

CGS 2005 Summer Workshop:

Ph.D. COMPLETION AT DUKE UNIVERSITY:

SOME INTERVENTIONS AND THEIR INITIAL EFFECTS



Faculty consensus on Graduate School goals and policies in early 1990's:

- ◆ All aspects of the Graduate School should be as transparent as possible to faculty and students.
- ◆ The Graduate School should be a major reservoir of information to permit administration, faculty, and students to assess the relative quality of departments and programs over time. The Graduate School should collect and publish data on student quality, progress to degree, job placements.
- ◆ The Graduate School should base allocation of funds to departments on rational criteria that provide incentives for improvements in quality of graduate programs.



A STUDY OF Ph.D. COMPLETION AT DUKE:

Ph.D. cohorts from Fall 1991 through Fall 1995 were examined for each Duke degree granting program for

- ◆ % Completion (as of Fall 2004)
- ◆ Patterns of withdrawal from Ph.D. program
- ◆ Median Time to Degree
- ◆ Effect of Variables such as GRE scores, GPA, Race, Gender, and Merit Fellowship selection
- ◆ Following Some Interventions, Attrition Rates Through 5th Year Were Compared for 1996-99 and 1991-95 Cohorts



EFFECT OF GPA/GRE SCORES, J.B. DUKE FELLOWSHIP SELECTION, RACE, AND GENDER ON Ph.D. COMPLETION RATES (1991-95 Cohorts)

| <u>Type of Matriculant</u> | <u>Biol Sci</u> | <u>Phys Sci/ Eng'g</u> | <u>Human/ Soc Sci</u> | <u>Grad Sch</u> |
|----------------------------|-----------------|----------------------------|---------------------------|-----------------|
| All matriculants | 73% | 60% | 61% | 64% |
| Low GPA (3.2-) | 75% | 60% | 60% | 63% |
| High GPA (3.7+) | 71% | 65% | 60% | 64% |
| Low GRE-V (590-) | 75% | 60% | 60% | 64% |
| High GRE-V (710+) | 65% | 59% | 59% | 60% |
| Low GRE-Q (590-) | 70% | --- | 60% | 63% |
| High GRE-Q (710+) | 72% | 60% | 64% | 64% |
| J.B.Duke Fellows | 79% | 70% | 69% | 73% |
| African-American | 83% | 23% | 73% | 64% |
| Males | 76% | 60% | 62% | 65% |
| Females | 67% | 59% | 60% | 62% |



CONCLUSIONS:

- High GRE (V and Q) and high GPAs do not correlate well with Ph.D. completion in any field.



N. KUNCCEL'S META-ANALYSIS OF "PREDICTORS" OF GRADUATE STUDENT SUCCESS IN ALL FIELDS

| <u>Criterion</u> | <u>GRE-V</u> | <u>GRE-Q</u> | <u>GRE-S</u> | <u>UGPA</u> |
|----------------------------|--------------|--------------|--------------|-------------|
| 1st Year GGPA | 0.34 | 0.38 | 0.45 | 0.33 |
| Faculty Ratings | 0.42 | 0.47 | 0.50 | 0.35 |
| Attains Degree | 0.18 | 0.20 | 0.39 | 0.12 |
| Research Productivity | 0.09 | 0.11 | 0.21 | |
| Publication Citation Count | 0.17 | 0.23 | 0.24 | |
| Time to Degree | 0.28 | -0.12 | 0.02 | -0.08 |

*N.R. Kuncel, S.A. Hezlett, D.S. Onez. (2001) *Psychol. Bull.* 127: 162-181.



CONCLUSIONS:

- Duke faculty CAN pick students who are more likely to complete than the general population based on reading of applications. In all fields, J.B.Duke fellowship awardees complete significantly more than others with similar high GRE scores and GPA's.



CONCLUSIONS:

- CAREFUL SELECTION, TARGETED FELLOWSHIP SUPPORT AND GOOD MENTORING DO WORK: Duke's African-American Ph.D. students complete the degree at higher rates than the general population (and even the JB Duke scholars) in all fields except the Physical Sciences and Engineering (where the numbers are very low).



INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: BETTER INFORMED SELECTION

- Reduce emphasis on GRE scores and GPA's – data show poor correlation with completion as Duke uses them
- Carefully read entire application: Emphasize demonstrated research experience
- Interview students before admitting them – campus visits and/or by telephone with international students



INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: BETTER INFORMED SELECTION

- Exchange information to learn “fit” rather than just sell program
- Transparency: Put on Web all Duke data on placement, time to degree, completion rates in each program – student should know what (s)he is getting into before undertaking Ph.D. study at Duke



INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: IMPROVED PROGRAMS

- Require structured teaching experiences for graduate TA's where career-appropriate
- Graduate school workshops in pedagogy and uses of instructional technology; expanded PFF program; Pathways to the Professoriate
- Field-specific symposia to introduce career options to Ph.D. students



INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: STUDENT FUNDING

- Institute 5-6 year funding guarantee in all A&S units; generally support to degree in sciences
- Reduce student teaching loads; more fellowship in early years – Lab Science departments brought closer to Biomedical Sciences funding model
- Competitive summer research support introduced
- Changed the way funds for Ph.D. student support are allocated to A&S departments



Allocation Formula for A&S Depts

- FTE are allocated to departments according to a set of criteria which provide positive incentives to improve graduate education in that department



Allocation Formula for A&S Depts

- Departments compete for a fixed pool of FTE's available in each division
- *Factors used to determine FTE allocation:*
 - ◆ Number of graduate faculty in dept
 - ◆ Number of faculty supervising Ph.D.s
 - ◆ Relative Ph.D. completion rate
 - ◆ Student quality: number of competitive merit fellowship recipients
 - ◆ Number of Ph.D. students in years 1-5 (or 6) supported on external funds



EFFECT OF INTERVENTIONS ON COMPLETION

Compare attrition in first 5 years for Fall 1996-99 vs. Fall 1991-95 cohorts:

- Significant reduction in attrition in disciplines where funding change is greatest: Humanities 5-year attrition reduced from 25% to 18%. Effect strongest in Language instruction departments where reduction in required service greatest.
- Reduced attrition in the most TA-dependent Physical Science departments (Chemistry, Math)



YEAR 1-5 ATTRITION AFTER "INTERVENTION":

Significant improvement in Humanities, particularly in highly T.A.-dependent Language & Literature departments

| Program | 1991-95 Cohorts | | | | | 1996-99 Cohorts | | | |
|--------------------|-----------------|----------------------------|-----------|-------------|-------------|----------------------------|-----------|-------------|--|
| | No. Matrics | %Matrics Withdrawn in Year | | | No. Matrics | %Matrics Withdrawn in Year | | | |
| | | 1 to 3 | 4 to 5 | Tot Yrs 1-5 | | 1 to 3 | 4 to 5 | Tot Yrs 1-5 | |
| Slavics | 13 | 38% | 0% | 38% | 2 | 0% | 0% | 0% | |
| Art History | 10 | 10% | 0% | 10% | 10 | 10% | 0% | 10% | |
| Religion | 61 | 10% | 3% | 13% | 38 | 8% | 5% | 13% | |
| Literature | 48 | 8% | 4% | 13% | 30 | 10% | 3% | 13% | |
| Classics | 23 | 48% | 0% | 48% | 14 | 14% | 0% | 14% | |
| English | 73 | 16% | 7% | 24% | 42 | 14% | 5% | 19% | |
| Philosophy | 25 | 24% | 0% | 24% | 14 | 21% | 0% | 21% | |
| Romance Studies | 45 | 33% | 2% | 36% | 30 | 17% | 7% | 23% | |
| Music | 32 | 28% | 0% | 28% | 19 | 21% | 5% | 26% | |
| German | 14 | 36% | 7% | 43% | 11 | 0% | 27% | 27% | |
| HUMANITIES | 344 | 22% | 3% | 25% | 210 | 13% | 5% | 18% | |
| GRAD SCHOOL | 1843 | 23% | 6% | 29% | 1380 | 23% | 6% | 29% | |



EFFECT OF INTERVENTIONS ON COMPLETION

Compare attrition in first 5 years for Fall 1996-99 vs. Fall 1991-95 cohorts:

- Virtually no overall effect on Biological Sciences, where attrition already lowest and funding with choice already in place
- Attrition worsens in most “tub on own bottom” units (EOS, Engineering) and others (Economics) that resist following Graduate School’s new budgeting system and/or recruit students directly into labs on research grants.



YEAR 1-5 ATTRITION AFTER "INTERVENTION":

Highly T.A.-dependent Physical Science depts generally improve;

"Tub on own bottom" depts in Engineering, EOS get worse

| Program | 1991-95 Cohorts | | | | | 1996-99 Cohorts | | | | |
|---------------------------|-----------------|----------------------------|-----------|-------------|-------------|----------------------------|-----------|-------------|--|--|
| | No. Matrics | %Matrics Withdrawn in Year | | | No. Matrics | %Matrics Withdrawn in Year | | | | |
| | | 1 to 3 | 4 to 5 | Tot Yrs 1-5 | | 1 to 3 | 4 to 5 | Tot Yrs 1-5 | | |
| Chemistry | 103 | 27% | 7% | 34% | 85 | 21% | 4% | 25% | | |
| Statistics | 28 | 29% | 0% | 29% | 27 | 26% | 0% | 26% | | |
| Mathematics | 43 | 34% | 7% | 40% | 28 | 29% | 4% | 32% | | |
| Physics | 63 | 32% | 6% | 38% | 46 | 30% | 4% | 35% | | |
| Computer Science | 52 | 23% | 13% | 37% | 45 | 27% | 13% | 40% | | |
| Earth & Ocean Sciences | 30 | 43% | 10% | 53% | 18 | 50% | 11% | 61% | | |
| PHYSICAL SCIENCES | 319 | 30% | 8% | 38% | 249 | 27% | 6% | 33% | | |
| Biomedical Engineering | 67 | 16% | 10% | 27% | 72 | 13% | 8% | 21% | | |
| Mechanical Engineering | 70 | 24% | 3% | 27% | 46 | 37% | 4% | 41% | | |
| Electrical & Computer Eng | 70 | 34% | 9% | 43% | 87 | 46% | 5% | 51% | | |
| Civil & Environmental Eng | 52 | 42% | 8% | 50% | 38 | 63% | 5% | 68% | | |
| ENGINEERING | 259 | 29% | 7% | 36% | 243 | 37% | 6% | 43% | | |
| GRAD SCHOOL | 1843 | 23% | 6% | 29% | 1380 | 23% | 6% | 29% | | |



Data Can Lead to Change:

- Based on the results from Duke's completion data project, Engineering has agreed that allocations for its departmental Ph.D. programs will be based on A&S factors.
- Engineering Ph.D. students are to be admitted with year 1 fellowships rather than tied to research grant support in a particular laboratory.

