Measuring the Relationship Between Outcomes, Success, and Retention in Undergraduate Education

A collaboration between ACT, Inc. and the University of Minnesota Rochester

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Measuring Student Success

- Understanding student success is foundational to developing curricular and resource interventions to assist students who are not succeeding

- Problem: Measures of student success are not universally agreed upon
Outcomes and Student Success

• One way to measure student success is to explore the extent to which students reach institutional outcomes while enrolled.

• While many/most institutions of higher education have articulated outcomes, measurement is highly variable and extremely complicated.
Outcomes and Student Success

• At the beginning of this study, for example, UMR had 2 sets of outcomes with considerable overlap*
  – Learning and Developmental
    • The learning outcomes included 3 domains (knowledge, intellectual and practical skills, and personal and social responsibility) that were subdivided into 17 categories
    • The developmental outcomes included 7 domains (responsibility and accountability, independence and interdependence, goal orientation, self-awareness, resilience, appreciation of differences, tolerance of ambiguity) that were subdivided into 31 categories
Measuring Outcomes as Indicators of Success

- The conceptual connection between institutional outcomes and academic success of students implies that students who are reaching the outcomes should also be academically successful (and vise versa).
- There were two primary goals for the project
  - Goal 1: Connect an established metric to our institutional developmental outcomes
  - Goal 2: Determine if progress toward those outcomes was predictive of student academic success and retention in the program.
Goal 1: Connect established metric to institutional outcomes

- **Goal 1:** Connect established metric to institutional outcomes
  - **Identify** an instrument appropriate to measuring student characteristics related to our institutional outcomes
  - **Map** the outputs of that instrument to our institution’s specific outcomes
  - **Administer** the instrument to all enrolled students
  - **Analyze** characteristics across year, sex, and race to ensure suitability of comparisons
Goal 1: Connect established metric to institutional outcomes

- **Identify** an instrument appropriate to measuring student characteristics related to our institutional outcomes
  - Evaluation of UMR’s learning and developmental outcomes revealed a fundamental connection to student psychosocial development
Goal 1: Connect established metric to institutional outcomes

- **Identify** an instrument appropriate to measuring student characteristics related to our institutional outcomes
  - The ACT Engage was the instrument that most clearly aligned with the domains of UMR institutional outcomes and project requirements
    - Measures psychosocial factors that are associated with academic success and student retention after the first year of college
    - Low stakes, self-report instrument
    - Composed of 108 items that form 3 broad domains and 10 scales
    - Online administration; allows for local items
Goal 1: Connect established metric to institutional outcomes

- **Map** the outputs of that instrument to our institution’s specific outcomes
  - Group of 12 faculty and staff mapped ACT Engage categories to UMR developmental outcomes
    - Cluster analysis revealed that UMR developmental outcomes mapped to 3 ACT Engage domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>ACT Engage Scales</th>
<th>UMR Student Development Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>▪ Academic Discipline</td>
<td>▪ Responsibility and Accountability</td>
</tr>
<tr>
<td></td>
<td>▪ Commitment to College</td>
<td>▪ Goal Orientation</td>
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<td></td>
<td>▪ Goal Striving</td>
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<td>▪ General Determination</td>
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<td></td>
<td>▪ Study Skills</td>
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<td></td>
<td>▪ Communication Skills</td>
<td></td>
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<tr>
<td>Social Engagement</td>
<td>▪ Social Activity</td>
<td>▪ Independence and Interdependence</td>
</tr>
<tr>
<td></td>
<td>▪ Social Connection</td>
<td>▪ Self-Awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Appreciation of Differences</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>▪ Academic Self-Confidence</td>
<td>▪ Resilience</td>
</tr>
<tr>
<td></td>
<td>▪ Steadiness</td>
<td>▪ Tolerance of Ambiguity</td>
</tr>
</tbody>
</table>
Goal 1: Connect established metric to institutional outcomes

- **Administer** the instrument to all enrolled students
  - Administered to 339 undergraduate students enrolled between January and February of 2015.
  - The instrument was delivered as part of four separate courses
    - CLI 1712, 2712, 3712, and 4712/13 are required for all students and co-developed by faculty and student development staff
Goal 1: Connect established metric to institutional outcomes

- **Analyze** characteristics across year, sex, and race to ensure suitability of comparisons
  - Due to factors such as repeated attempts on the assessment and incomplete student data, analysis was performed on 328 of 339 ACT Engage records
    - 235 identified as female, 93 identifying as male
    - 250 identified as White, 27 as Asian, 14 as Black/African American, 11 as Hispanic/Latino, 10 as Two or More Races, 13 as Prefer-not-to-Respond, and 3 who left the question blank on the instrument. Due to small numbers, racial categories were binned into two groups, White and Non-White, and those students who reported Prefer-not-to-Respond were excluded from analysis
    - 99 first year students, 120 second year students, 53 third year students, and 56 fourth year students.
    - Of the 328 participants, 34 unenrolled from the program at the end of the Spring 2015 term
    - The mean college GPA for the group was a 3.0
    - The mean ACT score reported for the group was 25.14 with a median of 25, a min of 14, max of 35
    - The large majority of students reported a high school GPA of 3.5 and above (236). However, 72 reported a high school GPA of 3-3.4, 17 reported a high school GPA of 2.5-2.9, and 3 reported a high school GPA of 2-2.4.
Goal 1: Connect established metric to institutional outcomes

- **Analyze** characteristics across year, sex, and race to ensure suitability of comparisons
  - As a cross-sectional cohort design, variability of demographic factors and key predictors of academic success were evaluated in order to determine the validity of making comparisons across groups to whom the instrument was administered
    - The only significant difference was in the ACT scores between females \((M = 24.75, SD = 3.08)\) and males \((M = 26.09, SD = 3.71)\)
  - The general lack of statistical dependency and difference across groups at a 0.95 confidence interval suggested that, with respect to critical demographic and predictive factors, there was no significant difference across groups. Therefore, it is reasonable to compare ACT Engage results across academic year, race, and sex.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Year</th>
<th>Race</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>.29</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>.74</td>
<td>.58</td>
<td>.91</td>
</tr>
<tr>
<td>GPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT Score</td>
<td>.13</td>
<td>.06</td>
<td>.00</td>
</tr>
</tbody>
</table>

*Note. p values > .05 suggest that the variables are independent (comparisons of the ordinal variables Year, Race, Sex, and HS GPA to each other) or that there is no difference in the mean ACT score by variable.*
Goal 2: Measuring Outcomes as Indicators of Success

- **Goal 2:** Determine if progress toward outcomes was predictive of student academic success and retention in the program.
  - Analyze student progress toward outcomes by demographic variables (year, sex, and race)
  - Determine if progress toward our DOs is predictive of student success and retention in our program.
Goal 2: Measuring Outcomes as Indicators of Success

- **Analyze** student progress toward outcomes by demographic variables (year, sex, and race)
  - Differences in developmental outcomes by year, sex, and race
    - Differences in *motivation* related outcomes:
      - Significant across sex \( (F(1, 283) = 16.38, \ p < .001) \). Females higher
      - Marginally significant across *academic year* \( (F(2, 283) = 2.42, \ p = .07) \). Third year highest
    - Marginal differences *social engagement* related outcomes
      - Marginally significant by sex \( (F(1, 283) = 3.44, \ p = .06) \). Females higher
    - Marginal differences in *self-regulation* related outcomes
      - Marginally significant across *race* \( (F(1, 283) = 3.14, \ p = .08; \) Whites higher than Non-whites) and *sex* \( (F(1, 283) = 3.25, \ p = .07; \) Males higher than Females)
Goal 2: Measuring Outcomes as Indicators of Success

- **Determine** if progress toward our DOs is predictive of student success and retention in our program.
  - Differences in developmental outcomes by grade category (0.0-1.99, 2.0-2.49, 2.5-2.99, 3.0-3.49, 3.5-4.0)
    - Significant differences in *Motivation* \( F(4, 314) = 6.22, p < .001 \) and *self-regulation* \( F(4, 314) = 8.26, p < .001 \) across grade category
      - Tukey analysis revealed that significant differences were between the 3.5 to 4.0 group and every other grade category except the 0.0 to 1.99 group. There was also a significant difference between the 3.0 to 3.49 and 2.0 to 2.49 groups for both DO1 and DO3. For DO1 there was also a difference between 2.5 to 2.99 and the 2.0 to 2.49 groups
  - Marginal differences in *Social engagement* across grade category \( F(4, 314) = 2.11, p = .08 \).
Goal 2: Measuring Outcomes as Indicators of Success

- **Determine** if progress toward our DOs is predictive of student success and retention in our program.
Goal 2: Measuring Outcomes as Indicators of Success

- **Determine** if progress toward our DOs is predictive of student success and retention in our program.
  
  - Analysis revealed that student scores in each of the three outcome related domains (motivation, social engagement, and self-regulation) were significantly higher for the students who stayed compared to the students who left the program.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Retained (n = 294)</th>
<th>Dropped (n = 34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO1</td>
<td>54.02, 5.5</td>
<td>50.24, 6.45</td>
</tr>
<tr>
<td>DO2</td>
<td>47.30, 7.0</td>
<td>44.76, 7.0</td>
</tr>
<tr>
<td>DO3</td>
<td>52.11, 8.5</td>
<td>48.91, 8.8</td>
</tr>
</tbody>
</table>
With respect to our two primary goals

- Connect an established metric to our institutional outcomes
  - The ACT Engage can be successfully mapped to our student developmental outcomes
  - Analysis of our population suggested it is reasonable to compare ACT Engage results across academic year, race, and sex.

- Determine if progress toward outcomes was predictive of student academic success and retention in the program.
  - There were significant differences in outcome related scores (motivation) by sex
  - There were significant differences in outcome related scores by grade category and retention
Summary

- Taken together, our results suggest:
  - Outputs from instruments like the ACT Engage can be used to measure student progress toward institutional outcomes.
  - In our case, there appears to be a strong relationship between student progress toward outcomes and student academic success/retention.
- This relationship needs to be explored further to inform possible interventions at the classroom and/or institutional levels.
- Additional information on and benefits of the ACT Engage
  - Foundation in research
  - Feedback for students and advisors
Why Behaviors?

• Grounded in research
  – Hundreds of primary studies and several meta-analyses show the value of behavior, personality, and other psychosocial characteristics for predicting academic performance and persistence. (e.g., Crede & Kuncel, 2008; Poropat, 2009; Robbins et al., 2004)
  – Many of these characteristics also are relevant to work outcomes. (e.g., Arthur et al., 2003; Barrick & Mount, 1991; Judge & Ilies, 2002; Ones et al., 1993; Salgado, 1998)

• Behaviors help us to understand the “whole” student
  – Help to identify students at risk
  – Provide a profile of relative strengths and needs
  – Help to connect students with resources and intervention
Reports

- Academic Success and Retention Indices allow early identification of students at risk
- Student profiles can be used to:
  - Identify relative strengths and needs
  - Match students’ needs to resources
  - Inform student advising and identify appropriate interventions
- Aggregate reports can help identify institutional-level needs and allocate resources more effectively
- Roster reports can be used for sorting and merging
  Engage data with other information
- All reports available online
Sample Engage Student Report

Profile of scores, sorted from high to low

Interpretive feedback, sorted from strengths to needs
Engage Advisor Report: Profile

Sample Student
Tested on August 30, 2011
1st year of college - ID 926096433

SAMPLE COLLEGE Class/section: ENG 101

ENGAGE measures personal, behavioral and academic skills critical to college achievement. Low scores on ENGAGE represent areas that, when improved, may increase your GPA and make it easier to focus on completing college. This report is designed to help you identify your strengths and needs in order to ensure that you are successful in your college career.

<table>
<thead>
<tr>
<th>SCALE</th>
<th>SCORE</th>
<th>PERCENTILES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic self-confidence</td>
<td>56</td>
<td>99</td>
</tr>
<tr>
<td>Commitment to college</td>
<td>56</td>
<td>99</td>
</tr>
<tr>
<td>Goal striving</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>Social activity</td>
<td>40</td>
<td>57</td>
</tr>
<tr>
<td>Steadiness</td>
<td>37</td>
<td>42</td>
</tr>
<tr>
<td>Social connection</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>Communication skills</td>
<td>21</td>
<td>33</td>
</tr>
<tr>
<td>Academic discipline</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>General determination</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Study skills</td>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>

ENGAGE INDICES
Probability estimates range from 0 to 1; indices do not appear on student reports.

- Academic Success Index
  - Probability of college GPA ≥ 2.0
  - 17th percentile

- Retention Index
  - Probability of returning second year
  - 27th percentile

STUDENT SELF REPORT
High school GPA: (C- to C) 1.5 - 1.9

This student provided an unusual pattern of responses; scores may not accurately reflect the student’s skills and/or likelihood of success.
Validating Engage

- 14,464 Students across 48 Postsecondary Institutions
- Good to excellent reliability. 
  (alpha range = .81 to .87; median = .84)
  (Le et al. 2005)
- Admission Policies represented:
  - Selective/Highly Selective
  - Traditional
  - Open/Liberal Schools

Predicting College Persistence and Performance

- Gathered Data on:
  - Prior Academic Achievement (HS GPA, ACT score)
  - Demographics
  - Institutional Effects

- To parse out Unique Contributions
  - Motivational factors
  - Social Engagement factors
  - Controlling for Traditional Predictors (HS GPA, ACT/SAT, SES, Race)
Validation Findings

- *Performance-based* (e.g., Academic Discipline) and *Goal-based* (e.g., Commitment to College) motivational factors were highly predictive of:
  - Academic performance
  - Persistence

- *Social Engagement* (e.g., Social Connection) was predictive of:
  - Persistence, after controlling for academic preparation
Average First-Year GPA at 4-Year Institutions, by ACT and Engage Academic Discipline Score

<table>
<thead>
<tr>
<th>ACT Composite Score</th>
<th>Low AD Scores</th>
<th>Moderate AD Scores</th>
<th>High AD Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom 25%</td>
<td>1.85</td>
<td>2.11</td>
<td>2.26</td>
</tr>
<tr>
<td>Middle 50%</td>
<td>2.28</td>
<td>2.68</td>
<td>2.98</td>
</tr>
<tr>
<td>Top 25%</td>
<td>2.74</td>
<td>3.17</td>
<td>3.57</td>
</tr>
</tbody>
</table>
First-Year College Retention at 4-Year Institutions, by ACT and Engage College Scores

- Low Engage: 67%, 73%, 74%
- Moderate Engage: 79%, 89%, 90%
- High Engage: 84%, 92%, 97%

ACT Composite Score:
- Bottom 25%
- Middle 50%
- Top 25%
ACT’s longitudinal program of research demonstrates the power of measuring academic behavior and the importance of connecting this information to interventions.

Assessing academic behavior helps educators and other stakeholders to better understand the whole student.