e.g., GPA, DWIF, SCH..)
  - Multiple dimensions in one dashboard?
    - One dimension filters out data

DWIF Rate by Instruction Mode

16.43%

15.41%

14.48%
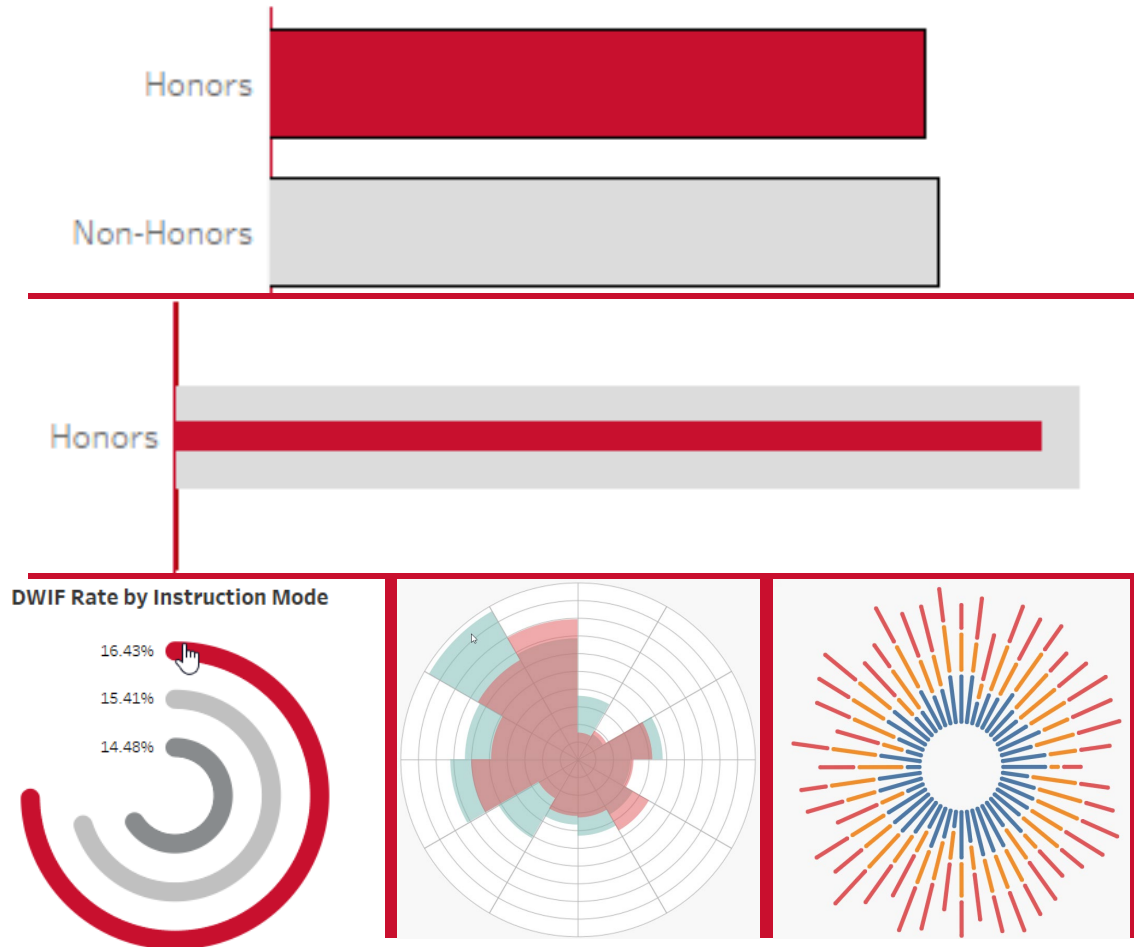
Stage 4: Points to consider

- Usefulness
- User-friendliness
- Maintainability
- Aesthetics

Course Name	A		B		C		DFW	
	N	%	N	%	N	%	N	%
ENG-W 131	11,115	33%	15,546	46%	4,776	14%	2,429	7%
MATH-M 118	5,360	16%	9,580	29%	8,086	24%	10,075	30%
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Gen Ed Course Offering and Enrollment Trends
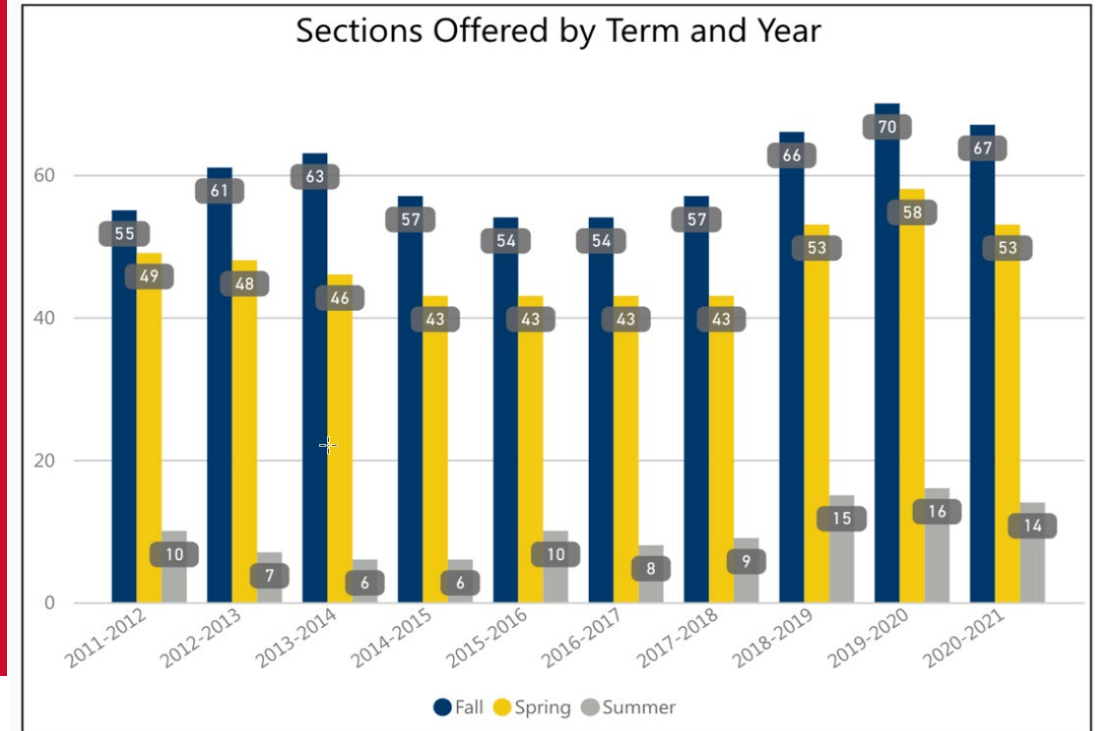The following filters affect only the trend charts below.

Course Subject: All

Course: All

Sections Offered by Term and Year

Fall · Spring · Summer

17

Create a Custom Table

Select the dimensions to create a custom table

Dimension 1: College   Dimension 2: (Blank)   Dimension 3: (Blank)

		Fall 2020		Fall 2021	
		N	Avg. GPA	N	Avg. GPA
Architecture		2,494	3.16	2,615	3.08
	Total	2,494	3.16	2,615	3.08
Total		2,494	3.16	2,615	3.08
Arts		7,877	3.30	6,622	3.28
	Total	7,877	3.30	6,622	3.28
Total		7,877	3.30	6,622	3.28
Business		24,712	2.98	24,434	3.00
	Total	24,712	2.98	24,434	3.00
Total		24,712	2.98	24,434	3.00
CLASS		50,362	2.92	50,153	2.83
	Total	50,362	2.92	50,153	2.83
Total		50,362	2.92	50,153	2.83
Education		9,337	3.49	8,874	3.39
	Total	9,337	3.49	8,874	3.39
Total		9,337	3.49	8,874	3.39
Engineering		7,904	2.73	7,754	2.78
	Total	7,904	2.73	7,754	2.78
Total		7,904	2.73	7,754	2.78
Exploratory Studies		304	3.49	446	3.23
	Total	304	3.49	446	3.23
Total		304	3.49	446	3.23
GHL		3,139	3.15	2,861	3.19
	Total	3,139	3.15	2,861	3.19
Total		3,139	3.15	2,861	3.19
NSM		45,547	2.54	42,749	2.27
	Total	45,547	2.54	42,749	2.27
Total		45,547	2.54	42,749	2.27
Nursing		491	3.51	491	3.72
	Total	491	3.51	491	3.72
Total		491	3.51	491	3.72
Social Work		16	3.23	10	3.90
	Total	16	3.23	10	3.90
Total		16	3.23	10	3.90
Technology		15,826	2.94	14,097	2.81
	Total	15,826	2.94	14,097	2.81

Stage 5: How could we link up real data with our dashboard in a production environment?

- Data issues resolved

- Dashboard concepts validated

- Tableau extract created in the production environment.

- Data source switched to production data.
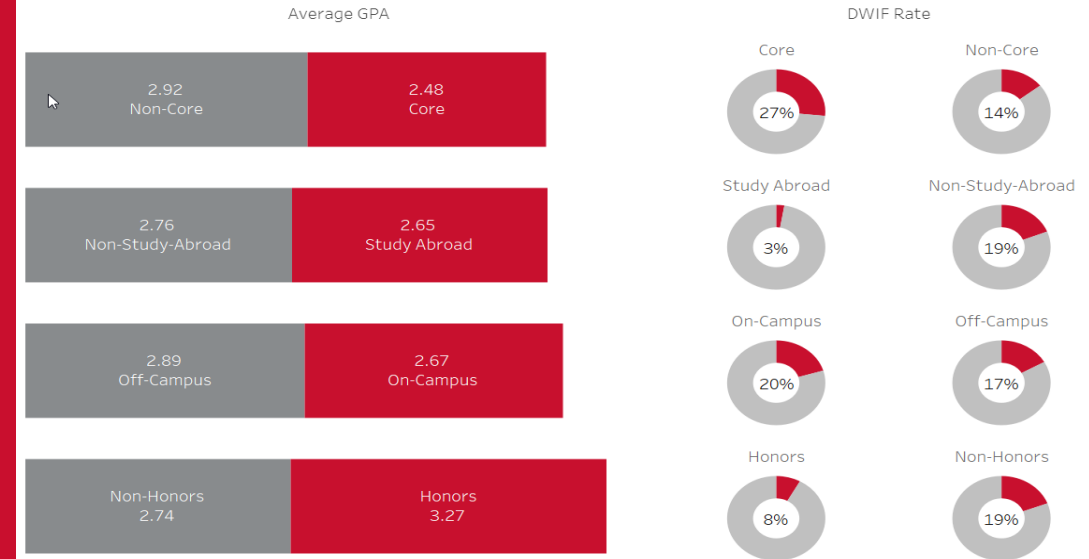
- New issues subsequently addressed

7 *Be flexible! Deal with new issues as they arise!*

Stage 6: How could we ensure that our dashboards are maintained and updated?

- Have a maintenance plan.
  - Develop documentation.
  - Identify the individuals responsible for the data source and the dashboard.
  - Be responsive to the feedback from actual users.

8 *It ain't over yet!*

Undergraduate GPA and DWIF Rate by Course Category

Average GPA

2.92 Non-Core	2.48 Core
2.76 Non-Study-Abroad	2.65 Study Abroad
2.89 Off-Campus	2.67 On-Campus
Non-Honors 2.74	Honors 3.27

DWIF Rate

Core 27% Non-Core 14%
Study Abroad 3% Non-Study-Abroad 19%
On-Campus 20% Off-Campus 17%
Honors 8% Non-Honors 19%

* N is number of course enrollments, % is percent of total course enrollments

	N	%	DWIF Rate	Avg. GPA
Non-Core	105,046	65.20%	14%	2.92
Core	56,060	34.80%	27%	2.48
Study Abroad	75	0.05%	3%	2.65
Non-Study-Abroad	161,031	99.95%	19%	2.76
Honors	3,877	2.41%	8%	3.27
Non-Honors	157,229	97.59%	19%	2.74
Off-Campus	62,726	38.93%	17%	2.89
On-Campus	98,380	61.07%	20%	2.67

Dashboard Demo

- Course Grade Performance

Contact:

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Any questions?