Research Focus II:
Insights in Higher Education Research for Enrollment Managers

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ACT
This new ACT publication is an annual report offering meaningful research insights for some of the most pressing questions impacting admissions and enrollment practice.

In the first release of this report, ACT research sheds light on the following topics:

- the practice of super-scoring
- STEM major choice
- factors impacting retention and transfer
- test optional admission policy
- benefits for students who opt in to the ACT Educational Opportunity Service (EOS)
Roadmap

• Who will declare a STEM major?

• Retention, Transfer, and Drop Out: Oh My!

• Enrollment Management Dashboard Prototype
Who will declare a STEM major?
The Role of Achievement and Interests
Issue

• STEM occupations are projected to grow at a higher rate than all occupations from 2012 to 2022 (Vilorio, 2014)
  – 13 percent vs. 11 percent
  – Shortage of STEM workers?

• New initiatives to promote STEM interest and participation among U.S. students
  – Committee on Science, Technology, Engineering, and Math Education
Leaky STEM Pipeline

• Interest in STEM is high
  – 50% of 2016 ACT-tested high school graduates expressing interest in majoring in STEM or having measured interests in STEM (ACT, 2016)

• STEM enrollment is significantly lower
  – Fewer than 30% of students actually declare a STEM major in college (Chen, 2009; Chen & Ho, 2012)
Literature

- Theory of Planned Behavior (Ajzen, 1991)
  - Intentions are believed to be the most immediate antecedent of behavior

- Person-Environment Fit
  - People seek out environments that match their interest, abilities, skills, values and attitudes
    - Theory of Vocational Choice (Holland, 1997)
    - Theory of Work Adjustment (Dawis & Lofquist, 1984)
Academic Fit: STEM Benchmark

Probability of achieving specific first-year college GPAs by ACT STEM score for STEM majors at a typical four-year institution

(Radunzel et al., 2015)
Current Study

• Objective
  – Which students are more likely to declare a STEM major?
  – Do the predictors differ by STEM major cluster?

• ACT definition of STEM (four clusters)
  – Computer Science and Mathematics
  – Science
  – Engineering and Technology
  – Medical and Health
Study Sample

• ~91,000 first-time entering students
  – 2005 to 2009 freshman cohorts
  – 43 four-year institutions

• 39% declared a STEM major during first term
  – 4% CS & Math
  – 16% Science
  – 11% Engineering & Technology
  – 8% Medical & Health
Multidimensional Model of STEM Enrollment

- Achievement levels
  - ACT STEM and ELA scores
  - HS math and science coursework
  - HSGPA
- Intended major and measured interests
  - Intended major (STEM, non-STEM, undecided)
  - Level of certainty of major intention
  - Measured interests in STEM (based on ACT Interest Inventory)
- Demographic characteristics and educational goals
STEM Major Choice by Intended Major and Major Sureness

- **Not Sure**: 51%
- **Fairly Sure**: 61%
- **Very Sure**: 70%

Intended Major:

- **STEM**
  - Not Sure: 21%
  - Fairly Sure: 17%
  - Very Sure: 14%

- **Non-STEM**
STEM Major Choice by ACT STEM Score and Intended Major
The Power of Three

1. ACT Readiness
2. STEM Intentions
3. Sureness of STEM Intentions

STEM Major

Probabilities range from 0.78 to 0.92
STEM Major Choice by Intended Major and STEM Interest

For students who are very sure about their major intentions
## Predictors of STEM Major Choice by Cluster (vs. Non-STEM)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sci</th>
<th>CS &amp; Math</th>
<th>Eng &amp; Tech</th>
<th>Med &amp; Hlth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Minority</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>HS academic preparation/achievement in mathematics and science</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculus</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>ACT STEM score</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>Intended major, interests and educational plans</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intended STEM major</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Measured STEM interest</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Beyond bachelor's degree</td>
<td>+</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

+ indicates more likely, — indicates less likely
The Role of Achievement and Interests on STEM Success
(Radunzel, Mattern, & Westrick, 2016)

Six-year STEM bachelor’s degree completion rates

- Average ACT Math & Science score:
  - < 22.5
  - 22.5 to 25.5
  - >= 26

- Expressed & measured interest
- Expressed interest only
- Measured interest only
- No interest
STEM Major Choice Study Implications

• Institutions can use this information to
  – Recruit and admit STEM students
    • ACT EOS (Equal Opportunity Service) selection to identify specific types of prospective students
    • Undecided students with high STEM scores
  – Determine resource needs
    • Lab space, course offerings, etc.

• Foster STEM exploration, interests, and readiness
Retention, Transfer, and Drop Out: Oh my!

Using incoming student information to identify students at-risk of not returning...
Recent study suggests that only

- 60% of four-year students complete a degree from initial institution within six years (Kena et al., 2016)
- 28% of two-year students complete a degree from initial institution within three years

Largest share leave initial institution during their first two years (Bradburn, 2002; Tinto, 2012)
Factors Related to Student Retention

- Pre-entry attributes
  - Academic readiness — Demographics
- Academic goals and commitments
- Institutional experiences
- Academic and social integration into college environment
  - Living on campus — Enrolling full-time
  - Participating in activities — Attending closer to home
  - Attending institution that matches preferences
- External commitments
  (Tinto, 1975; 1993)
Early Alert/Warning Systems

- Early identification of at-risk students in need of institutional services and supports (Tampke, 2013)
  - Identify those that may not return in year 2
    - Academic jeopardy
    - Difficult assimilating into college environment
  - Based on holistic view of student readiness and needs
Current Study

• **Objective**
  - Examine the use of incoming student information from ACT record for early identification of at-risk students
  - Determine where transfer students are going

• **Study Sample**
  - More than 630,000 first-time entering students
    - 2014 freshman cohort
    - Nearly 1,150 two- and four-year institutions with at least 50% ACT-tested
  - Tracked through fall 2015 using NSC data
Study Outcomes

- Fall-to-fall retention at year 2 – multinomial outcome
  - Returned to initial institution
  - Transferred to another institution
  - Dropped out (not enrolled in college)

- Type of institution transferred to year 2 – binary outcome
  - Four-year sample: reverse vs. lateral transfer
    - “Transferred down” from 4-year to 2-year (vs. 4- to 4-year)
  - Two-year sample: vertical vs. lateral transfer
    - “Transferred up” from 2-year to 4-year (vs. 2- to 2-year)
Retention and Attrition Rates

- **Four-year sample**
  - Returned: 76%
  - Transferred: 11%
  - Dropped out: 13%

- **Two-year sample**
  - Returned: 60%
  - Transferred: 10%
  - Dropped out: 30%
Descriptive Transfer Results

• Among students who transferred to another institution
  – Four-year sample:
    • 57% transferred to another four-year institution
    • 43% transferred down to a two-year institution
  – Two-year sample:
    • 62% transferred up to a four-year institution
    • 38% transferred to another two-year institution
Multidimensional Model of Retention/Attrition

- Academic preparation and achievement levels
- College intentions about living on campus, enrolling full-time, and working while in college
- Educational goals
- Number of college preferences met by initial institution
- Distance from home to initial institution
- Demographic characteristics
Retention and Attrition Rates by ACT Score
## Retention/Attrition by Hours Plan to Work

<table>
<thead>
<tr>
<th></th>
<th>Four-year</th>
<th></th>
<th>Two-year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returned</td>
<td>Transferred</td>
<td>Dropped out</td>
</tr>
<tr>
<td>0</td>
<td>81%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>1 - 10</td>
<td>80%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>11 - 20</td>
<td>77%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>21 - 30</td>
<td>74%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>31 +</td>
<td>71%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>0</td>
<td>66%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>1 - 10</td>
<td>66%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>11 - 20</td>
<td>63%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>21 - 30</td>
<td>59%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>31 +</td>
<td>54%</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>
Retention/Attrition by College Preferences

<table>
<thead>
<tr>
<th></th>
<th>Four-year</th>
<th>Two-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>76</td>
<td>56</td>
</tr>
<tr>
<td>1</td>
<td>77</td>
<td>63</td>
</tr>
<tr>
<td>2</td>
<td>79</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>67</td>
</tr>
</tbody>
</table>

Number of college preferences met

- Returned
- Transferred
- Dropped out
Retention/Attrition Rates by Distance from Home

Four-year institutions

Two-year institutions

LOG(Distance + 1)

Percent

Dropped out  Transferred  Returned

Dropped out  Transferred  Returned
## Understanding What Influences Transfer Decision

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Four-year “Transfer down”</th>
<th>Two-year “Transfer up”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic readiness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher ACT Composite scores</td>
<td>—</td>
<td>+</td>
</tr>
<tr>
<td>Higher HSGPAs</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td><strong>College intentions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live on campus</td>
<td>—</td>
<td>+</td>
</tr>
<tr>
<td>Work more hours</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td><strong>Educational plans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bach or beyond vs. associate’s</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td><strong>Initial college distance</strong></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Farther away from home</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*+ indicates more likely, — indicates less likely*
Understanding What Influences Transfer Decision

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Four-year “Transfer down”</th>
<th>Two-year “Transfer up”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
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<tr>
<td>Male vs. female</td>
<td>+</td>
<td></td>
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<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic vs. White</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td><strong>Median household income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low vs. high</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Medium vs. high</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><strong>Parents’ education level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No college vs. graduate degree</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Some college vs. graduate degree</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Bach degree vs. graduate degree</td>
<td>+</td>
<td>–</td>
</tr>
</tbody>
</table>

+ indicates more likely, — indicates less likely
Descriptive Transfer Results

- Among students who transferred to another institution
  - Four-year sample:
    - Fewer college preferences typically met by second institution
    - Typically transferred closer to home
  - Two-year sample:
    - More college preferences typically met by second institution
    - Typically transferred farther from home
      - Primarily for those who transferred up to a four-year institution
Retention Study Implications

• Institutions can use this information to
  – Augment their early alert/warning systems
  – Incorporate it into student-level dashboards
  – Inform their retention strategies
  – Learn more about incoming students using other data available on the ACT student record
  – Inform/implement transfer strategies/policies that help students achieve their educational goals
Enrollment Management Dashboard Prototype
ACT Research Partnership Opportunities

- National College Success Research Partnership Opportunity
- ELA and Writing Scores Research Opportunity
- International Student College Success Initiative
  - Contact Justine Radunzel at justine.radunzel@act.org
References


References continued

Radunzel, J. *Using incoming student information to identify students at-risk of not returning to their initial institution in year two.* (ACT Working Paper No. 2016-4). Iowa City, IA: ACT, Inc.


