Student Success and the High School–University Transition

Zits, by Jerry Scott and Jim Borgman, November 6th 2010
http://www.arcamax.com/zits/

Dr. David C. Stone
Department of Chemistry, U of T
Western Conference on Science Education
dstone@chem.utoronto.ca
http://www.chem.utoronto.ca/~dstone/Research/survey.html

The first-year experience:

- Mean Uni vs HS
  \[ R^2 = 0.9752 \]
- 1st year chemistry
- 2006-2010 surveys
- WD & DNW omitted
- HS mean = 86 ± 7
- Uni mean = 69 ± 14

\[ y = 0.922x - 10.16 \]
\[ R^2 = 0.9752 \]

http://www.chem.utoronto.ca/~dstone/Research/survey.html

Pathways & barriers to success:

Aggregate student data for 2006–2010
(WD and DNW omitted)

- Overall:
  - GD = -17 ± 13
- Upper quartile:
  - GD = -9 to +20
- Lower quartile:
  - GD = -60 to -30

http://www.chem.utoronto.ca/~dstone/Research/survey.html

“other” (60%+)

FICSS:
http://www.ficss.org/

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Topical Content: Semestered
Student recall of coverage, Ontario 11/12U Chem.

![Graph showing topic frequency for semestered school students.](URL)

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Topical Content: Year-long
Student recall of coverage, Ontario 11/12U Chem.

![Graph showing topic frequency for year-long schools.](URL)

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Student study skills:

"I have had to re-evaluate my study skills"

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.7%</td>
<td>32.0%</td>
<td>8.0%</td>
<td>1.6%</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

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Ways of learning:

Student intention

- Achieving
- Goal-driven
- Strategic

Instructional practices

- Teaching
- Content

Outcome (quality)

- Deep
- Surface

http://www.chem.utoronto.ca/~dstone/Research/bibliography.html

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ASSIST Inventory (Entwistle et al):  
Deep, Strategic  
Surface, Apathetic  
Deep  
Strategic  
Surface  

Deep, Strategic  
Surface, Apathetic  
Deep  
Strategic  
Surface  
Relating ideas  
Using evidence  
Time management  
Organized studying  
Fear of failure  
Rote memory  

Interest in ideas  
Monitoring understanding  
Intention to seek meaning for yourself  
Alertness to assessment & monitoring studying  
Intention to achieve the highest grades  
Intention to cope minimally with requirements  
Syllabus-bound focus on minimum requirements

http://www.etl.tla.ed.ac.uk/questionnaires/ASSIST.pdf

ASSIST Local validation:  
Cronbach α:  
• 403 responses  
• 52 items  
• 13 sub-scales  
  ▷ 0.63 – 0.81  
• 3 main scales  
  ▷ 0.87 – 0.93  

Factor analysis:  
• 403 responses  
• 13 sub-scales  
• 3 factor solution  
• 50.5% of variance  
• $\chi^2 = 154 (p << 10^{-4})$

ASSIST Main scale correlations  
• Pearson’s $r$ values:  
  – 1st-year chemistry students (life sciences), $n = 394$

<table>
<thead>
<tr>
<th>Scale</th>
<th>Deep</th>
<th>Strategic</th>
<th>Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st-year</td>
<td>0.1960</td>
<td>0.2859</td>
<td>-0.4060</td>
</tr>
<tr>
<td>Deep</td>
<td>-</td>
<td>0.4561</td>
<td>-0.3545</td>
</tr>
<tr>
<td>Strategic</td>
<td>-0.2528</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

All $r$ values statistically significant @ 99.99% CL ($p < 10^{-4}$)

$$t = \frac{|r| \sqrt{n-2}}{\sqrt{1-r^2}}; H_0(r = 0)$$

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**ASSIST Scores and grades**

Mean normalised scores by grade range for 1st-year chemistry students (life sciences) $n = 394$; error bars are ±1 s.d.

**Student perceptions - school:**

I expect to do well in university chemistry  
I found high school chemistry challenging  
Tests emphasized memorization  
Classes emphasized memorization  
My teacher performed effectively  
I used the text extensively  
I always completed homework  
I procrastinated a lot  
I was organized and used my time effectively

**Knowledge in the Google age?**

Doonesbury, by Garry Trudeau, June 25th 2011  
http://www.arcamax.com/thefunnies/doonesbury/
High school memorization:

Statistical tests:

- Same mean high school grades ($p > 0.01$)
- Different mean university grades ($p < 0.0001$)
- Different mean GDs ($p < 0.001$)

- Students who felt that high school emphasized memorisation tend to do worse in university

ASSIST Deep scale:

- Interest in ideas (II)
  
  “I sometimes get ‘hooked’ on academic topics and feel I would like to keep on studying them”

- Relating ideas (RI)
  
  “I like to relate ideas I come across to those in other topics or courses”

- Seeking meaning (SM)
  
  “When I’m reading an article or book, I try to find out for myself exactly what the author means”

- Use of evidence (UE)
  
  “It’s important for me to be able to follow the argument, or to see the reason behind things”

High school habits:

Comparison of results for extreme response groups ($t$-test of means, unequal variance)

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean HS Grade</th>
<th>Mean Uni Grade</th>
<th>Mean GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Management</td>
<td>Different</td>
<td>Same</td>
<td>Same (?)</td>
</tr>
<tr>
<td></td>
<td>$p &lt; 0.005$</td>
<td>$p &gt;&gt; 0.01$</td>
<td>$0.01 &lt; p &lt; 0.05$</td>
</tr>
<tr>
<td>Homework Completion</td>
<td>Different</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td></td>
<td>$p &lt; 0.005$</td>
<td>$p &gt;&gt; 0.01$</td>
<td>$p &gt;&gt; 0.01$</td>
</tr>
<tr>
<td>Used Text</td>
<td>~Different</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td></td>
<td>$p = 0.0099$</td>
<td>$p &gt;&gt; 0.01$</td>
<td>$p &gt; 0.05$</td>
</tr>
</tbody>
</table>
ASSIST Strategic scale

- Achieving orientation (AO)
  “I put a lot of effort into studying because I’m determined to do well”
- Alertness to assessment demands (AA)
  “I keep an eye open for what lecturers seem to think is important…”
- Monitoring effectiveness (ME)
  “I think about what I want to get out of this course to keep my studying focussed”
- Organised studying (OS)
  “I usually plan out my week’s work in advance, either on paper or in my head”
- Time management (TM)
  “I’m pretty good at getting down to work whenever I need to”
  “I work steadily through the semester, rather than leave it all until the last minute”

ASSIST Surface scale

- Fear of failure (FF)
  “I often worry about whether I’ll ever be able to cope with the work properly”
- Lack of purpose (LP)
  “Often I find myself wondering whether the work I am doing here is really worthwhile”
  “I’m not really interested in this course, but I have to take it for other reasons”
- Syllabus boundness (SB)
  “I concentrate my learning just on those bits of information I have to know to pass”
- Unrelated memorising (UM)
  “Much of what I’m studying makes little sense; it’s like unrelated bits and pieces”
  “I’m not really sure what’s important in lectures, so I try to get it all down”
ASSIST Cluster analysis

- k-means grouping into 24 clusters:
  - students with similar “traits”

<table>
<thead>
<tr>
<th>SM</th>
<th>RI</th>
<th>UE</th>
<th>II</th>
<th>OS</th>
<th>TM</th>
<th>AA</th>
<th>AO</th>
<th>ME</th>
<th>LP</th>
<th>UM</th>
<th>SB</th>
<th>FF</th>
<th>Uni</th>
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</thead>
<tbody>
<tr>
<td>12.4</td>
<td>10.8</td>
<td>14.0</td>
<td>9.7</td>
<td>10.1</td>
<td>7.1</td>
<td>14.7</td>
<td>11.6</td>
<td>13.2</td>
<td>13.8</td>
<td>13.9</td>
<td>15.2</td>
<td>18.0</td>
<td>57%</td>
</tr>
<tr>
<td>15.0</td>
<td>14.9</td>
<td>15.2</td>
<td>17.5</td>
<td>14.4</td>
<td>16.0</td>
<td>17.0</td>
<td>16.3</td>
<td>16.6</td>
<td>9.2</td>
<td>11.3</td>
<td>14.4</td>
<td>17.2</td>
<td>71%</td>
</tr>
<tr>
<td>14.0</td>
<td>14.3</td>
<td>15.4</td>
<td>13.0</td>
<td>14.6</td>
<td>14.9</td>
<td>14.6</td>
<td>14.0</td>
<td>14.4</td>
<td>11.9</td>
<td>14.7</td>
<td>15.3</td>
<td>17.6</td>
<td>74%</td>
</tr>
</tbody>
</table>

Curiosity

“Dissonance in study orchestrations” (Jan Meyer et al)

Dr. David C. Stone, Department of Chemistry, University of Toronto

Research teams:

- 2006-7:
  - Robin Baj, Michael Lebenbaum, Sujan Saundarakumaran, Derrick Tam, & Jakub Vodsedalek

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dstone@chem.utoronto.ca
http://www.chem.utoronto.ca/~dstone/Research/survey.html

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