UCF’s Pilot Project

- Faculty Driven
- Faculty Decision

- Faculty Chose...

- Content agnostic
- Adaptive learning and assessment
- Robust assessment component
Adaptive Mathematics Course Development: Precalculus to Calculus Pathway using the RealizeIT Platform
Students’ Perceptions of Learning Material Difficulty

Intermediate Algebra
n=20

College Algebra
n=29

Total
n=49

<table>
<thead>
<tr>
<th></th>
<th>Too easy</th>
<th>Somewhat easy</th>
<th>Neither easy/hard</th>
<th>Somewhat difficult</th>
<th>Too difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate</td>
<td>0.20</td>
<td>0.15</td>
<td>0.50</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>College Algebra</td>
<td>0.03</td>
<td>0.24</td>
<td>0.59</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td>Total</td>
<td>0.10</td>
<td>0.20</td>
<td>0.55</td>
<td>0.12</td>
<td></td>
</tr>
</tbody>
</table>

35% Easy or Neither

65% Difficult

30% Somewhat difficult
32% Too difficult
Students’ Academic Class Standing

- Freshman: \( \text{Intermediate Algebra} n=20 \)  
  - Other: \( 0.05 \)  
  - Senior: \( 0.35 \)  
  - Junior: \( 0.30 \)  
  - Sophomore: \( 0.20 \)  
  - Other: \( 0.02 \)  
  - Total: \( n=50 \)

- Sophomore: \( \text{College Algebra} n=30 \)  
  - Other: \( 0.27 \)  
  - Senior: \( 0.40 \)  
  - Junior: \( 0.20 \)  
  - Sophomore: \( 0.27 \)  
  - Other: \( 0.13 \)  
  - Total: \( n=50 \)

Course
Students’ Ethnicity – Minority/Non-Minority Status

<table>
<thead>
<tr>
<th>Course</th>
<th>Prefer not to answer</th>
<th>Non-minority</th>
<th>Minority</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Algebra</td>
<td>0.10</td>
<td>0.25</td>
<td>0.65</td>
<td>0.10</td>
</tr>
<tr>
<td>College Algebra</td>
<td>0.13</td>
<td>0.50</td>
<td>0.37</td>
<td>0.13</td>
</tr>
<tr>
<td>Total</td>
<td>0.12</td>
<td>0.40</td>
<td>0.48</td>
<td>0.12</td>
</tr>
</tbody>
</table>
Students’ Weekly Employment (in hours)

- 20+ hours
- 1-19 hours
- Unemployed

Course

<table>
<thead>
<tr>
<th>Course</th>
<th>20+ hours</th>
<th>1-19 hours</th>
<th>Unemployed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Algebra n=20</td>
<td>.60</td>
<td>.25</td>
<td>.15</td>
</tr>
<tr>
<td>College Algebra n=30</td>
<td>.60</td>
<td>.07</td>
<td>.33</td>
</tr>
<tr>
<td>Total n=50</td>
<td>.60</td>
<td>.14</td>
<td>.26</td>
</tr>
</tbody>
</table>
Preferred Amount Of Interaction With Other Students

- **A lot, Some or No Preference**
  - Intermediate Algebra: 45% (n=20)
  - College Algebra: 48% (n=29)
  - Total: 46% (n=49)

- **A Little Or None**
  - Intermediate Algebra: 55% (n=20)
  - College Algebra: 52% (n=29)
  - Total: 54% (n=49)
How Can We Reach Our Students?

How do we address hurdles?
• Missing prerequisite knowledge
• Different learning styles and speed
• Scheduling and financial concerns

How do we provide motivation?
• Make the course relate to them
• Eliminate busy work
• Provide monitoring and encouragement
• Provide a path for completion
Adaptive Intermediate and College Algebra using the RealizeIT Platform

• No textbook to purchase means low or no cost to the student

• Course permits both acceleration and remediation within a single curriculum

• Ability to complete multiple courses within existing semester structures reduces time to graduation
  • Fall 2016: 13/299 (4.3%) Intermediate Algebra students also enrolled in College Algebra
  • Spring 2017: 5/40 (12.5%) Intermediate Algebra students also enrolled in College Algebra

• Course content is personalized to UCF and the student
Objective Overview Page:
Determine Knowledge or Learning Map

Structure of Algebra, Sets, Absolute Value, and Number Concepts
Due date: 8/28/2017

Test, each Module is broken down into activities that are arranged in a learning path.

Your Learning Path for this Module contains 4 activities.

This Overview section will show you how much you have done, how well you are doing and help you decide what to do next.

What to do first

Determine knowledge
It's a set of targeted questions to help determine what you already know. This allows you to skip past familiar activities in your Learning Path.

Determine knowledge  View your Learning Path
Frequency of Students Following Suggested Path

Always, Often or Sometimes

- Always: 81%
- Quite Often: 93%
- Sometimes: 88%
- Rarely: 7%
- Never: 12%

Rarely or Never

- Always: 19%
- Quite Often: 20%
- Sometimes: 31%
- Rarely: 12%
- Never: 19%

Intermediate Algebra
n=21

College Algebra
n=30

Total
n=51

Course
Determine Knowledge

How well do you think that you know the material in Properties of Real Numbers and Operations with Real Numbers?

It is important that you take the time to answer the questions; the system uses your responses to figure out your path through the material. You could end up with more work to do if you don't try your best now.

Not at all  Small amount  Reasonable amount  A lot  All of it

Determine knowledge
The Student Steps Through the Content

Learn: Properties of Real Numbers

Lesson path

1. Learn (WhyU Video)
2. Worked Examples
3. Try it
4. Check of Understanding

This is a WhyU video about the associative and distributive properties of multiplication of real numbers.

- Commutative property of multiplication: \( A \cdot B = B \cdot A \)
- Associative property of multiplication: \((A \cdot B) \cdot C = A \cdot (B \cdot C)\)
- Distributive property: \((A + B) \cdot C = A \cdot C + B \cdot C\)
The Learning Content is Algorithmic

<table>
<thead>
<tr>
<th>Property</th>
<th>Examples</th>
<th>General Rule</th>
<th>Word Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associative Property of</td>
<td>((LWE1a + LWE1b) + LWE1c = LWE1a + (LWE1b + LWE1c))</td>
<td>((a + b) + c = a + (b + c))</td>
<td>When you have three or more addends, changing the grouping of what you are adding does not affect the sum.</td>
</tr>
<tr>
<td>Addition</td>
<td>since (LWE1a + LWE1b + LWE1c = LWE1a + LWE1b + LWE1c) which simplifies to (LWE1a + LWE1b + LWE1c = LWE1b + LWE1c + LWE1a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associative Property of</td>
<td>((LWE1b \cdot LWE1c) \cdot LWE1d = LWE1b \cdot (LWE1c \cdot LWE1d))</td>
<td>((a \cdot b) \cdot c = a(b \cdot c))</td>
<td>When you have three or more factors, changing the grouping of what you are multiplying does not affect the product.</td>
</tr>
<tr>
<td>Multiplication</td>
<td>since ((LWE1b \cdot LWE1c) \cdot LWE1d = (LWE1b \cdot LWE1c) \cdot LWE1d) which simplifies to (LWE1b \cdot LWE1c \cdot LWE1d = LWE1b \cdot LWE1c \cdot LWE1d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Examples</th>
<th>General Rule</th>
<th>Word Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associative Property of</td>
<td>((8 + 13) + 7 = 8 + (13 + 7)) since <strong>21 + 7 = 8 + 20</strong> which simplifies to <strong>28 = 28</strong></td>
<td>((a + b) + c = a + (b + c))</td>
<td>When you have three or more addends, changing the grouping of what you are adding does not affect the sum.</td>
</tr>
<tr>
<td>Addition</td>
<td><strong>since 21 + 7 = 8 + 20</strong> which simplifies to <strong>28 = 28</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associative Property of</td>
<td>((13 \cdot 7)(35) = (13)(7 \cdot 35)) since ((91)(35) = (13)(245)) which simplifies to (3185 = 3185)</td>
<td>((a \cdot b)c = a(b \cdot c))</td>
<td>When you have three or more factors, changing the grouping of what you are multiplying does not affect the product.</td>
</tr>
<tr>
<td>Multiplication</td>
<td><strong>since ((91)(35) = (13)(245)) which simplifies to (3185 = 3185)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Interaction Questions Are Asked While Going Through the Learning Content

\[ 0 + (x + 8) = (x + 8) \]  

**Additive Identity Property**

We have now used the properties of addition to change the left-hand side of the given equation such that it is the same as the right-hand side of the given equation.

The given equation is demonstrating the associative, inverse, and identity properties of addition.

For the given equation, identify any of the properties of addition that are being demonstrated:

\[ 16 + (b + 20) = (b + 16) + 20 \]

- [ ] Commutative Property of Addition
- [ ] Associative Property of Addition
- [ ] Additive Identity
- [ ] Additive Inverse
- [ ] None of the above

**one attempt**

[Check]
Students can Request Another Method or Additional Content

Lesson path

1. Learn
   - Learn

2. Worked Example
   - Learn (Pencast)

3. Try It
   - Example

4. Check of Understanding
   - Worked Example

5. Summary
   - Try It
   - Check of Understanding
   - Summary

In many problems, we can let \( x \) represent an unknown quantity based on the information we are given. Then we can solve the problem into an equation and then solve for \( x \).
Practice Opportunities are Provided

1. ex. 22.2.3
   Solve the system \[
   \begin{align*}
   8x + 5y &= -10 \\
   7x + 9y &= -4 
   \end{align*}
   \] by substitution.
   
   \[
   x = \begin{array}{|c|c|}
   \hline
   \cdot & \cdot \\
   \hline
   \end{array}
   \]
   \[
   y = \begin{array}{|c|c|}
   \hline
   \cdot & \cdot \\
   \hline
   \end{array}
   \]

2. ex. 22.2.9
   Solve the system \[
   \begin{align*}
   -2x - 7y &= 1 \\
   10x + 4y &= -8 
   \end{align*}
   \] by substitution.

   \[
   x = \begin{array}{|c|c|}
   \hline
   \cdot & \cdot \\
   \hline
   \end{array}
   \]
   \[
   y = \begin{array}{|c|c|}
   \hline
   \cdot & \cdot \\
   \hline
   \end{array}
   \]
   
   Solution:

   Solve the second equation for \( y \) we get:
   \[
   9y = -4 - 7x
   \]
   Which implies
   \[
   y = \frac{-4 - 7x}{9}
   \]
   Use that in the first equation and we get:
   \[
   8x + 5 \left( \frac{-4 - 7x}{9} \right) = -10
   \]
   \[
   8x + \frac{-4}{9} - \frac{5 \cdot 7x}{9} = -10
   \]
   \[
   8x - \frac{35}{9}x = -10 + \frac{20}{9}
   \]
   \[
   \frac{37}{9}x = -\frac{70}{9}
   \]
   \[
   x = -\frac{70}{37}
   \]
Questions are Algorithmic

List the points at which the graph of the function \( f \) has local maxima and local minima.

Separate the coordinate pairs with a comma, if there is no local maxima or minima then enter "None".
University demographics (gender, ethnicity) help personalize the course.
Word Problems Related to the Student’s Program of Study

Samantha owns a sandwich business. She has a daily order worth $55.00 with one company. She sells sandwiches to individuals for 3.50 each. Yesterday, Samantha’s turnover was 93.50. How many individual sales did she make yesterday? (Note: Business turnover is a numeric value representing total sales.)

Amara hired a company to determine if the foundation of her home was compromised. The cost for the engineering elevation survey was $1000 and the soil samples cost $145 each. If the total cost was $4480, how many soil samples were taken?
GO Knights!

The University of Central Florida’s building fund has invested some money in two ways: part of the money at 2.9% interest and three times as much at 3.2%. Find the amount invested at each rate if the total annual income from interest is $1873.87

amount placed at 2.9% = 

amount placed at 3.2% = 
Students Perceived Better Learning With RealizeIT

<table>
<thead>
<tr>
<th>Agree or Neither</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>77%</td>
<td>.10</td>
<td>.43</td>
<td>.24</td>
<td>.14</td>
<td>.12</td>
</tr>
<tr>
<td>59%</td>
<td>.14</td>
<td>.28</td>
<td>.17</td>
<td>.17</td>
<td>.20</td>
</tr>
<tr>
<td>66%</td>
<td>.34</td>
<td>.34</td>
<td>.20</td>
<td>.16</td>
<td>.16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>24%</td>
<td>.10</td>
<td>.14</td>
<td>.10</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>38%</td>
<td>.17</td>
<td>.17</td>
<td>.21</td>
<td>.16</td>
<td>.16</td>
</tr>
<tr>
<td>32%</td>
<td>.20</td>
<td>.20</td>
<td>.20</td>
<td>.16</td>
<td>.16</td>
</tr>
</tbody>
</table>

Intermediate Algebra: n=21
College Algebra: n=29
Total: n=50

Course

Center for Distributed Learning
Students Perception Of Time Spent In Realizeit Compared To Non-RealizeIT Course

### Intermediate Algebra
- More: 76.2%
  - Much More: 0.48
  - More: 0.29
  - The Same: 0.05
  - Less: 0.14
  - Much Less: 0.05
- Same or Less: 23.8%
  - Much More: 0.13
  - More: 0.13
  - The Same: 0.20
  - Less: 0.20
  - Much Less: 0.05

### College Algebra
- More: 53.3%
  - Much More: 0.33
  - More: 0.20
  - The Same: 0.20
  - Less: 0.13
  - Much Less: 0.13
- Same or Less: 45.6%
  - Much More: 0.14
  - More: 0.14
  - The Same: 0.13
  - Less: 0.13
  - Much Less: 0.13

### Total
- More: 62.7%
  - Much More: 0.39
  - More: 0.24
  - The Same: 0.20
  - Less: 0.14
  - Much Less: 0.10
- Same or Less: 37.3%
  - Much More: 0.14
  - More: 0.14
  - The Same: 0.13
  - Less: 0.13
  - Much Less: 0.13

**Courses:**
- Intermediate Algebra (n=21)
- College Algebra (n=30)
- Total (n=51)
Students Would Take Another Course Using RealizeIT if Given the Choice

<table>
<thead>
<tr>
<th>Agree or Neither</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>Agree</td>
<td>51%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>60%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>40%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>n=20</th>
<th>n=27</th>
<th>n=47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Algebra</td>
<td>.40</td>
<td>.11</td>
<td>.11</td>
</tr>
<tr>
<td>College Algebra</td>
<td>.20</td>
<td>.29</td>
<td>.34</td>
</tr>
<tr>
<td>Total</td>
<td>.20</td>
<td>.37</td>
<td>.30</td>
</tr>
</tbody>
</table>

Intermediate Algebra n=20  
College Algebra  n=27  
Total Course  n=47
Dr. Julie Hinkle
Pathophysiology

Center for Distributed Learning
Pathophysiology

• Case studies
  • Variables and conditions
  • Feedback
  • Evaluation
  • Future plans

• Face to Face, Mixed Mode, Fully Online delivery
Realizeit and case studies

- Realizeit has robust tools to create variables and conditions
- Enables cases to be repeated over and over with repetition being unique
- Reinforces fundamental concepts vs memorization of answers

Example next:
Case Study

A 42-year-old male is brought to the emergency department after friends find him unconscious at home when he did not report for his shift as a restaurant cook. He has a 30-year history of Type 1 diabetes. He experienced a tumultuous adolescence following the diagnosis and has struggled with alcohol and drug abuse. He has had difficulty maintaining a job and frequently moves between friend’s homes. He is on 70/30 Novolin insulin twice daily and has this prescribed by the health department. He has no insulin coverage plan. He has had 5 admissions over the past year and his current A1c is 12.5%. His medical care has been sporadic since diagnosis, but during emergency department and hospitalizations, he has been diagnosed with nephropathy, hyperlipidemia, peripheral neuropathy, gastroparesis and hypoglycemia unawareness. He has been treated for a diabetic foot ulcer.
The following assessments were noted.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>w2HR bpm</td>
</tr>
<tr>
<td>B/P</td>
<td>94/54</td>
</tr>
<tr>
<td>Respirations</td>
<td>w2rr rpm</td>
</tr>
<tr>
<td>O₂ saturation</td>
<td>87% room air</td>
</tr>
<tr>
<td>Temperature</td>
<td>37.4°C</td>
</tr>
</tbody>
</table>

The client is alert and oriented and slightly diaphoretic and pale. Respirations are slightly labored. Crackles are...
**Labs on admission to the ED are as follows:**

<table>
<thead>
<tr>
<th>CHEM panel</th>
<th>CBC</th>
<th>ABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>glucose</td>
<td>WBC</td>
<td>pH</td>
</tr>
<tr>
<td>Na+</td>
<td>Hgb</td>
<td>CO₂</td>
</tr>
<tr>
<td>K+</td>
<td>HCT</td>
<td>O₂</td>
</tr>
<tr>
<td>Cl⁻</td>
<td>neut</td>
<td>HCO₃</td>
</tr>
<tr>
<td>BUN</td>
<td>lymph</td>
<td>Anion gap</td>
</tr>
<tr>
<td>Creatinine</td>
<td>Mono</td>
<td></td>
</tr>
<tr>
<td>BUN/Creatinine</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Results:**
- W1glucose: mg/dL
- W1wbc: WBC
- W1hgb: Hgb
- W1co2: CO2
- W1k: mEq/L
- W1htc: %
- W1cl: mEq/L
- W1neut: %
- W1lymph: %
- W1bun: mg/dL
- W1mono: %
- W1creates: mg/dL
- W1anion: Anion gap
This one takes some thought. How did you do?

The patient is hypochloremic because $C^-$ is **$w_{1cl}$** mEq/L which is less than 96 mEq/L.

$w_{1na}<135$

The patient is hyponatremic because $Na^+$ is **$w_{1na}$** mEq/L which is less than 135 meq/L.

$w_{1na}>145$

The patient is hypernatremic because $Na^+$ is **$w_{1na}$** mEq/L which is greater than 145 mEq/L.

$w_{1k}<3.3$

The patient is hypokalemic because $K^+$ is **$w_{1k}$** mEq/L which is less than 3.3 mEq/L.
The answer we're looking for here is metabolic acidosis.

Glucose is w1glucose mg/dl. This patient is a type 1 diabetic and has DKA.

You can either give:

0.1 U/kg as IV bolus followed by 0.1 U/kg/hr as continuous IV infusion

or:

0.14 U/kg as continuous IV infusion
1. The two main intracellular fluid (ICF) compartments are the interstitial fluid contained in the comp3 and the intravascular fluid contained in the comp4.

2. The lab results for a patient are HCO3 = hco3b, pH = ph2, CO2 = co2b. What can be determined?

3. ![ECG Image]
Grad case studies

• Grad case studies are more complex
  • Emphasize multisystem, treatment, assessment, and or impact or treatment.
  • Hard to structure prerequisite nodes as in UG
  • Set up to have “practice” before hand
  • Then can direct to prereq nodes if needed.
Endocrine due by 6/16/2017

Steps | Progress | Advanced
--- | --- | ---
2 hr 20 mins | Estimated work to be done | Due date

First step:

- Your first step is to let the system determine your level of knowledge.

Determine knowledge

Messages from system (2):

My learning path (showing full module):

- Intro to Endocrine
  - Endocrine basics
    - Pituitary Disorders
    - Thyroid Disorders
  - Diabetes Complications
    - Intro to Diabetes
  - Adrenal Gland Disorders
Due date reached

The due date of 6/16/2017 has been reached. You can access summary information for the section using the Grading button. Grading information has been transferred.

Question answer queries

One question answer that was judged incorrect has been queried by one of the people in this section. Press Questions to examine the question.

Knowledge covered

This module was due on 6/16/2017.

One person has not started.

22 people are finished.

One person has not yet done determine knowledge for this module.

People

<table>
<thead>
<tr>
<th>Name</th>
<th>Knowledge state</th>
<th>Knowledge covered</th>
<th>Objective time</th>
<th>Estimated work to be done</th>
<th>Last access</th>
<th>Paired</th>
<th>Due</th>
</tr>
</thead>
</table>
Debbie L. Kirkley
Faculty Development

Center for Distributed Learning
Faculty Development

- Pilot Study

- BAS Program
  - IDL6543 – Interactive Distributed Learning alternative
PAL6000 – Personalized Adaptive Learning

- Module 0: Getting Started
- Module 1: Introduction to Personalized Adaptive Learning
- Module 2: Course Organization
- Module 3: Course Content
- Module 4: Assessment
- Module 5: Grading Strategies
- Module 6: Course Management
- Showcase
Support

PAL Team

Instructional design – pedagogical approaches
  • Consultations -
    ✓ Course organization
    ✓ Grading strategies

Course Building
  • Course Building Planner
  • Content aggregation
  • Graphical / video

Student Support
Challenges

• Course building can be time-consuming

• Move from summative to formative assessment

• Course organization

• Collaboration?
Example #1

Example #2

**EXAMPLE:** One large section delivered via lecture-capture

**REDESIGNED**

Multiple sections, each meeting for 5 sessions each term

**OUT-OF-CLASS:** Interactive, adaptive personalized learning

**IN-CLASS:** Small group work, in technology-enhanced active-learning pods, facilitated by faculty
Future – Scalable Strategies

Targeting:
• Large class size
• Frequent D and F
• High Withdrawal Rates
• STEM concentration
Questions?

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dkirkley@ucf.edu

Center for Distributed Learning