Using Adaptive Learning Technology and Reflective Exercises to Improve First-Year Success in a Paired Developmental College Reading/Environmental Science Course

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Barbara Eshbach, Head Librarian  
Dr. Jorge Santiago-Blay, Biology Instructor  
Penn State York
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Penn State York

What causes the seasons?

Do you know the answer? Be honest!

☐ I know it
☐ I think I know it
☐ I'm not sure
☐ I have no idea

John N. Gardner Institute for Excellence in Undergraduate Education Annual Gateway Course Experience Conference
March 23-25, 2014

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Rich Learning Environment

First-year Students
Environmental Science Instructor
College Reading Instructor
SoTL Springboard Partner
BACKGROUND
Underprepared students encouraged to take LL ED 005 College Reading
College Reading course history

- Standalone
- Paired with content course
  - Intro to Psychology - Fall 2012
  - Environmental Science - Fall 2013
Zhao and Kuh (2004) describe the “added value” of learning communities, especially when...

“faculty members teaching the common courses structure assignments that require students to apply what they are studying in one course to other courses and assignments” (p. 116).
Course goals

STAGE 1: Effective textbook reading strategies + vocab learning system

STAGE 2: Metacognition: Awareness of learning + deep learning strategies

STAGE 3: Critical thinking

Application to College Readiness and Attitudes and Behaviors for Success

Fall 2012 Pilot
Fall 2012 Pilot: Exam Averages

<table>
<thead>
<tr>
<th>Exam</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
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<tr>
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<td>Exam 3</td>
<td>10</td>
</tr>
<tr>
<td>Exam 5</td>
<td>9</td>
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</table>

SAT Verbal Average 404

50% pass rate in PSYCH 100
What’s not working in the 1st pilot?

- Student learning attributes
  - curiosity, resilience, motivation, confidence . . .

- Academic skills

Fall 2012 Pilot
Implementing CHANGE
Three Main Changes

ELLi
ALT
TOOLBOX
New Course Design

Course Goals

- Strengthening Reading Skills
- Weekly Toolbox Assignments

Encouraging Positive Learner Attributes: Lifelong Learning

- Effective Lifelong Learning Instrument ELLI Pre/Post
- Reflection – Self-knowledge
- Reflection – Goal Setting
- Reflection – Action Plan + Results Posting

Applied to Life

Applied to Bisco03

Coaching
Why did you want to participate in the project?
Why?

- To enhance the teaching and learning experience
- To address engagement by non-majors
- To combat the “science fear factor”

Is she about to shoot herself?
Why?

- To improve science literacy

The ultimate goal . . .

Help students become self-directed, lifelong learners
We know TIME SPENT is an issue . . .

How many hours/week are you spending studying for class?

We want

WHY DO WE DO THINGS?

We can

We have the time/money

$
A recent clicker survey

Question # 2

How many hours/week are you spending studying for this class?

a. More than 9 hours
b. 6-9 hours
c. 3-6 hours
d. 1-3 hours
e. Less than 1 hour

Non-majors < Majors (non-honors)< Honors

Gen Ed Biol | 3 – 6 hours per week
Biology     | 6 – 9 hours per week
Biology Honors | Closer to 9 hours
Disconnect between expectation & reality!

Students say:

- Too much material for them to learn
- We want the “study guide”
- Not enough study time (working trying to pay for college)

Pairing Helps:

- Students with:
  - Learning/reading strategies
  - Reflection to target the disconnects
  - Time on task reading/studying BiSc
ES Course Design

- Lecture
- Discussion/Activities
- Worksheets → Study Guide
ES Course Assessments

- Weekly online quizzes
- 6 M/C exams
- Participation
- Extra credit points for participation in project (data sharing, pre/post, ELLI pre/post)
CR / ES Collaboration
What are your final thoughts?
Most meaningful moments?
- 72-Item online Self-Report
- Measures 7 Dimensions of “Learning Power”

Validated & reliable: Deakin Crick & Yu (2008)
Output

Changing and Learning

Critical Curiosity

Meaning Making

Creativity

Strategic Awareness

Learning Relationships

Resilience

September
ELLI Cycle

- Self-Knowledge
- Reflection
- Action Planning
- Coaching
WEEK 1:

What does “Changing & Learning” mean?

– Description of C & L
– Guest - Campus Career Counselor – My Plan – identify possible careers – any changes?
– Reflection, action plan: What is needed?
WEEK 2: Practice Activity

IMPLEMENTATION

- Exam Debrief: What’s going on? What needs to change?

- Reflection: meditation + detailed description/journal of a study session

- Coaching: After reading journal entries – I present the findings to class and then we do – “What a study session should look and feel like”

DEBRIEF IT reflect and action plan
Give it a try . . .

- Creativity
- Try it using the handout
- SCAMPERR

**ELLIE EFFECTIVE LIFELONG LEARNING INVENTORY**

The Seven Dimensions of Learning Power

1. Changing and Learning
2. Critical Curiosity
3. Meaning Making
4. Creativity
5. Resilience
6. Strategic Awareness
7. Learning Relationships

*How creative do you think you are?*

1) Plan a party

2) Use the SCAMPERR techniques to modify it (created by Bob Eberle and written about by Michael Michalko in his book, *Thinkertoys*)

**S** Substitute - Remove some part of the accepted situation, thing, or concept and replace it with something else.

**C** Combine - Join, affiliate, or force together two or more elements of your subject matter and consider ways that such a combination might move you toward a solution.

**A** Adapt - Change some part of your problem so that it works where it did not before.

**M** Modify - Consider many of the attribute of the thing you’re working on and change them, arbitrarily, if necessary.

**E** Eliminate - Arbitrarily remove any or all elements of your subject, simplify, reduce to core functionality

**R** Reverse - Change the direction or orientation. Turn it upside-down, inside-out, or make it go backwards, against the direction it was intended to go or be used.

**R** Rearrange - Similar to Reverse, modify the order of operations or any other hierarchy involved.

**REFLECTION**

How can you use this (or these) exercises over the next week to strengthen your “creativity muscles”? How would your life be different if you thought of yourself as a creative person?
Summer Prep for ELLI

- Summer training – multiple campuses
  - Introduction
  - Reading Profiles
  - Coaching
  - Integration

- ELLI integration
  - LLED/Bi Sc
  - HDFS 397
What are students persisting towards *towards*?
- Self-knowledge
- Clarifying goals

Elements of reflection – opportunities to “notice” new outcomes of learning

Importance of imagination to envision a new reality
What’s your Confidence Level?

True or false: Asking if the proponents of a particular claim of a study have considered alternate points of view is a valid way to evaluate if that study is sound science.

Do you know the answer? (Be honest)

- I know it
- Think so
- Unsure
- No idea
True or false: Asking if the proponents of a particular claim of a study have considered alternate points of view is a valid way to evaluate if that study is sound science.

Click the answer you think is right!

True
False

Click the correct answer!

Give up!

Self-testing
Illusion of confidence
Adaptive Learning Technology

- Question
- Confidence
- Question
Reports for section: **LL ED 005**

- **Progress Overview**
  View student progress broken down by module.

- **Module Details**
  View information on how your class performed on each section of their assigned modules.

- **Missed Questions**
  View frequently missed questions.

- **Most Challenging Learning Objectives**
  View the most challenging learning objectives.

- **Student Details**
  View student progress details plus completion level breakdown for each module.

- **Practice quiz**
  This gives you a quick overview of the quizzes results for your students.

- **Metacognitive Skills**
  View statistics on how knowledgeable your students are about their own comprehension and learning.

- **Pretest Results**
  This gives you a quick overview of the pretest results for your students.
### Reports

#### Chapter 1: Understanding Our E...

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<th>Self-study</th>
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OUTCOME & NEXT STEPS
Predicted Scores ES Exams by SAT Reading Scores

Fall 2011-13

\[ r = 0.73 \]

Exam Average vs. SAT Critical Reading Scores

- Exams Average
- Linear (Exams Average)
EXAMS: Pilot Years 1 and 2

Closing the Gap?

2012 Exam Averages

2013 Exam Scores

ES Pre/Post Tests: Significance?

- Control/Treatment Pre: 0.0583
- Control Pre/Post: 0.0015
- Treatment Pre/Post: 0.0006
- Control/Treatment Post: 0.794
## 2012 and 2013 Pilot Comparisons

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<tr>
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<th>Fall 2012 Pilot</th>
<th>Fall 2013 Pilot</th>
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<tbody>
<tr>
<td>N</td>
<td>17</td>
<td>16</td>
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<tr>
<td>SAT Reading Average</td>
<td>404</td>
<td>359</td>
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<tr>
<td>Content Course Success Rate</td>
<td>50%</td>
<td>84%</td>
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<tr>
<td>Fall-Sp retention</td>
<td>95%</td>
<td>84%</td>
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<tr>
<td>Fall - Fall retention</td>
<td>47%</td>
<td>?</td>
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<tr>
<td>Fall GPA</td>
<td>2.39</td>
<td>2.42</td>
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<tr>
<td>SP GPA</td>
<td>2.07</td>
<td>?</td>
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### Some Comparisons

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<tr>
<td>Students SAT&lt;1200 with no LLED</td>
<td>2.05</td>
<td>21</td>
</tr>
<tr>
<td>Students SAT&lt;1200 with LLED Non-paired</td>
<td>2.19</td>
<td>18</td>
</tr>
<tr>
<td>Students SAT&lt;1200 with paired LLED</td>
<td>2.42</td>
<td>16</td>
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</table>

**p = 0.232444**

**Fall GPA**

![Bar chart showing Fall GPA for different groups]
### Control and Treatment Pre-Semester

<table>
<thead>
<tr>
<th>Dimensions of Learning Power</th>
<th>$p$</th>
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<tr>
<td>Changing and Learning</td>
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<tr>
<td>Learning Relationships</td>
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<tr>
<td>Strategic Awareness</td>
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<tr>
<td><strong>Resilience</strong></td>
<td><strong>0.03</strong></td>
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<td>Creativity</td>
<td>0.36</td>
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<td>Meaning Making</td>
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<tr>
<td>Critical Curiosity</td>
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## Control Pre and Post

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<th>Pre</th>
<th>Post</th>
<th>% Change</th>
<th>t-test p value</th>
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<tr>
<td>Changing and Learning</td>
<td>71.667</td>
<td>73.684</td>
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<td>0.633</td>
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<td>Learning Relationships</td>
<td>64.737</td>
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<td>59.357</td>
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<td>Resilience</td>
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<td>57.018</td>
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<td>Creativity</td>
<td>51.657</td>
<td>54.581</td>
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<td>0.596</td>
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<td>Critical Curiosity</td>
<td>48.684</td>
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## Treatment Pre and Post

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<th>Post</th>
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<th>t-test p value</th>
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<td>70.526</td>
<td>81.569</td>
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<tr>
<td>Learning Relationships</td>
<td>67.193</td>
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<td>Critical Curiosity</td>
<td>48.465</td>
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# ALT and ES Outcomes

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<tr>
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<th>ALT % Correct &amp; unaware</th>
<th>ALT % Incorrect &amp; aware</th>
<th>ALT % Incorrect &amp; unaware</th>
<th>Time Spent Minutes</th>
<th>Average ALT % completed</th>
<th>Overall</th>
<th>Exams Average</th>
<th>Quizzes Average</th>
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<tr>
<td>ALT % Correct &amp; aware</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ALT % Correct &amp; unaware</td>
<td>-0.8791</td>
<td>1</td>
<td></td>
<td></td>
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<td>ALT % Incorrect &amp; unaware</td>
<td>0.6863</td>
<td>-0.9049</td>
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<td>1</td>
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<tr>
<td>Time Spent Minutes</td>
<td>0.2891</td>
<td>-0.3212</td>
<td>-0.1480</td>
<td>0.1579</td>
<td>1</td>
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<tr>
<td>Average ALT % completed</td>
<td>0.1530</td>
<td>-0.2181</td>
<td>0.0397</td>
<td>0.0161</td>
<td>0.2060</td>
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<tr>
<td>Overall</td>
<td><strong>0.5205</strong></td>
<td>-0.3312</td>
<td>-0.2945</td>
<td>0.0896</td>
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<tr>
<td>Exams Average</td>
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<td>Quizzes Average</td>
<td>0.3782</td>
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<td>-0.1870</td>
<td>0.1064</td>
<td>0.3881</td>
<td><strong>0.8010</strong></td>
<td><strong>0.8612</strong></td>
<td>0.4969</td>
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# Reflection Elements

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<th>Example</th>
<th>Percent of Total Comments (n=77)</th>
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<tbody>
<tr>
<td>Experience Description</td>
<td>Description of what happened - events</td>
<td>2.5%</td>
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<tr>
<td>Taking Perspectives into Account</td>
<td>Re-frame reference to lead to new insights</td>
<td>2.5%</td>
</tr>
<tr>
<td>Critical Analysis</td>
<td>Writer steps back to critique assumptions, beliefs, Questions, Use of imagination to test hypotheses</td>
<td>13%</td>
</tr>
<tr>
<td>Personal Experience</td>
<td>Inner conversation, Internal examination</td>
<td>26%</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Writer arrives at a new understanding Confirming statement about learning</td>
<td>56%</td>
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My least favorite subject is science. I WILL NEVER LIKE SCIENCE! It’s sooo hard for me. I think I make it harder on myself because just when someone mentions science I freeze up. I would do anything to avoid it. It never made sense to me. I love math because there is a formula to everything. I always passed science with a 69. Which is horrible.
Some success that I have come across would be in my science class when I first started I thought that I wouldn’t get a good grade in anything but later on I saw that all I have to do is apply myself. When applying yourself you tend to go over what you have learned so far. Later allowing you to retrieve that information and then the material comes easy. All it takes is practice and not just throwing in the towel when the going gets tuff.
• How did you feel being part of a research study?
  – 77% - good experience
  – 23% Neither bad nor good
• Pairing with Bi Sc
  – 86% Keep it
  – 79% said it was a strongly positive experience
    • 21% said it was difficult but they saw the benefits
• Toolbox Assignments (Cornell Notes) 86% Keep it
• ELLI – 93% Keep it
• Lecture and In-Class activities – 86% Keep it
• ALT – 50% Keep it – 29% Lose it – 21% Modify it
• 100% said they would advise a new student to take the pairing
Barb Eshbach

Springboard partner . . .

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In a paired college reading/environmental science course

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Course Overview

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This project pairs LL ED 005 College Reading (which I am teaching) with a content course, BiSc 003 Environmental Science, taught by Dr. Jorge Santiago-Blay. In LL ED 005, students acquire reading and learning skills that they apply to the content of the BiSc course. In addition to reading skills, students are also working through a series of reflections geared towards helping them become stronger lifelong learners, using the Effective Lifelong Learning Inventory (ELLI).

Below is a concept map of the course design. The blog posts that follow are in reverse order, summarizing the activities and discoveries during the course. Analysis of the data is on-going.

http://sites.psu.edu/fa13project
QUESTIONS?
References