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

- Mean Uni vs. HS $R^2 = 0.9752$

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 $-30$

- "other" (60%+)

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

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

Thursday, July 7, 2011

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

Ways of learning:

Student intention

Instructional practices

Outcome (quality)

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

Thursday, July 7, 2011
ASSIST Inventory (Entwistle et al.):

Deep, Strategic  Surface, Apathetic

Deep

Strategic

Surface

- Relating ideas
- Using evidence
- Time management
- Organized studying
- Fear of failure
- Rote memory

Deep

Strategic

Surface

- 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

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

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Ways of learning redux:

Student intention

Instructional practices

Outcome (quality)

- Achieving Meaning
- Goal-driven Intrinsic Deep
- Strategic

- Teaching Content
- Syllabus-bound focus on minimum requirements

- Orientation Motivation Style

- Approach to content Strategy Process

- Reproducing Extrinsic Surface

- Assessment Workload

Understanding

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ASSIST Local validation:

Factor analysis:

- 403 responses
- 52 items
- 13 sub-scales
- 50.5% of variance
- $\chi^2 = 154 (p << 10^{-4})$

Cronbach $\alpha$:

- 403 responses
- 52 items
- 13 sub-scales
- 3 factor solution
- $0.63 - 0.81$
- 3 main scales
- $0.87 - 0.93$

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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>
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<tr>
<td>Deep</td>
<td>0.4561</td>
<td>-0.3545</td>
<td>-0.2528</td>
</tr>
<tr>
<td>Strategic</td>
<td></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

![Distribution of Main Scale Scores](image)

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

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### Knowledge in the Google age?

Doonesbury, by Garry Trudeau, June 25th 2011

http://www.arcamax.com/thefunnies/doonesbury/

### 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

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High school memorization:

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

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

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>
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</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 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”
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"

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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>
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<th>UM</th>
<th>SB</th>
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<th>Uni</th>
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<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>
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<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

Discipline & Focus

Goals

Anxiety

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

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