Closing The Gap: Strategies For Research To Practice In Online Undergraduate STEM General Education

Jacquelyn Kelly, PhD

Associate Dean

University of Phoenix
Agenda

Our plans for today
The Challenge
Our UOPX Journey
Break
Practice with Philosophical Framework Development
Planning for Your Journey
The Challenge

Philosophical Frameworks as a Solution
The Challenge

Educational theory does not always make it to the classroom.

– Hard to translate complex theories into practice

– Hard to distinguish the difference between data-driven and theory-driven decisions

– Hard to measure the direct impact of theory and philosophy implementation

– It is messy……
The Solution

Use a clearly defined philosophical framework to guide choices

– Develop a framework: Use best practice

– Identify course features / teaching behaviors

– Align framework to features / behaviors

– Assess fidelity of alignment
Philosophical Framework

Operational definition for today

A collection of seminal education theories or best practices used to describe and guide our ideal learning environments. Purpose: to inform everything we do for students.
Our UOPX Journey

It was iterative and nonlinear
How this started, back in 2019

<table>
<thead>
<tr>
<th>MTH/215 Test 10/22/19</th>
<th>MTH/215A Pilot Sections N=150</th>
<th>MTH/215T Control Sections N=520</th>
</tr>
</thead>
<tbody>
<tr>
<td>W + F %</td>
<td>5.3%</td>
<td>15.5%</td>
</tr>
<tr>
<td>Midterm Exam Avg</td>
<td>78%</td>
<td>75%</td>
</tr>
<tr>
<td>Final Exam Avg</td>
<td>82%</td>
<td>74%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MTH/216 Test 11/26/19</th>
<th>MTH/216A Pilot Sections N=225</th>
<th>MTH/216T Control Sections N=558</th>
</tr>
</thead>
<tbody>
<tr>
<td>W + F %</td>
<td>4.4%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Midterm Exam Avg</td>
<td>75%</td>
<td>70%</td>
</tr>
<tr>
<td>Final Exam Avg</td>
<td>65%</td>
<td>50%</td>
</tr>
</tbody>
</table>
How do we do it again?

– People kept asking, “How?”
– It was more than “just courseware”
– We wanted to replicate, so we tried
Our initial assumptions

- Thought is developed through use of language
- Belonging predicts persistence
- Learning environments define learning
- Language is context dependent
- Knowledge is synthesis
- Emotions impact cognitive processes
- Learning occurs through conceptual change

Successful Student
Our initial educational theories

- Social Constructivism
- Metacognition & affect
- Conceptual Change
- Academic Self-Concept
- Holism
- Systemic Functional Linguistics
- 21st Century Knowledge

Philosophical Framework

© 2021, University of Phoenix.
## Philosophical Framework

Table 1: Matrix of theories translated into practice toward closing the theory to practice gap. The included citations focus on seminal works.

<table>
<thead>
<tr>
<th>Theory</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognition and Affect</td>
<td>(Dole &amp; Sinatra, 1998; Mayer, 1998; Moons &amp; Mackie, 2007; Sinatra, 2005)</td>
</tr>
<tr>
<td>Conceptual Change</td>
<td>(Strike &amp; Posner, 1992; Carey, 1999; Carey, 2000; Chinn &amp; Brewer, 1993; Chi, 2008)</td>
</tr>
<tr>
<td>Social Constructivism</td>
<td>(Vygotsky, 1986)</td>
</tr>
<tr>
<td>Academic Self-concept</td>
<td>(Marsh, &amp; Shavelson, 1985; Bong &amp; Skaalvik, 2003)</td>
</tr>
<tr>
<td>Holism</td>
<td>(Dewey, 1986; Mahmoudi, Jafari, Nasrabad, Liaghatdar, 2012)</td>
</tr>
<tr>
<td>Systemic Functional Linguistics</td>
<td>(Halliday, 1992; Holliday, Yore, &amp; Alvermann, 1994)</td>
</tr>
<tr>
<td>21st Century Knowledge Framework</td>
<td>(Kereluik, Mishra, Fahnoe, &amp; Terry, 2013; Mishra, Anbar, Scragg, &amp; Ragan, 2019)</td>
</tr>
</tbody>
</table>
### Additional Implementations 2019-2021

Across 16 additional Undergraduate General Education STEM Courses

<table>
<thead>
<tr>
<th>Full Implementation</th>
<th>Moderate Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH/215(T)</td>
<td>MTH/219(T)</td>
</tr>
<tr>
<td>MTH/216(T)</td>
<td>MTH/220(T)</td>
</tr>
<tr>
<td>MTH/217</td>
<td>MTH/221</td>
</tr>
<tr>
<td>MTH/218</td>
<td>MTH/280</td>
</tr>
<tr>
<td>SCI/163(T)</td>
<td>MTH/290</td>
</tr>
<tr>
<td>SCI/220(T)</td>
<td>MTH/380</td>
</tr>
<tr>
<td>SCI/209</td>
<td>MTH/360</td>
</tr>
<tr>
<td>CHM/110</td>
<td>BIO/101T</td>
</tr>
</tbody>
</table>
Not all implementations were equivalent

And student outcomes reflected those differences

<table>
<thead>
<tr>
<th>Implementation Level</th>
<th>Pre Revision Avg W+F Dec 18-April 19</th>
<th>Post Revision Avg W+F Dec 20-April 21</th>
<th>Change W+F YOY</th>
<th>Percentage Change W+F YOY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>18.1% (N=1931)</td>
<td>12.4% (N=1646)</td>
<td>-5.7</td>
<td>31.5% decrease</td>
</tr>
<tr>
<td>Full</td>
<td>11.5% (N=12435)</td>
<td>6.0% (N=13352)</td>
<td>-5.5</td>
<td>47.8% decrease</td>
</tr>
<tr>
<td>ALL</td>
<td>12.4% (N=14366)</td>
<td>6.7% (N=14998)</td>
<td>-5.7</td>
<td>46.0% decrease</td>
</tr>
</tbody>
</table>
We wanted to scale

We needed a tool to ensure consistency with Philosophical Framework and Practice

1. Operationally Define the theories of our Philosophical Framework
2. Identify Course Features we wanted to impact
3. Create criteria linking Philosophical Frame to Course Features
4. Use criteria/inventory while designing and enhancing courses
1. Operationally Define our Framework

How do we interpret these for our students?
## Philosophical Framework

### 1. Operationally Define Framework

<table>
<thead>
<tr>
<th>Theory</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognition and Affect</td>
<td>(Dole &amp; Sinatra, 1998; Mayer, 1998; Moons &amp; Mackie, 2007; Sinatra, 2005)</td>
</tr>
<tr>
<td>Conceptual Change</td>
<td>(Strike &amp; Posner, 1992; Carey, 1999; Carey, 2000; Chinn &amp; Brewer, 1993; Chi, 2008)</td>
</tr>
<tr>
<td>Social Constructivism</td>
<td>(Vygotsky, 1986)</td>
</tr>
<tr>
<td>Academic Self-concept</td>
<td>(Marsh, &amp; Shavelson, 1985; Bong &amp; Skaalvik, 2003)</td>
</tr>
<tr>
<td>Holism</td>
<td>(Dewey, 1986; Mahmoudi, Jafari, Nasrabadi, Liaghatdar, 2012)</td>
</tr>
<tr>
<td>Systemic Functional Linguistics</td>
<td>(Halliday, 1992; Hollliday, Yore, &amp; Alvermann, 1994)</td>
</tr>
<tr>
<td>21st Century Knowledge Framework</td>
<td>(Kereluik, Mishra, Fahnoe, &amp; Terry, 2013; Mishra, Anbar, Scragg, &amp; Ragan, 2019)</td>
</tr>
</tbody>
</table>
Spotlight: Metacognition & Affect

Emotions impact metacognitive processes and access to heuristics

In courses this looks like:

– Acknowledging and validating emotions
– Reducing anxiety (or hot emotions) when critical thought is required
– Eliciting reflection about thought processes used to complete tasks
– Providing explicit, detailed formative feedback frequently to develop metacognitive awareness
Spotlight: Conceptual Change

Preconceptions impact conceptual development; change may be required

In courses this looks like:

– Eliciting prior knowledge
– Creating opportunities for preconceptions and misconceptions to appear
– Confronting and resolving misconceptions through specific feedback and interactions
– Using prior knowledge as a foundation for new concepts
Spotlight: Social Constructivism

Knowledge is developed through language and between social partners

In courses this looks like

– Providing authentic opportunities to discuss concepts as a strategy to build knowledge
– Asking questions that are intentional and build on prior knowledge
– Posing questions that support conceptual learning trajectory
– Creating opportunities for collaborative exploration that leads to consensus
– Allowing students to solve complex problems, not complete algorithms
– Using assignments / assessments that provide opportunity to express understanding through language
Spotlight: Academic Self-Concept

Sense of belonging, or identity, related to content predicts persistence

In courses this looks like

– Using language that promotes a sense of belonging (approachable, inclusive, personable)
– Creating learning situated in the student experience
– Validating and supporting student challenges
– Demonstrating that expertise and careers in the field are attainable for students
– Leveling course content appropriately for students
Spotlight: Holism

The learning environment implies bias about the nature of knowledge

In courses this looks like

- The classroom is student-centered
- Students are provided with experiences that address the whole person
- Class policies are consistent with curricular platform and claims about learning
- Classroom environment is consistent with curricular platform and claims about learning
- Students experience consistency between claims about learning and actions taken in the classroom
Spotlight: Systemic Functional Linguistics

The meaning of language is situation and context dependent

In courses this looks like:
- Explicitly discussing vocabulary in different contexts (colloquial vs technical uses)
- Asking students about their use of terms in various contexts
- Providing students opportunities to practice using technical language
- Using operational definitions
- Allowing students opportunities to communicate to different audiences and adjust language appropriately
Spotlight: 21st Century Knowledge

Knowledge is synthesis of foundational, humanistic, and metacognitive information

In courses this looks like

- Giving students opportunities to demonstrate
  - Technical knowledge
  - The social/human context of the knowledge
  - Reflective and cognitive processes used to engage with the knowledge
- Addressing assumptions, biases, lenses
- Addressing the fluidity and nature of knowledge
2. Identify Course Features to Impact

What do we have control to change?
Original Course Features

Our initial list of nine identified features

1. Advisory language
2. Remediation strategy
3. Discussion questions
4. Content resources
5. Assignments
6. Assessments
7. Iterative opportunity
8. Feedback speed
9. Perception of academic learning
Original Course Features, revised

Our initial list of nine identified features

1. Advisory language
2. Remediation strategy
3. Discussion questions
4. Content resources
5. Assignments
6. Assessments
7. Iterative opportunity
8. Feedback speed
9. Perception of academic learning

Determined these were more behavior dependent views and assumptions

Would target later, in other initiatives
Final Course Features

Our functioning list of five identified features

1. Advisory language
2. Discussion questions
3. Content resources
4. Assignments
5. Assessments
3. Link Framework to Features

Criteria or Inventory Creation
Process for Linking

Creating criteria and/or an inventory

1. Select Feature

2. Select one component of Philosophical Framework and interpret it for this feature

3. Create statement of what ideal feature would look like for that one component

4. Repeat with all other components for Philosophical Framework

5. Repeat for each Feature
## Example – Assignment Feature

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Not Present</th>
<th>Somewhat Present</th>
<th>Strongly Present</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metacognition &amp; Affect</strong>&lt;br&gt;Assignments support students with using and identifying the processes they engage to access and create knowledge.&lt;br&gt;Assignments do not attempt to frighten students, instead support students with moving their affective states in order to build knowledge.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Conceptual Change</strong>&lt;br&gt;Assignments are used to build. They are formative to allow students to practice, elicit, confront, and resolve misconceptions.&lt;br&gt;They are not presented as high stakes.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Social Constructivism</strong>&lt;br&gt;Assignments give students opportunities to practice expressing their thought through language. By connecting those things, students are building and demonstrating knowledge. Having feedback from an additional social partner, on route, is recommended.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Academic Self-Concept</strong>&lt;br&gt;Assignments have the purpose of supporting students with feeling like they are capable of becoming academic scholars in the discipline. They are not for catching students and making them feel wrong. They support students through this learning journey so that students become empowered learners.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Holism</strong>&lt;br&gt;Assignments are not high stakes. Students are provided multiple opportunities to improve and practice. Grades should be able to improve as students reattempt. No late penalties should be assigned as these are learning opportunities that are not time dependent.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Systemic Functional Linguistics</strong>&lt;br&gt;Assignments explicitly support students with navigating how language changes between different contexts. They acknowledge that technical terms may not mean the same thing as in colloquial sense and help students practice switching back and forth.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>
Considerations for Linking

Things we have learned
– Use language appropriate for stakeholders who might use it

– Try to provide affirmative statements more often than things to avoid

– If you experience dissonance, it might mean something needs to change (your framework, or your features)

– These will be BEST CASE. For pragmatic reasons, you may not achieve ideal state every time (and that’s ok)
4. Use Your Inventory

For designing and communicating
Some of Our Use Cases

How do we use this?

– When designing or revising courses – to guide feature development
– When we see something isn’t working and need to know why – assessing existing feature
– To prioritize projects – needs assessment
– To determine which features / theories are most impactful for students
Implementation Considerations

Things we have learned
– While you may start at course level implementation, it might grow to
  • Teaching behaviors
  • Programmatic choices
  • Guides for student related initiatives
  • Assessment strategy

– These will be BEST CASE. For pragmatic reasons, you may not achieve ideal state every time (and that’s ok)

– It might change based on what you learn
Practicing with Philosophical Frameworks

Stepping through an example
Let’s Practice

In Teams, we will work on the following (one step at a time)

1. Operationally Define the theories of our Philosophical Framework
2. Identify Course Features we wanted to impact
3. Create criteria linking Philosophical Frame to Course Features
4. Use criteria/inventory while designing and enhancing courses
1. Operationally Define Your Framework

It starts with selecting theory or best practice
# Philosophical Framework

Table 1: Matrix of theories translated into practice toward closing the theory to practice gap. The included citations focus on seminal works.

<table>
<thead>
<tr>
<th>Theory</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognition and Affect</td>
<td>(Dole &amp; Sinatra, 1998; Mayer, 1998; Moons &amp; Mackie, 2007; Sinatra, 2005)</td>
</tr>
<tr>
<td>Conceptual Change</td>
<td>(Strike &amp; Posner, 1992; Carey, 1999; Carey, 2000; Chinn &amp; Brewer, 1993; Chi, 2008)</td>
</tr>
<tr>
<td>Social Constructivism</td>
<td>(Vygotsky, 1986)</td>
</tr>
<tr>
<td>Academic Self-concept</td>
<td>(Marsh, &amp; Shavelson, 1985; Bong &amp; Skaalvik, 2003)</td>
</tr>
<tr>
<td>Holism</td>
<td>(Dewey, 1986; Mahmoudi, Jafari, Nasrabadi, Liaghatdar, 2012)</td>
</tr>
<tr>
<td>Systemic Functional Linguistics</td>
<td>(Halliday, 1992; Hollliday, Yore, &amp; Alvermann, 1994)</td>
</tr>
<tr>
<td>21st Century Knowledge Framework</td>
<td>(Kereluik, Mishra, Fahnoe, &amp; Terry, 2013; Mishra, Anbar, Scragg, &amp; Ragan, 2019)</td>
</tr>
</tbody>
</table>
Choose a Theory or Best Practice

TEAMWORK 1: In your Team for 8 minutes

– Choose one theory or best practice (one of ours or your own choice)

– Answer the following:
  • What is its name? (or what will you call it)
  • Summarize the big ideas of the theory or best practice.
  • What student outcome should it impact? (ex: retention, learning, experience)
  • Why is this appropriate for your students?
  • Note down at least one reference.
2. Identify Course Features to Impact

What do you have control to change?
List Course Features for You

TEAMWORK 2: In your Team for 8 minutes

– Make a list of all course features you want to impact with the theory
– Considerations
  • Choose things you can control
  • Choose things you might be able to observe / measure
  • This might look very different for online vs in person environments
  • This might look different for small vs large institutions
3. Link Framework to Features

Criteria or Inventory Creation
Process for Linking

TEAMWORK 3: In your Teams for 8 minutes

1. Select one Course Feature

2. Create statements of what ideal feature would look based on the theory you selected (If your theory was implemented flawlessly, what would this feature look like?)

3. Practice your statements in language that might be appropriate for wide variety of stakeholders
4. Use Your Inventory
For designing and communicating
Discuss Use Cases

TEAMWORK 4: In your Teams for 8 minutes

– How might you use this inventory?

– What stakeholders would you share this with?

– What are the strengths / limitations of what you produced?
Planning Your Journey

Action Items to take Home
Time to Reflect

5 Minutes to Journal Your Thoughts Independently for your Journey

– Theory ideas
– Feature ideas
– Thoughts about linking
– Thoughts about use cases
– Foreseeing barriers
Let’s Wrap Up

Where have we gone?
Overview

Our plans for today

The Challenge

Our UOPX Journey

Practice with Philosophical Framework Development

1. Operationally Define the theories of our Philosophical Framework
2. Identify Course Features we wanted to impact
3. Create criteria linking Philosophical Frame to Course Features
4. Use criteria/inventory while designing and enhancing courses

Planning for Your Journey
Thank you!

Closing the research to practice gap is messy, but it is a way that we can intentionally support our students.

“In theory, theory and practice are the same. In practice, they are not.” - Unknown

Questions?
Jacquelyn Kelly, PhD
Jacquelyn.Kelly@phoenix.edu
References