Learning From Pioneers

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What is the Open Learning Initiative?

Open online learning environments based on the science of learning and designed to improve both quality & productivity in higher education.
Goal directed practice & targeted feedback enhances the quality of students’ learning.

So \( (1, 2)(2, 3)(3, 4)(4, 5) = (5, 4, 3, 2, 1) \).

Here is a more complicated permutation on \( n = 12 \), and its decomposition into transpositions.

There are many other identities relating to transpositions. For the next proposition, we abuse notation and use exponents for permutations given in cycle notation.

**Proposition**

\[
(a, b) \circ (b, c) \circ (a, b) = (a, c)
\]

\[
(1, \ldots, n)^i \circ (1, 2) \circ (n, \ldots, 1)^i = (i + 1, i + 2)
\]

where \( 0 \leq i \leq n - 2 \).

As already mentioned, the decomposition into transpositions is not unique. In fact, not even the number of transpositions used is unique. However, there is still an invariant.

**Even permutation**

(definition) A permutation is even if it can be written as the product of an even number of transpositions, and odd if it can be written as the product of an odd number of transpositions.
The “Killer App” Data Collection & Feedback Loops for Continuous Improvement
# Module 1: Examining Distributions

## Learning Objectives

- Summarize and describe the distribution of a categorical variable in context. [Show Details...]

- Generate and interpret several different graphical displays of the distribution of a quantitative variable (histogram, stemplot, boxplot). [Show Details...]

- Summarize and describe the distribution of a quantitative variable in context: a) describe the overall pattern, b) describe striking deviations from the pattern. [Show Details...]

- Relate measures of center and spread to the shape of the distribution, and choose the appropriate measures in different contexts. [Show Details...]

- Compare and contrast distributions (of quantitative data) from two or more groups, and produce a brief summary, interpreting your findings in context. [Show Details...]

- Apply the standard deviation rule to the special case of distributions having the "normal" shape. [Show Details...]

### Class Participation

39 of 40 students participated

48% of 43 activities started on average

- View Participation in Module by Student

### Open-ended Responses

- One Categorical Variable > Learn By Doing [11]
- Histogram > Learn By Doing [4]
- My Response: About Stemplots [9]
- Measures of Center > Learn By Doing [12]

### Checkpoints and Quizzes

- Checkpoint: Examining Distributions Checkpoint 1 [38]
- Checkpoint: Examining Distributions Checkpoint 2 [36]
Relate measures of center and spread to the shape of the distribution, and choose the appropriate measures in different contexts.

Estimated Learning by Student

- 40 students
- 1 dot = 1 student

Class Accuracy by Sub-Objective

- Predicting...
- Mean vs median
- Compute median
- Identify outlier
- Select appropriate...

Students with Moderate Estimated Learning

Student names removed

Contact these students

Checkpoints and Quizzes

- Checkpoint: Examining Distributions Checkpoint 1 [38]
- Checkpoint: Examining Distributions Checkpoint 2 [36]
Ed tech + wide use = “Basic research at scale”

- NSF Science of Learning Center
- 10 years, ~$50 million
- Tech enhanced courses, assessment, & research
- School cooperation for data collection
Learning Curve Analysis

DataShop:  Pittsburgh Science of Learning Center
Team-based design and development

Course Development

- Learning Science
- Instructional Technology
- User Experience
- Project Management
- Domain Expertise
- Universal Design
- Instructional Design
- Software Development
Review:

- Apply learning science research and scientific method to course development, implementation and evaluation.
- Develop interactive learning environments collaboratively
- Feedback loops for continuous improvement.
- Communities of use, evaluation and improvement.

What Difference Does it Make?
Results

**OLI STUDY ON ACCELERATING STUDENT LEARNING WITH OLI STATISTICS**


This study, conducted at Carnegie Mellon University, shows that students using the OLI statistics course at Carnegie Mellon achieved the same or better learning outcomes as students in the traditional course in **half the time.**

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**INDEPENDANT TRIAL OF THE OLI STATISTICS COURSE**


The results of this study are remarkable; they show comparable learning outcomes for this basic course, with a promise of cost savings and productivity gains over time.

Deanna Marcum
Managing Director, Ithaka S+R
OLI Development and Use (2006)

Use
• 117,963 Course Enrollments (Academic)
• Used by 1,809 Instructors in 1,050 Institutions
• 1,148,807 Independent Learners (Registered and Anonymous)

Development
• 44 Academic courses have been created
• By 104 contributing Faculty from 55 Institutions
OLI Projects

- Open Professionals Education Network (OPEN) free services for TAACCCT grantees
- Community College Open Learning Initiative (CC-OLI)
- Next Generation Learning Challenge Projects
- Evaluation Pilots: WGU, Texas & Washington
- Carnegie Foundation Statway
- Introduction to Computer Science
- UMUC Development/Adaptation project
- OLNet – Open Education Research Network
- Hewlett Packard Catalyst: Measuring Learning
Build OLI Functionality into OpenEdX opening new possibilities
Strategy for Educational Improvement

EdTech → Data → Theory → EdTech
Open Data and Data Formats

Share Alike and Share Data

(This doesn’t exist, but we think it should.)

Build and promote communities of research.
**Pasteur’s Quadrant**

Stokes argues basic/applied goals need not trade off

<table>
<thead>
<tr>
<th></th>
<th>Low Emphasis on Applied Work</th>
<th>High Emphasis on Applied Work</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Emphasis on Basic Science</strong></td>
<td>How to translate to real world?</td>
<td>(Bohr)</td>
</tr>
<tr>
<td></td>
<td>(Pasteur)</td>
<td></td>
</tr>
<tr>
<td><strong>Low Emphasis on Basic Science</strong></td>
<td>X</td>
<td>What principle can be derived?</td>
</tr>
<tr>
<td></td>
<td>(Edison)</td>
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Better Science & Technology ...

Improves Assessment

Increases Outcomes

Accelerates Learning

> 100 hours  
~3% gain

< 50 hours  
~18% gain

Produces A Virtuous Cycle

EdTech  
Data

Theory
“Without a complete revolution...in our approach to teaching...we cannot go beyond (current levels) of productivity” (Baumol, 1967).

Our message:  
Such a revolution is possible.

Our question:  
Who will lead it?
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