Wise Instructional Choices: Your Roadmap for New Faculty Workshop and Future Teaching

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AAPT Physics and Astronomy New Faculty Workshop
October 25, 2018
NFW can seem like this.
Learning physics and astronomy can seem like this.

Let’s make it more like this.
Let’s make it more like this.
Wise instructional choices

- Articulate priorities for student learning
- Identify what makes teaching methods work
- Recognize how your context matters

+ Anticipate stages in building teaching expertise
Plan:

1. Priorities for Student Learning
2. Wise instructional choices
3. Context matters
University science teaching is changing
University science teaching is changing
RBISs
Research Based Instructional Strategies

Close relatives:

EBIPs
Evidence Based Instructional Practices
RBISs
Research Based Instructional Strategies

From the universe of

DBER
Discipline Based Education Research

and

PER
Physics Education Research

NASA/ESA/S. Beckwith(STScI) and The HUDF Team
RBISs you’ll explore in New Faculty Workshop

**Inclusive Teaching Structures**
- Just In Time Teaching (JITT)
- Critical Thinking in Labs
- (Lecture) Tutorials
- Interactive Lecture Demos
- Think-Pair-Share / Peer Instruction
- PhET Interactive Simulations
- Resources: PhysPort/comPADRE

**IMPORTANT:**
- Tools
- Instruments
- Vehicles
- Methods
**Inclusive Teaching Structures**

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“Why use this?”

Orient your compass – **Intentions for students**
Bloom’s Taxonomy

- **Remember**: Recall facts and basic concepts
  - define, duplicate, list, memorize, repeat, state

- **Understand**: Explain ideas or concepts
  - classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

- **Apply**: Use information in new situations
  - execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

- **Analyze**: Draw connections among ideas
  - differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

- **Evaluate**: Justify a stand or decision
  - appraise, argue, defend, judge, select, support, value, critique, weigh

- **Create**: Produce new or original work
  - design, assemble, construct, conjecture, develop, formulate, author, investigate
Multiple kinds of learning...

**Foundational Knowledge**
Understanding & Remembering:
- Information
- Ideas

**Application**
- Skills
- Thinking: critical, creative, practical
- Managing Projects

**Integration**
Connecting:
- Ideas
- People
- Realms of Life

**Learning How to Learn**
- Study skills & habits
- Inquiry; curiosity
- Self-direction; agency

**Caring**
Developing new:
- Feelings
- Interests
- Values
- Attitudes

**Human Dimension**
Learning about & working well with:
- Oneself, Others

Fink 2003
Caltech Physics + Chemistry + Math (Core) Faculty: 
Big intentions for students

• see the world differently
• motivate further inquiry
• tackle real-world issues
• recognize and solve different kinds of problems
• collaborate effectively
• appreciate the relevance of foundational science

integration
caring
application
learning to learn
human dimension
caring + knowledge
Orient your compass:

Write ~3 big intentions you have for students

- **Integration** – Connecting Ideas, People, Realms of Life
- **Human Dimension** - Learning about & working well with oneself and others
- **Caring** – Developing new: Feelings, interests, values, attitudes
- **Learning How to Learn** – Study skills & habits; Inquiry; curiosity; Self-direction; agency
Why use this?

**Hypothetical RBIS A**
- Students work in pairs
- Short conceptual questions
- One cycle takes a few minutes

**Hypothetical RBIS B**
- Students work in teams of four
- Multi-part problems/cases
- One cycle takes 20-30 minutes
1. Priorities for Student Learning
2. Wise instructional choices
3. Context matters
Wise instructional choices:

• Why use this?
  What kinds of learning outcomes is it good for?
  What are its key affordances?

• What aspects are essential?

• What are the potential pitfalls?
Fidelity of adoption

High Quality Reproduction

What’s crucial?

What’s adaptable?

Image: Jordanhill School D&T Dept, CC BY 2.0

Li et al. 2015
Minimum increment
What aspects are essential?

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Fidelity of adoption?
Minimum increment?
What are the potential pitfalls?

• Common “mistakes” (non-optimal implementations)
• Ways to avoid them
Potential pitfalls

“[Student] comments on the use of [think-pair-share] are generally mixed, but encouraging.

One of the general takeaways, that you had already warned me about, is that such things can be useful, but one has to be very careful how one uses it.

I enjoyed the [method] and aim to use it more in the future, but it requires a lot of thought to make it productive. And even more to have the students recognize the value :-)

”
What are the potential pitfalls?

• Common “mistakes” (non-optimal implementations)?
• Ways to avoid them?

Ask:
• NFW Facilitators
• Each other

“Going deeper” and practice sessions

These may not always be in the published literature...
Handy reference...

<table>
<thead>
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1. Priorities for Student Learning
2. Wise instructional choices
3. Context matters
What matters in adopting & sustaining RBISs?

• Training ✓
• Time
• Incentives
• Professional identity

Institutional context

You—an authentic individual

Brownwell & Tanner 2012
Context: Institutional Differences
Context:
Career Stage Differences
Evaluation Criteria (Promotion/Tenure)

- Research
- Teaching
- Service

Time
Incentives
Identity
USING RESOURCES

- Research
  - Institutional Grants/Releases
  - Others’ materials
- Teaching
- Service
- Online Repositories

Faculty/Teaching Center
Institutional context

- Research
- Teaching
- Service

Time
Incentives
Identity

Magic Wand
Productive Alignment
Professional & Personal Identity Matters
- Who you are as a scientist, educator, mentor, colleague, person...
- Circumstances in which you best express your enthusiasm and passion...
Context and Identity

Hypothetical RBIS A
• Students work in pairs
• Short conceptual questions
• One cycle takes a few minutes

Hypothetical RBIS B
• Students work in teams of four
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What if you:
• Teach in rooms with fixed, tiered seating?
• Find it challenging to interrupt/improvise?
• Have a full set of lecture materials from a colleague?
• Have a full set of problems/cases from a colleague?
Handy reference...

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The following questions may be helpful when deciding which RBIs (Research Based Instructional Strategies) to implement:

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Thriving in Academe

Wise Instructional Choices in an Evidence-driven Era

Everywhere you turn, colleagues are talking about evidence-based teaching. But even when this evidence is compelling, it can be tough to choose a strategy and begin using it well. This pragmatic guide will help you get started.

By Gabriela K. Tatem

Your Instructional GPS

You would not set out on a road trip without using a map and directions, nor would you cook a meal without a recipe. But what happens after you choose your instructional strategy? How do you know if the approach is working and whether you should continue using it? Your Instructional GPS provides tools to answer these questions and help you refine your teaching.

Foundational questions

1. Your instructional approach is aligned with your teaching goals.
2. You are using clear, concise language.
3. Your students are engaged and motivated.
4. You are providing feedback and opportunities for reflection.

Tales from real life and how to go for authenticity

Authentic learning experiences allow students to apply what they have learned in real-world situations. This section provides examples of how you can incorporate authentic learning into your instruction and encourage your students to think critically and creatively.

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Final thought:

NFW is an opportunity to take ONE NEXT STEP in your teaching development...

Some students → all students
20% active → (20+x)% active
Low structure → mod/high structure
Translucent → transparent
References & Resources:


