Spatial Visualization: A Promising Intervention for Promoting Student Equity

Wednesday April 27th, 2016 2:00-3:00pm

EngageEngineering.org

Goal

Compel and help:

YOU develop a SV-Skills Training for YOUR students

Co-Sponsors

WEPAN
Women in Engineering Professional Network

FACT: SV Critical to Engineering Success
FACT: SV Skills—Men Outperform Women

Curriculum & Snap Cubes: higheredservices.org

Facts Compel Action

SV Skills Facts Summary:
- Critical for Engineering success
- Some subpopulations of students are less skilled
- Improves with brief intervention

Facts Compel Action

SV Skills Training is an Imperative for Retention

CU-Boulder SV Skills Intervention

Motivated by:
- Gender Equity
- WEPAN and ENGAGE Engineering
- Sheryl Sorby’s work
- Evidence-driven (other and CU’s)
- Intention to promote access, retention and performance
- SV skills critical to STEM success

Change Foundation
Intervention Design Process

Experience is what you get when you didn't get what you wanted.
— Randy Pausch, The Last Lecture

Purdue Spatial Visualization Test-Rotation (PSVT-R)

Two SV Measures
1) Performance = 0-30
2) Passing Rate > 20

83 % Pre SV Passing Rate

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83%

Masks Inequity

Gender Disparity Uncovered

Only 68% of Women Passed

International Disparity Uncovered

Only 61% of International Students Passed
Who are SV Skills Workshoppers?

- 1.7x over representation of WOMEN
- 2.6x over representation of INTERNATIONAL

SV Workshopper Results: Passing Rate

0→91%
Overall Passing Rate

SV Workshopper Results: Performance Gain

23% average performance gain benefitted ALL workshopers

Women: Before/After Workshop

BEFORE
68% Passing
AFTER
96% Passing

Men: Before/After Workshop

BEFORE
88% Passing
AFTER
99% Passing

Internationals: Before/After Workshop

BEFORE
61% Passing
AFTER
92% Passing
Domestics: Before/After Workshop

**BEFORE**
85% Passing

**AFTER**
99% Passing

Closing the Gender Gap

**99%**
Post-workshop Passing Rate for Men

**96%**
Post-workshop Passing Rate for Women

(88% → 99%)

Our Spatial Visualization Workshop

Your Turn!

1. Isometric drawing
2. Orthographic views
3. 1 and 2 axis rotations
4. Review and test
   ...for those needing more SV work:
5. Curved surfaces & inclined planes
6. Timed testing
7. Rotation strategies
8. Review and test

Communication with “Workshoppers”
Workshop Activity Stations

- Group
- Individual
- Peer-Teach
- Computer

Example-Week 1: Isometric Drawing

Station 1 – Group Block Relay

Station 2 – Individual Workbook Drill

Station 3 - Peer Teach

Station 4 - Computer Aided Visualization
Total Annual Budget

$21,700/year

$20,000 Faculty (1 course credit)

CU Boulder SV Model Execution

SV Model Pros

- No course curriculum changes
- No ramping up by design course faculty
- Reasonable time demand for students
- Reasonable time demand for one faculty teaching credit (64 hr in workshops/year)
- Scalable with addition of TAs ($1150 each)
- Accountability ensured with 5% course grade

SV Model Cons

- Requires commitment by design course faculty
- Communication intensive
- Lots of moving parts
- Data management and integrity
- Element of surprise for workshoppers (after hours requirement starts 2nd week of class)

Questions?

Your Turn Again: Poll 3

What do you perceive are YOUR barriers to IMPLEMENTATION of a spatial visualization intervention?
YOUR Next Step?

Together we can engage all minds in engineering the future!