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Using Advanced Analytics to Boost Student Success

Dr. Braden J. Hosch, Asst. Vice President for Institutional Research, Planning & Effectiveness, Nov. 11, 2018

Overview

- Institutional profile and grad rate improvements
- Initiatives
- “Traditional” IR / Analytics
- Predictive Analytics
- Takeaways

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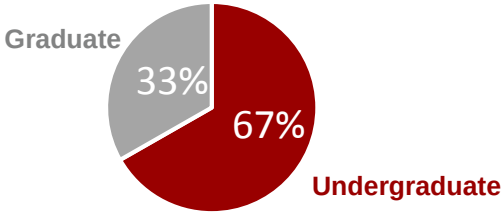
Stony Brook University Institutional Profile

Students:

26,254

Fall headcount



Institution:

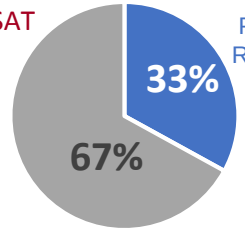
Doctoral, Highest Research Activity

Founded 1957, joined AAU 2001

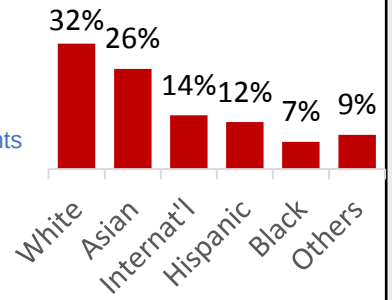
Undergraduate Profile

1323

avg. SAT

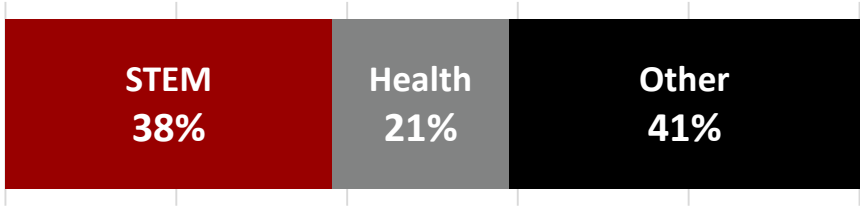


Pell Recipients



Program Profile

7,272 Completions 2017-18



Employees:

14,732 including hospital

2,704 faculty (FT & PT)

Finance:

2.5 billion USD annual budget

230 million USD research exp.

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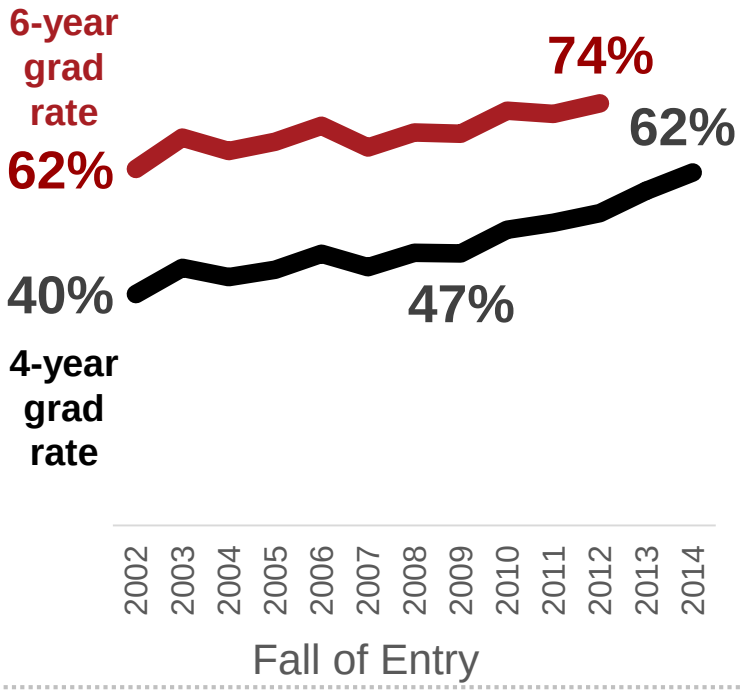
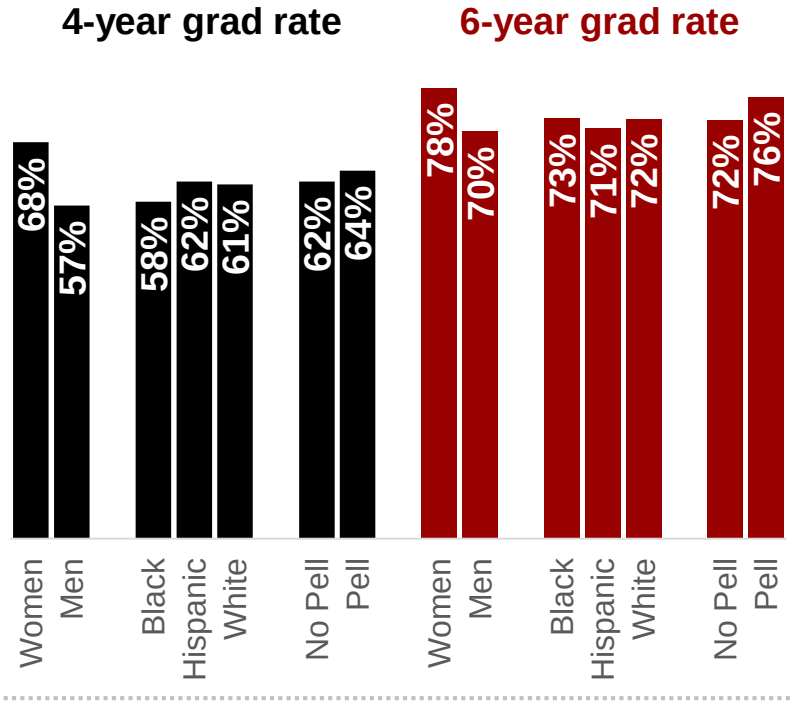
Freshman graduation rates increased fifteen percentage points in the last five years; equity gaps are largely closed





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Improvements realized through multi-pronged approach

Broad-based academic success team	"Traditional" institutional research	In-house analytics
3rd-party analytics	Policy and procedure reform	Mini-grants to seniors
Attention to special populations	Expanded advising	Class availability

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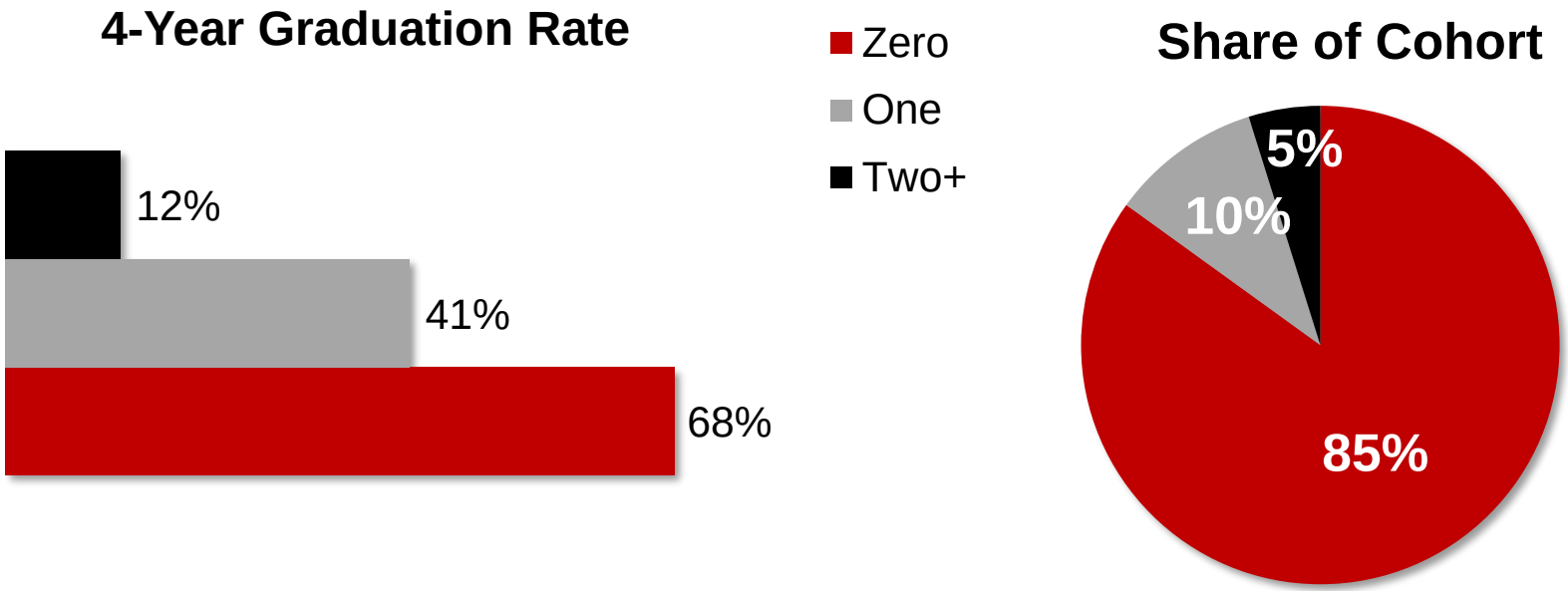
Traditional IR - grad rates by DFW rates

Number of 1st Term Course Grades of D, F, W or U



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Source: IRPE Grad Rate data set v31; cohort entering 2014

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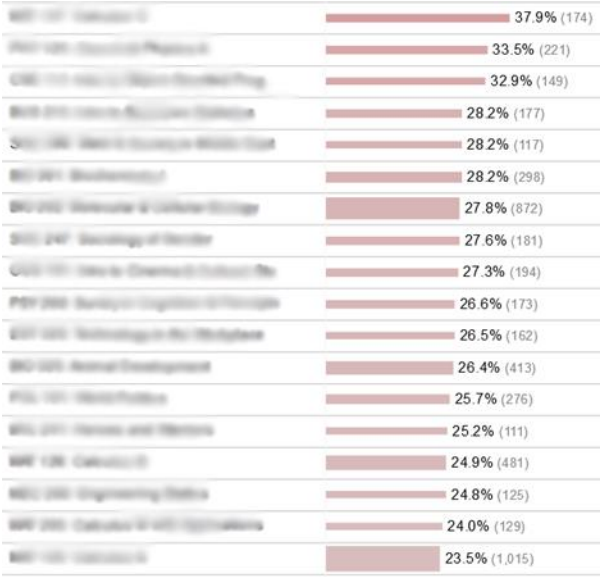
Address Courses with Higher DFW Rates

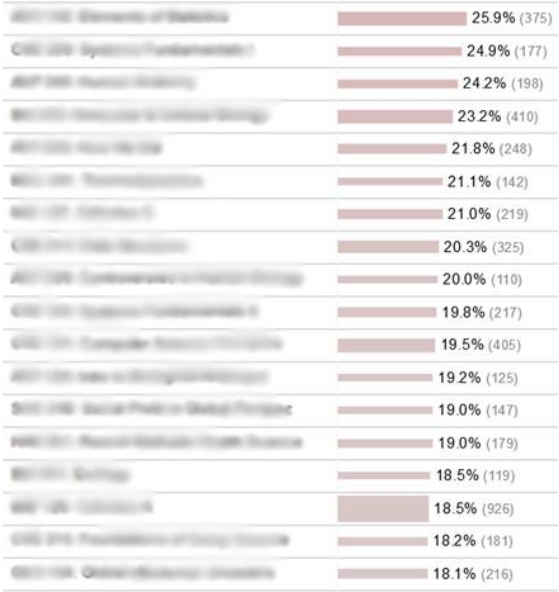
Top 18 Fall 2010 courses

23.5%-37.9%



Top 18 Fall 2017 courses

18.1%-25.9%



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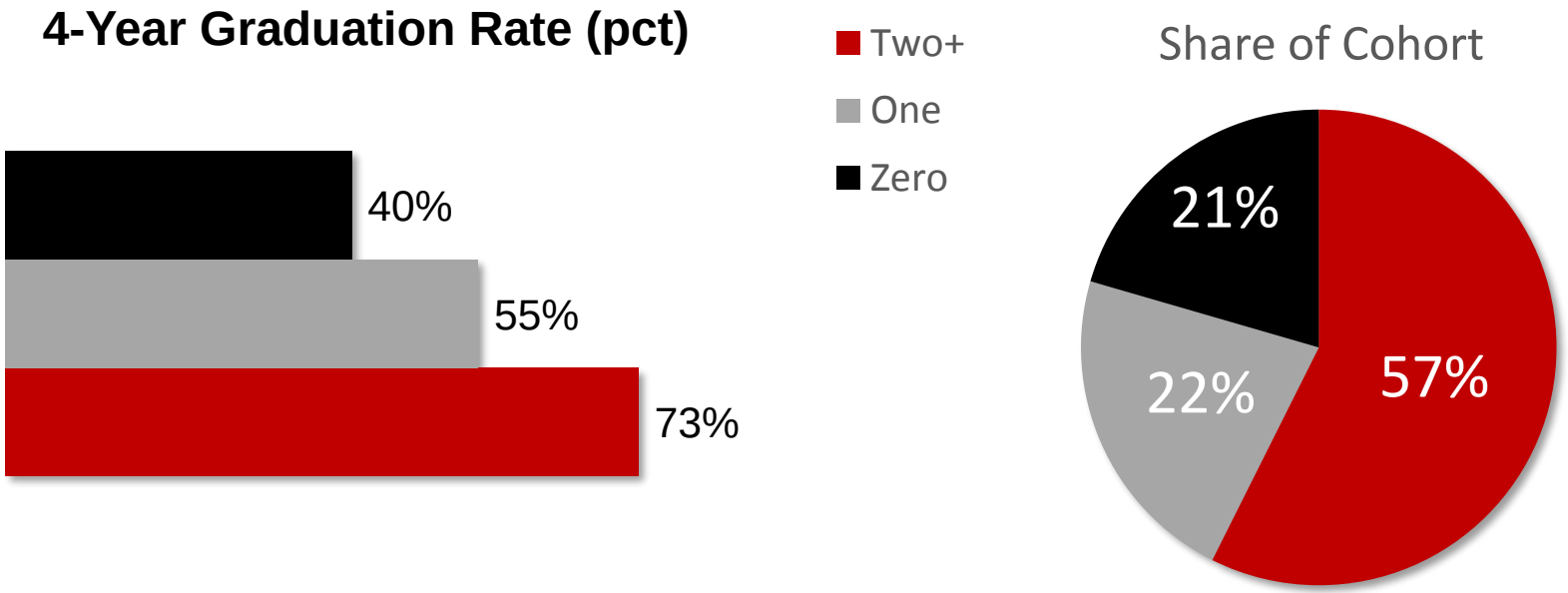
Exploratory IR – number of course grades of A

Number of 1st Term Course Grades of A or A-



Source: IRPE Grad Rate data set v31; cohort entering 2014

Method for local analytics: student-level predictions

Credit to: Nora Galambos, Ph.D., Senior Data Scientist

Decision trees using SAS Enterprise Miner

Classification and Regression Trees (CART) method	Clustering to reduce multi-collinearity	Imputation of some but not all missing values	Data partitioned into training, test, and validation sets

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Data included in model

Demographics	Pre-college academic characteristics	College academic characteristics	Transactions, service utilization, activities.	Financial aid
• Gender • Race/ethnicity • geographic residence when admitted.	• SAT scores • high school GPA • average SAT scores of the high school (to control for high school GPA).	• Credits accepted when admitted • AP credits • number of STEM and non-STEM courses current term • enrollment in high DFW courses • area of major.	• **Learning management system (LMS) logins** • advising visits • tutoring center utilization • intramural and fitness class participation	• Expected family contribution AGI • types and amounts of disbursed aid • Pell, Tuition Assistance Program (TAP).

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LMS Data Processing

- Count only one login per course per hour
  - A course can have up to 24 logins per day
  - Eliminates multiple logins just few minutes apart.
- Logins totaled by week
- Per-course login rates calculated for STEM and non-STEM courses
- Class assignment grades not yet included
  - Timing and data processing issues
  - Completeness issues
  - Significant noise and false positives

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Decision Tree Model for Freshmen GPA: Part 1—HS GPA <= 92.0

HS GPA<=92.0

LMS logins per non-STEM crs, wk 2-6 >=11.3 or missing

Avg. HS SAT CR >570

SAT Math CR >1360

- AP STEM Crs>= 1 → Avg. GPA = 3.63, N = 46
- AP Stem Crs = 0 → Avg. GPA = 3.20, N = 23

SAT Math CR <=1360

- Highest DFW STEM Crs. Rate>= 17% → Avg. GPA = 2.92, N= 34
- Highest DFW STEM Crs. Rate <17% → Avg. GPA = 3.25, N=94

Avg. HS SAT CR<=570

Logins per STEM crs, wk 2-6 >=32.2

- SAT Math >=680 → Avg. GPA = 3.35, N=78
- SAT Math< 680 or miss. → Avg. GPA = 3.09, N = 121

Logins per STEM crs, wk 2-6 <32.2

- Non-STEM crs logs > = 3 or miss. → Avg. GPA = 2.94, N = 371
- Non-STEM crs logins <3 → Avg. GPA = 2.53, N = 57

LMS logins per non-STEM crs, wks 2-6<11.3

Avg. HS SAT CR >=540

AP STEM Crs. >=1

- STEM crs logs Wk. 1>=5 or miss. → Avg. GPA = 3.21, N = 64
- STEM crs logs Wk 1 < 5 → Avg. GPA = 2.69, N=16

AP STEM Crs = 0

- STEM logs Wk. 1 >=5 or miss. → Avg. GPA = 2.75, N = 73
- STEM crs logs Wk. 1 <5 → Avg. GPA = 2.12, N= 18

Avg. HS SAT CR < 540

Logs per STEM crs, wk 2-6 >=5.3 or miss

- STEM crs logs Wk 1 >=1 or miss. → Avg. GPA = 2.62, N = 305
- STEM crs kogs Wk 1 = 0 → Avg. GPA = 1.94, N = 25

Logs per STEM crs. wk 2-6 < 5.3

- Avg. GPA = 1.59, N = 13

Decision Tree Model for F14 Freshmen GPA: Part 2—HS GPA > 92.0

HS GPA>92.0 or Missing

Scholarship = Yes

HS GPA >=96.5 or missing

Math Placement Exam >= 5	Math Placement Exam < 5
Logs per STEM Crs., wks 2-6 >=15.6	Logs per STEM Crs, wk 2-6 <15.6	Ethnic Group = White, Hisp.	Ethnic Group= Asian, Afr. Amer., Unk.
Avg. GPA = 3.63 N = 285	Avg. GPA 3.40 N = 83	Avg. GPA =3.50 N= 73	Avg. GPA = 3.05 N=30

HS GPA < 96.5

Logs per non-STEM crs,wks 2-6 >=29.1	Logs per non-STEM crs,wks 2-6 <29.1
SAT Math >=700	SAT Math <700 or miss.	Avg HS. CR, M Wrt >=1830 miss	Avg. HS CR, M, Wrt< 1830
Avg. GPA = 3.76 N=26	Avg. GPA = 3.52 N = 74	Avg. GPA = 3.59 N = 54	Avg. GPA = 3.13 N = 54

Scholarship = No

LMS logins per non-STEM crs. Wk 2-6 >=10.4

AP STEM Crs. >=1	AP STEM Crs = 0
DFW STEM Crs Total >=2	DFW STEM Crs Total <2	SAT Math >=760	SAT Math <760
Avg. GPA = 3.23 N = 163	Avg. GPA = 3.49 N=101	Avg. GPA = 3.76 N = 11	Avg. GPA = 3.03 N= 194

LMS logins per non-STEM crs. wk 2-6 < 10.4

Logs per STEM crs, wks 2-6 >=10.9 or miss.	Logs per STEM crs. wks 2 6 < 10.9
DFW non-STEM 1st yrs >=28%	DFW non-STEM 1st yrs <28%	STEM Crs logs Wk 1 >=8	STEM Crs logs Wk 1 <8 or miss
Avg. GPA = 3.05 N = 72	Avg. GPA = 2.90 N = 73	Avg. GPA= 1.30 N=11	Avg. GPA = 2.52 N = 16

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Analytics dashboard

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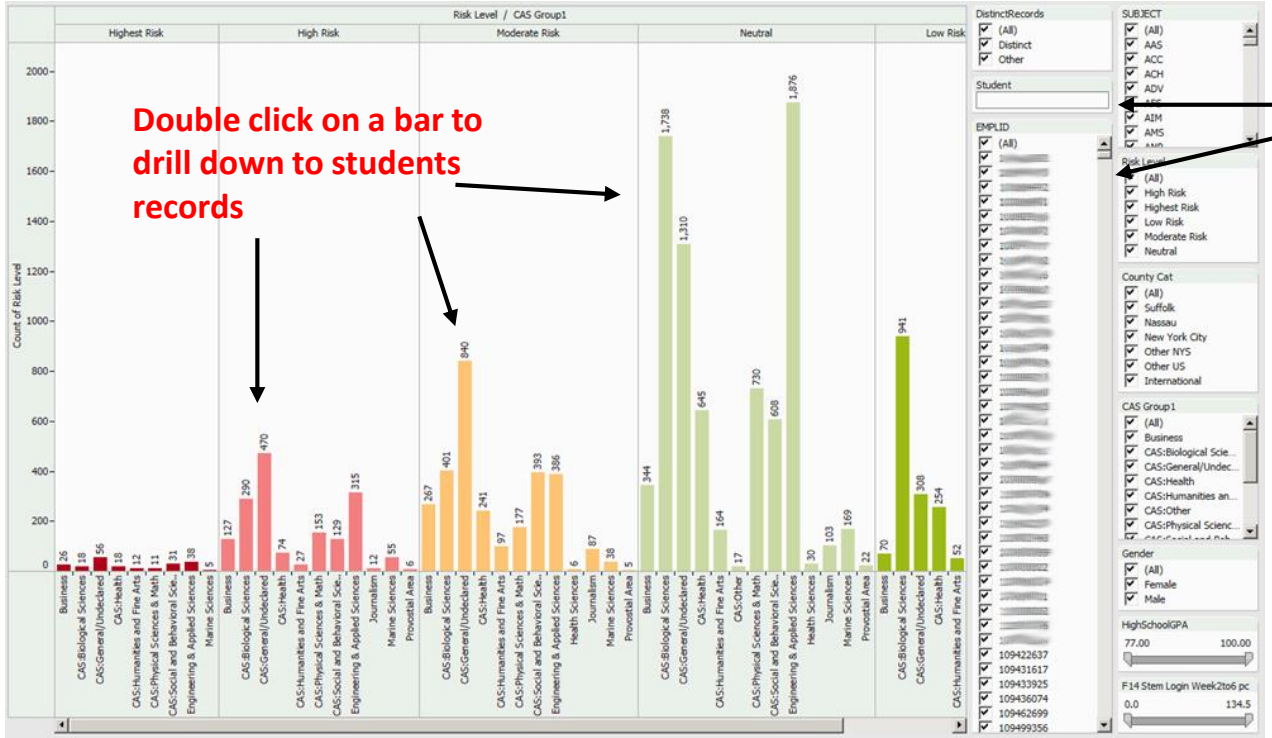
Population monitoring and drill to detail



Search for a student's name or choose an ID

HS GPA and LMS login sliders

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Final thoughts

Selected Technical considerations

- Information delivery
- Data quality/governance
- False positives/negatives

Use of analytics is not just technical

- Culture change
- Trust
- Ethics