# Using The Science of Learning to Transform Teacher Preparation

*Believe and Prepare*
*February 2016*

DEANS FOR IMPACT

*Steve Wojcikiewicz*
*VP of Policy, Deans for Impact*

# Today's presentation

- Introduction to Deans for Impact
- The Science of Learning
- Design for Practice Network
- Q & A

DEANS FOR IMPACT

# Who we are….

**Deans for Impact is a national nonprofit organization representing leaders in educator preparation who are committed to transforming educator preparation and elevating the teaching profession.**

# Our members are united by a commitment to a set of guiding principles

**Data-Informed**



We are committed to collecting, sharing and using data to drive change within our programs and across the field of educator preparation.

**Outcomes Focused**



We are committed to using common metrics and assessments that tightly align the activities of our programs with demonstrable impact on student achievement and other common outcomes measures.

**Empirically Tested**



We are committed to using the tools of research to identify the features of educator-preparation programs that improve student learning.

**Transparent and Accountable**



We are committed to elevating expectations for educator-preparation accountability and making program outcomes transparent to all.

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# Our members

- **Gregory Anderson** | Temple University
- **David Andrews** | Johns Hopkins University
- **Carole Basile** | University of Missouri, St. Louis
- **David Chard** | Southern Methodist University
- **Kenneth Coll** | University of Nevada, Reno
- **Karen Symms Gallagher** | University of Southern California
- **Jack Gillette** | Lesley University
- **Mark Girod** | Western Oregon University
- **Ellen McIntyre** | University of North Carolina, Charlotte
- **Robert Pianta** | University of Virginia
- **Scott Ridley** | Texas Tech University
- **Tom E.C. Smith** | University of Arkansas
- **Jesse Solomon** | Boston Teacher Residency
- **Sara Ray Stoelinga** | University of Chicago
- **Josh Thomases** | Bank Street College of Education
- **Frank Hernandez** | The University of Texas of the Permian Basin
- **Cassandra P. Herring** | Hampton University
- **Mayme Hostetter** | Relay Graduate School of Education
- **Mari Koerner** | Arizona State University
- **Alan Lesgold** | University of Pittsburgh
- **Corinne Mantle-Bromley** | University of Idaho
- **Shane Martin** | Loyola Marymount University

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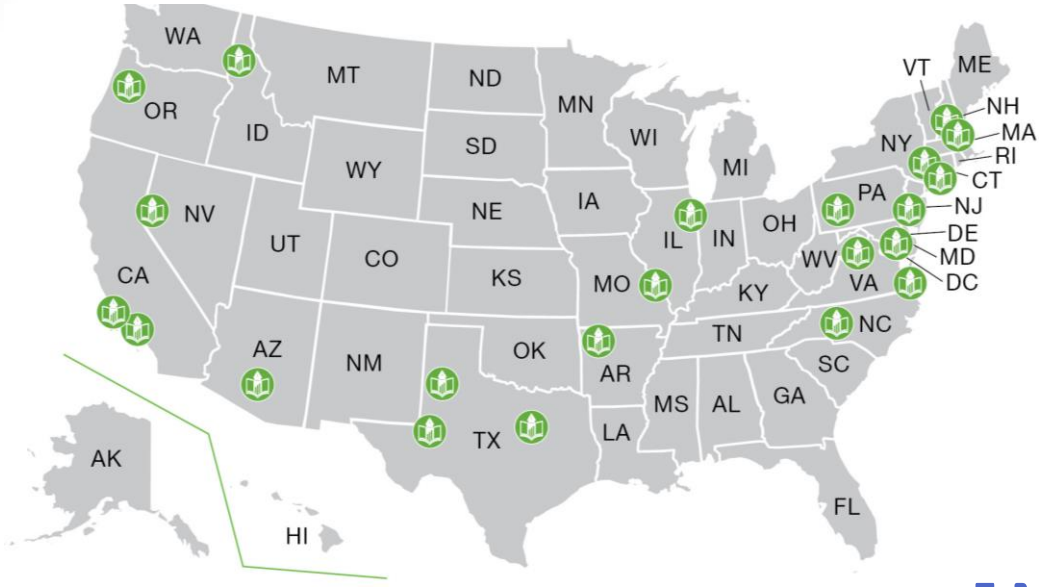
# …head a diverse set of institutions




**Total enrollment (2013):**

**13,396**

**15 urban**
**6 semi-urban**
**2 rural**

**13 public**
**9 private**
**1 hybrid**

**8 R1 universities**
**7 other doctoral universities**
**5 Master's colleges and universities**

**6 preparing more than 50% teachers of color**

**1 HBCU**

**1 residency**

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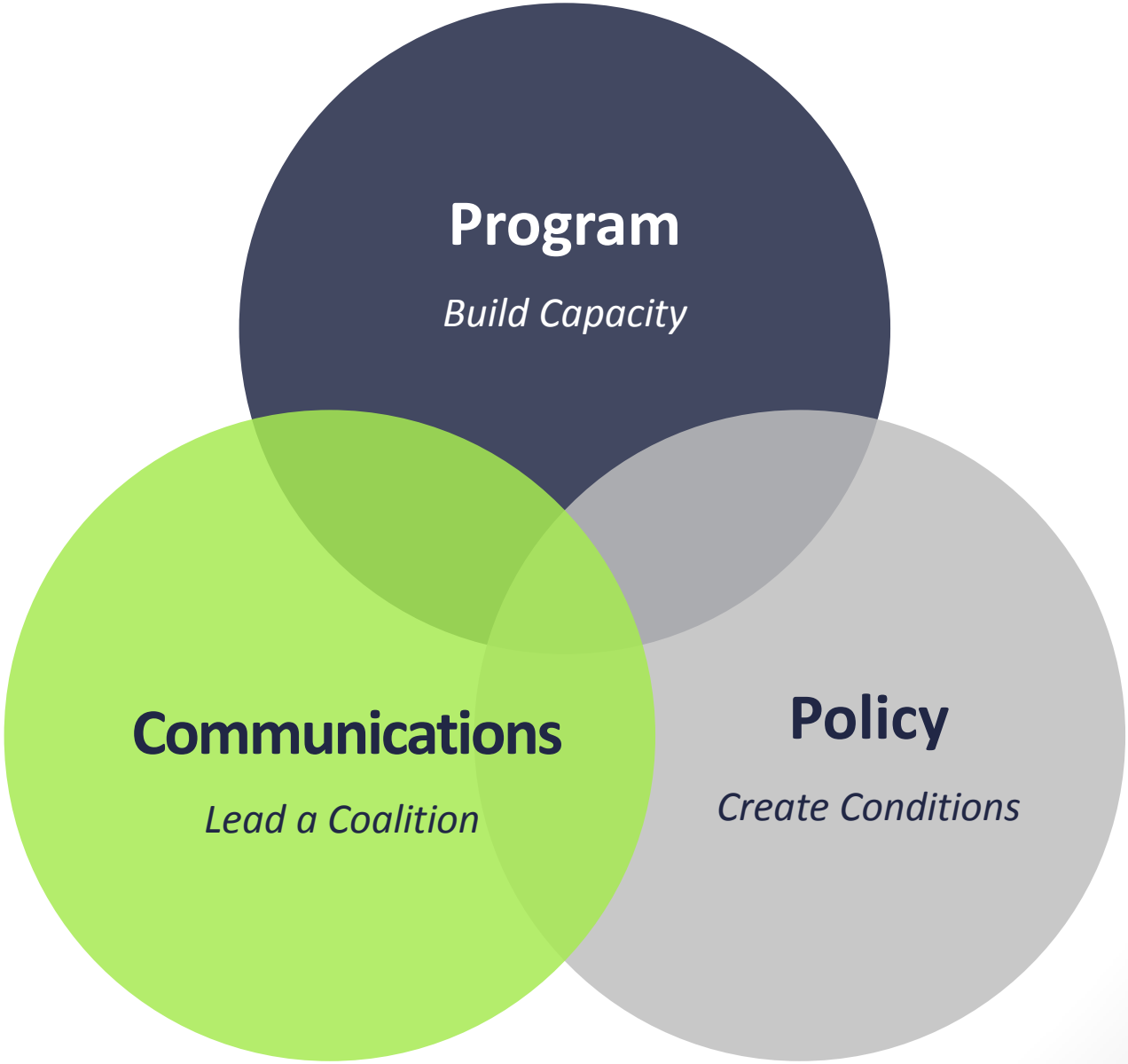
# Our theory of change drives our strategic priorities

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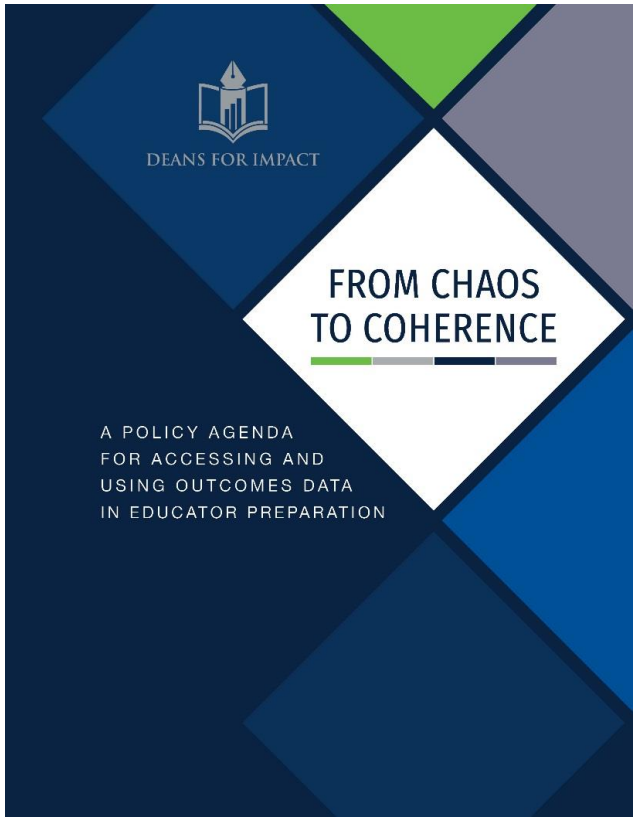
# Policy

We **create the conditions** for data-informed improvement, accountability, and research

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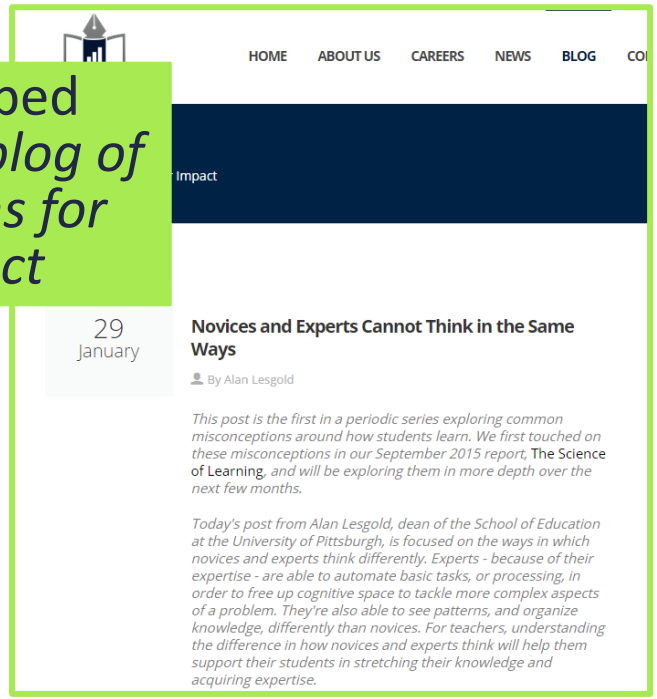
# Communications

We develop and **lead a broad coalition** that shares a collective vision of what excellent educator preparation looks like

Prepped
*The blog of Deans for Impact*




@deansforimpact

Learning Tours

- ASU Mary Lou Fulton Teachers College, Arizona State University
- UTPB, The University of Texas of the Permian Basin
- Lesley University
- UMSL Education, University of Missouri–St. Louis
- University of Idaho, College of Education

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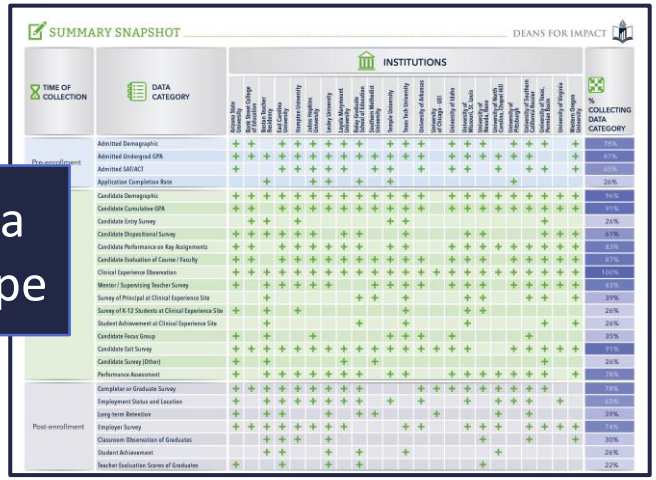
# Program

We **build capacity** of individuals and organizations to increase the impact of their programs

THE SCIENCE OF LEARNING

Design for Practice Network

DFI Data Landscape

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# Guiding principles in action

*How can we build the capacity of individuals and organizations to put guiding principles into action?*

**DFI's Approach**

- Distill and organize research within a current area
- Pilot approaches to implementation in a network
- Measure impact of pilots
- Disseminate findings and resources broadly



**Empirically Tested**



**Data-Informed**



**Outcomes Focused**



**Transparent and Accountable**

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# First publication focusing on how students learn

## Guiding principles in action

- Distill and organize research within a current area
- Pilot approaches to implementation
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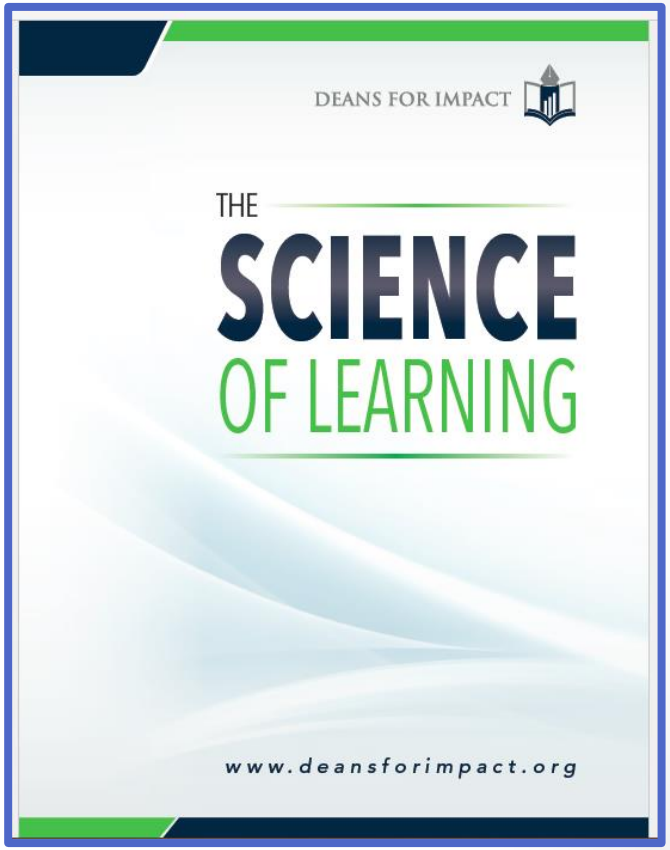


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# Why start with cognitive science?


- Educators, including new teachers, must have a better understanding about the existing scientific consensus around basic cognitive principles
- Research base already exists – but sense is that it's not well-integrated into the field of teacher preparation
- Opportunity to connect theory to practice is the sweet spot for higher education

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# The development process

Initially drafted by Dan Willingham, UVA cognitive scientist, and Paul Bruno, middle-school teacher

Detailed comments provided by a small group of additional researchers and practitioners

Outreach to a wide variety of stakeholders for additional feedback and support

*Ongoing feedback from member deans of Deans for Impact*

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# Six key questions educators should grapple with

1. How do students understand new ideas?
2. How do students learn and retain new information?
3. How do students solve problems?
4. How does learning transfer to new situations in or outside of the classroom?
5. What motivates students to learn?
6. What are common misconceptions about how students thinks and learn?

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# Design principles

**Research organized around key questions**

## 1 HOW DO STUDENTS UNDERSTAND NEW IDEAS?

| COGNITIVE PRINCIPLES | PRACTICAL IMPLICATIONS FOR THE CLASSROOM |
|---|---|
| **Students learn new ideas by reference to ideas they already know.**[1] | • A well-sequenced curriculum is important to ensure that students have the prior knowledge they need to master new ideas.[2]<br>• Teachers use analogies because they map a new idea onto one that students already know. But analogies are effective only if teachers elaborate on them, and direct student attention to the crucial similarities between existing knowledge and what is to be learned.[3] |
| **To learn, students must transfer information from working memory (where it is consciously processed) to long-term memory (where it can be stored and later retrieved). Students have limited working memory capacities that can be overwhelmed by tasks that are cognitively too demanding. Understanding new ideas can be impeded if students are confronted with too much information at once.**[4] | • Teachers can use "worked examples" as one method of reducing students' cognitive burdens.[5] A worked example is a step-by-step demonstration of how to perform a task or solve a problem. This guidance – or "scaffolding" – can be gradually removed in subsequent problems so that students are required to complete more problem steps independently.<br>• Teachers often use multiple modalities to convey an idea; for example, they will speak while showing a graphic. If teachers take care to ensure that the two types of information complement one another – such as showing an animation while describing it aloud – learning is enhanced. But if the two sources of information are split – such as speaking aloud with different text displayed visually – attention is divided and learning is impaired.[6]<br>• Making content explicit through carefully paced explanation, modeling, and examples can help ensure that students are not overwhelmed.[7] *(Note: "explanation" does not mean teachers must do all the talking.)* |
| **Cognitive development does not progress through a fixed sequence of age-related stages. The mastery of new concepts happens in fits and starts.**[8] | • Content should not be kept from students because it is "developmentally inappropriate." The term implies there is a biologically inevitable course of development, and that this course is predictable by age. To answer the question "is the student ready?" it's best to consider "has the student mastered the prerequisites?"[9] |

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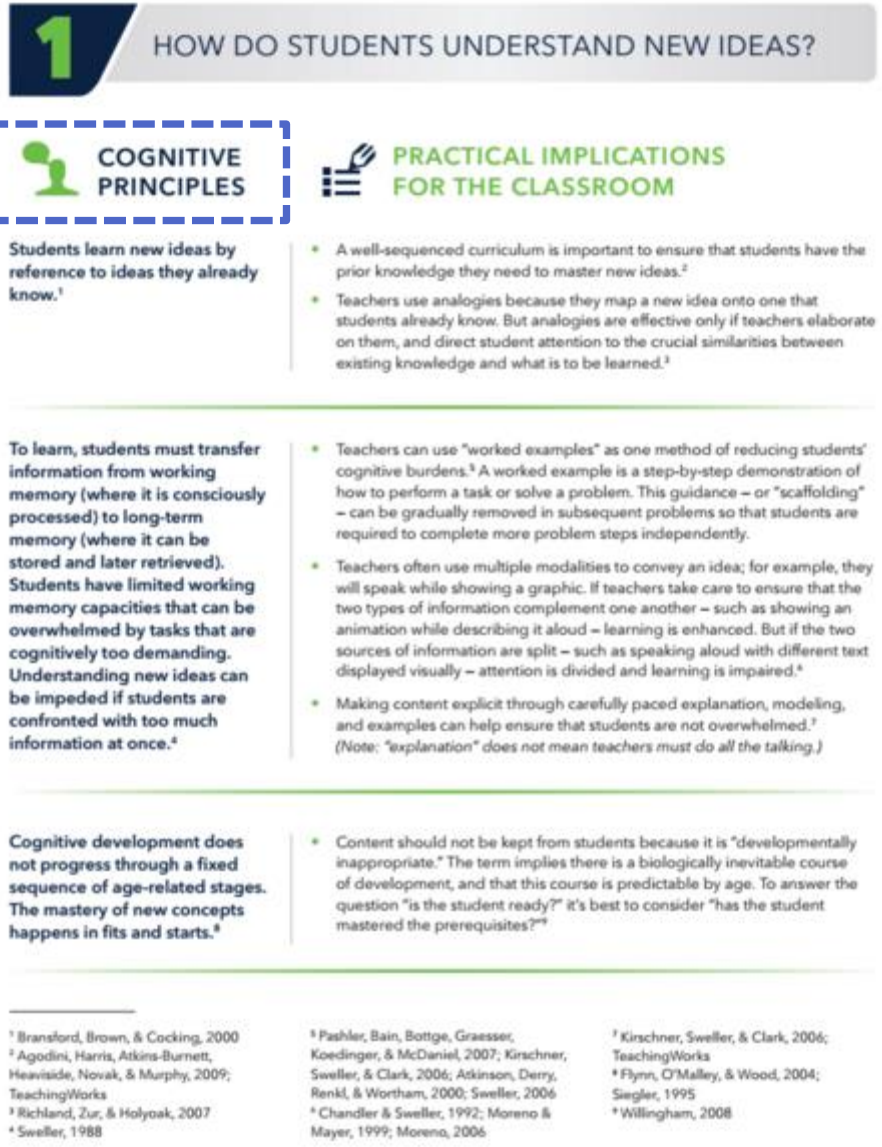
# Design principles

Based on the best scientific consensus



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**Accessible and useful for teachers and teacher-educators**

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**Provides practical implications for teaching**

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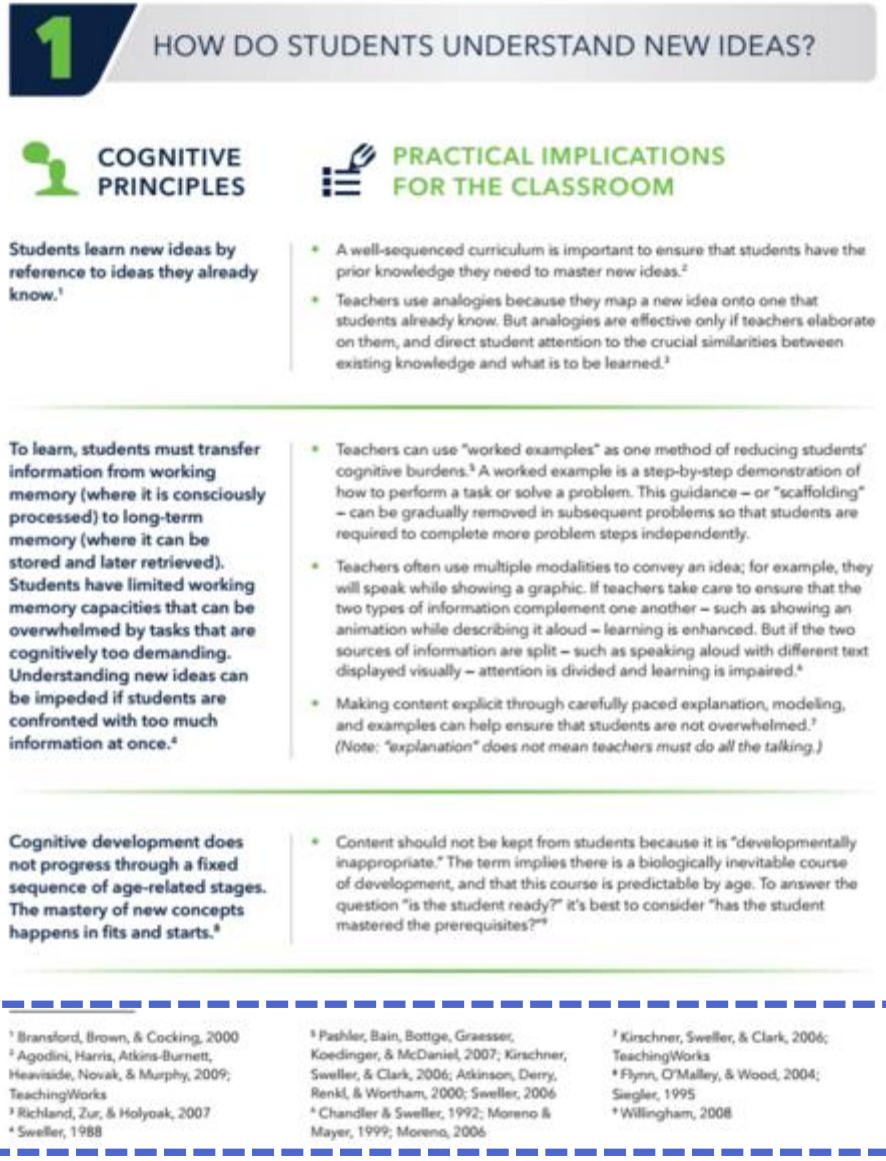
# Design principles



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**Links to academic research**

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# Reception to *The Science of Learning*

- Over 60 individuals and organizational supporters
- Accessed over 15,000 times
- Featured in *EdWeek, Education Next, US News & World Report, Huffington Post, Edutopia*


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# Ongoing work

- "Mythbusting" blog post series on Deans for Impact website to investigate common misconceptions about how students learn
- Continually looking for examples of educator-preparation programs, teacher-educators and teachers deeply embedding cognitive science principles into their practice

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# Design for Practice Network

## Guiding principles in action

- Distill and organize research within a current area
- Pilot approaches to implementation
- Measure impact of pilots
- Disseminate findings and resources broadly


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# Design for Practice Network


**A subset of programs led by member deans that aims to build teacher-candidate mastery of cognitive-science principles for learning**

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# Goals of the network


1. Design, implement, and iterate on programmatic interventions
2. Measure impact of interventions
3. Develop shared resources
4. Build knowledge and document what it takes to drive change

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# Structure of the network

- Four institutions designing and implementing pilots
  - Pilot designs are institution-specific
- DFI staff helps to facilitate learning and sharing across pilot sites
  - In-person meetings 3 times / year





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TEMPLE UNIVERSITY

**Goals**

- Improve understanding of cognitive science and utilization in decision-making and improve attitudes about learning in math and science

**Description**

- ECE Math and Science Methods sections selected for cognitive science "infusion"
- Methods sections receive five "mini-lessons" reviewing cognitive science content

**Measures**

- Knowledge pre/post-test and pre/post-attitude survey
- Lesson plans, reflections, and lesson observations

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RELAY/GSE

**Goals**

- Teachers will be able to articulate key findings of growth mindset (GM) research and demonstrate proficient enactment of a brief GM lesson with K-12 students

**Description**

- Online elective module on GM incorporating classroom video and practice and feedback opportunities
- Pilot in late spring with ~20 Relay students

**Measures**

- Teachers' scores on quizzes of GM concepts and evaluation of GM-in-action, teachers' scores on GM-in-action rubric
- Kids' scores on GM quiz and survey

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**Goals**

- Ground new teachers in the principles, practices and language of cognitive science

**Description**

- Group of 13 early-career teachers (grads of BTR) studying the question “What motivates students to learn?”
- Participants will receive group and 1:1 coaching

**Measures**

- Journals of teacher reflection and student artifacts, commentary on peer journals
- Pre/post-assessments and Pre/post- student surveys

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# Ongoing collective work: Developing common assessments

- Members of the network are developing three different assessments to measure candidate understanding of cognitive science principles, at different levels of mastery

| **Level 1:** ***Identify and understand principles*** | **Level 2:** ***Analyze and evaluate in others' practice*** | **Level 3:** ***Apply in own practice*** |
|---|---|---|
| Declarative knowledge assessment | Video case study analysis | Lesson reflection protocol |

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# Ongoing collective work: Learning about the change process

- Monthly interviews with each site to reflect on learnings from the design and implementation process
  - Activities completed
  - Progress against goals
  - Accomplishments, challenges, learning

- DFI will synthesize learnings in a white paper to be released in the fall

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# Initial learnings during design and implementation

**Challenge**

- Cognitive science is often taught in a silo and not incorporated throughout programs
- Non-psych faculty don't feel equipped to embed principles into their courses

**Opportunity**

- Professional learning opportunity for faculty
  - In multiple pilots, introduction to cognitive science has interested and energized faculty who have been exposed to new research that has changed their own practice

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# Initial learnings during design and implementation

**Challenge**

- The need to more intentionally embed cognitive science into programs does not necessarily resonate with teacher-educators

**Opportunity**

- Start with a small pilot
  - Collect and share data from pilot
  - Get candidates to talk about what was valuable about the experience
  - Generate momentum by elevating the instructors that participate in the pilot and see results
- Create opportunities for faculty research that tie into the work

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# Initial learnings during design and implementation

**Challenge**

- Defining what cognitive science understanding looks like in practice has been challenging

**Opportunity**

- View as tiers of mastery, building up to application in practice
- Application to practice can be captured in lesson planning and lesson reflection stages
  - Having candidates explain their rationale for decisions they make while teaching can surface their "mental models" of how students learn

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# For more information

**www.deansforimpact.org**

**@deansforimpact**

**facebook.com/deansforimpact**

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