

Knowledge & Beliefs Charts:

# Learners and Learning

## Key Ideas

- Identify prior knowledge
- Refine prior knowledge  $\hat{=}$  Construct new knowledge
- New knowledge comes from experiences
- Science is for EVERYONE

## New ideas

- "Learning styles" are a common misconception

## Applying

- PD [ • Considering pacing  $\hat{=}$  timing of PD (practice is essential)
- Create opportunities for cognitive dissonance so that new ideas are deemed plausible/useful and dissatisfaction w/ existing ideas.
- Strategic plan [ • As we develop strategic plan, view teachers as LEARNERS

# Adult Learning & Prof Development (67-74)

## Best Practices in Teachers' PD in U.S.

- student learning ~ Content Focus
- Effective classroom learning + teaching ~ Content Focus/Coherence
- Build content knowledge + reflect ~ Content Focus/~~Active~~ Learning
- Research based ~ adult learners ~ Active Learning
- collaborate with colleagues ~ Collective Participation
- Serve in leadership roles ~ Collective Participation
- Links ~ Coherence
- Evaluate ~ improve ~ Sustained Duration

Coherence between ... ?

to knowledge ...

- ? Link PD to Teacher Eval
- ? Observing ~ Feedback
- ? Continuous contact

How does a district pay for the type of PD?

How to reward?

### Key Ideas

- Shift from static to dynamic conceptions.
- 21<sup>st</sup> century requires a new set of skills
  - thinking critically
  - making judgements
  - Solving complex, open-ended problems
  - communicating & collaborating
- Both a set of practices & accumulation of knowledge
- **Need all 3 Dimensions** to accomplish

### Creating Strategic Plan

- Must be sustainable
- Must have goals/outcomes
- Must include a variety of strategies
- Should be data-driven
- Evaluate teacher & student needs
- Reflect on Plan & Revise

### PD with Teachers

- **Reflect the Nature of Science**
- Include 21<sup>st</sup> century skills
- Engage the teachers in 3D learning, enabling teachers to create similar experiences for students.

### Role of a Teacher

Assess where learners are →

Choose appropriate activities →

Offer scaffolding →

Re-assess to inform instruction

Pedagogical knowledge relies on content knowledge

Teaching is complex

Requires specialized knowledge:

- students
- content
- curriculum
- instruction
- assessment
- school / Community

"requires teachers to process info. on multiple levels simultaneously"

Student thinking & learning

Student motivation

Social-Emotional context

Classroom Management

Assessment

Implications for PD/Support:

- Consider the big picture
- Provide opportunities for collaboration & examining student work
- Address both content & pedagogy
- Give tools to evaluate their effectiveness / their students' progress

# The Change Process

change takes time

beliefs & practices change congruently

Which do you address first? Can you address both at the same time?

beliefs form through active engagement

Change Process  
Book by Kotter & Schlesinger (2008)

initiation, implementation, institutionalization

Something new:  $D \times V \times F > R$   
(Initiation) (Vision) (First steps) (Resistance)

## Strategic Plan Considerations

- change takes time (YEARS!!!) → reoccurring P.D.
- plan for & predict areas of resistance to avoid accelerating it → actively engaging participants in P.D
- check in is vital - How is it going? → share the "why"
- clearly define, communicate & support change throughout the system → frequent follow-up  
(define → align → focus) → communicate often with everyone

With a teacher  
work with the  
do districts provide  
support to that  
allow for time at  
expense of student  
learning

Considerations for PD:

- Should create cognitive dissonance
- Allow time for practice <sup>through</sup> experiences
- T.s need content and pedagogy
- Teaching is really complex
- Giving opportunities for collaboration and examining student work
- Consider how to build T. leaders
- Tools to know if they're successful
- Science instruction is dynamic & a process that needs to be taught
- Need a 3D learning approach ⇒ and can be used to build content
- Allow time for reflection & feedback

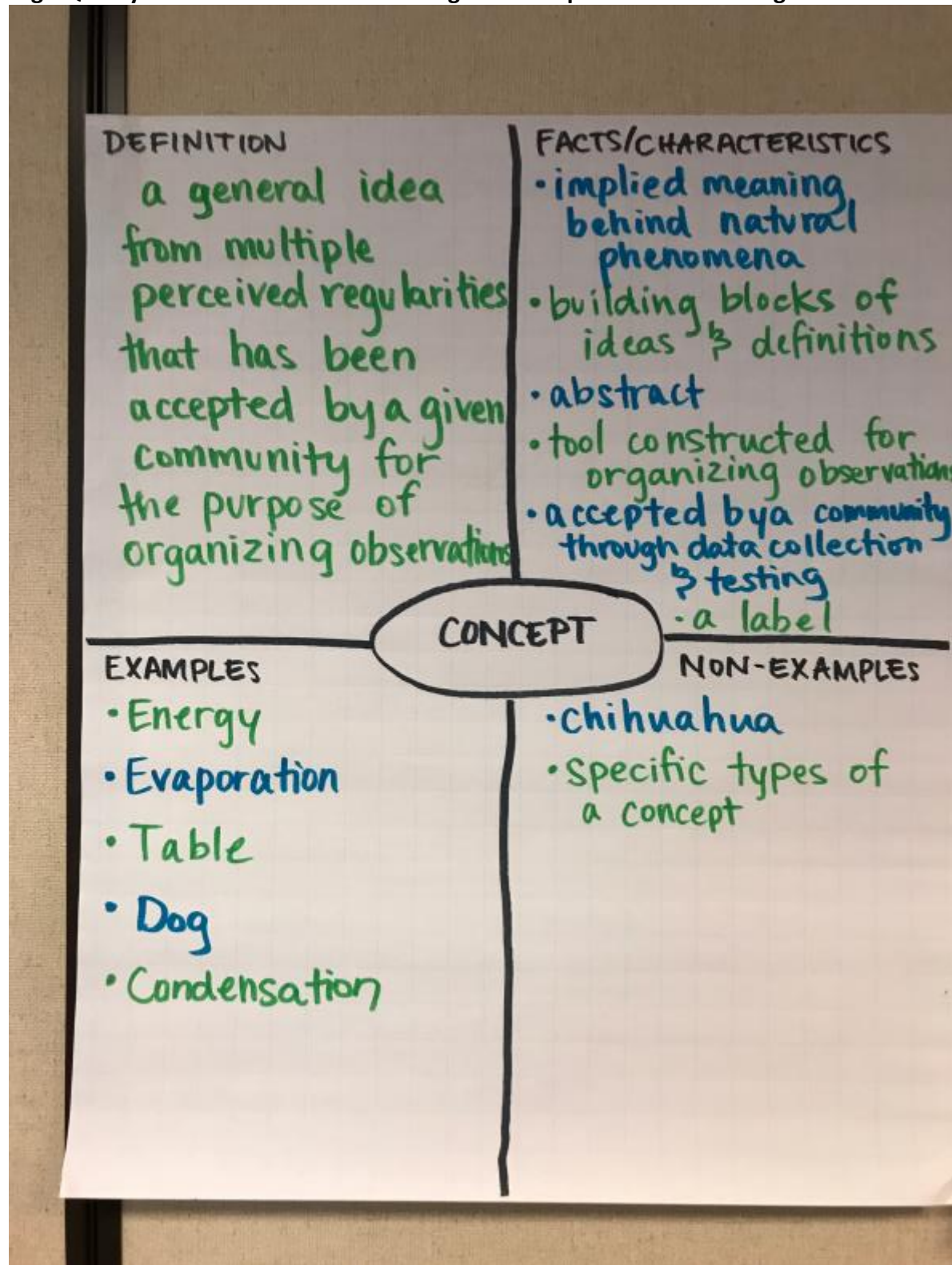
• active learning, coherence, <sup>trying to envision</sup> collaboration, duration, content focus <sub>not 1 shot workshop</sub>

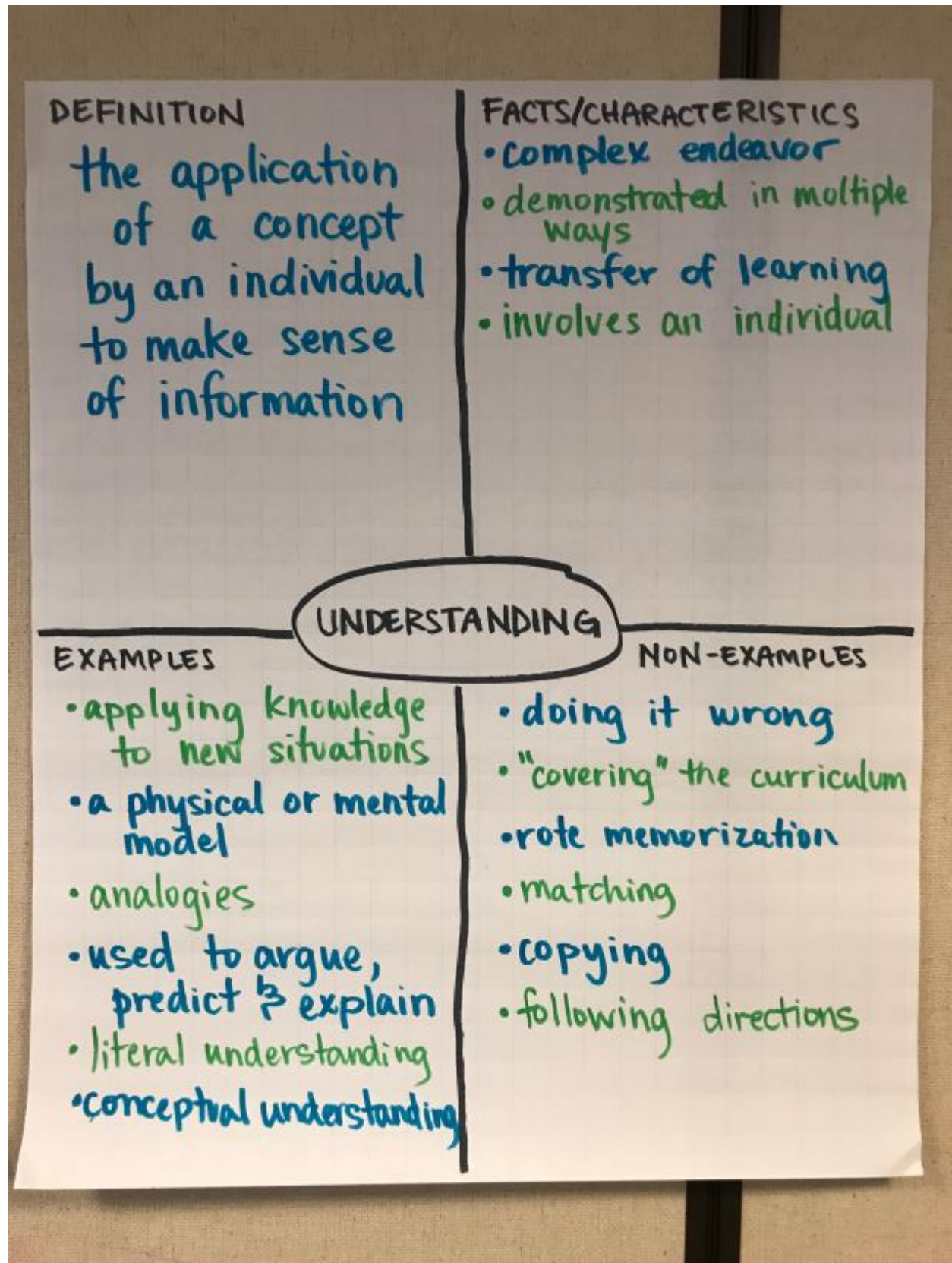
- Support PD with research
- differentiate PD
- Follow-up

Considerations for Strategic Plans

- Need to consider T.s as learners
- Keeping all the moving parts in mind
- Using what has worked & learning from ourselves & others
- Assessment & Data for students and teachers to inform & evaluate
- Need to look vertically, across grade bands
- Sustainability
  - Think about funding possibilities
  - Change takes time (2-3 yrs to see S. change)
  - Plan for resistance
  - Checking in frequently
  - Need systemic change

High Quality Science Instruction: Teaching for Conceptual Understanding



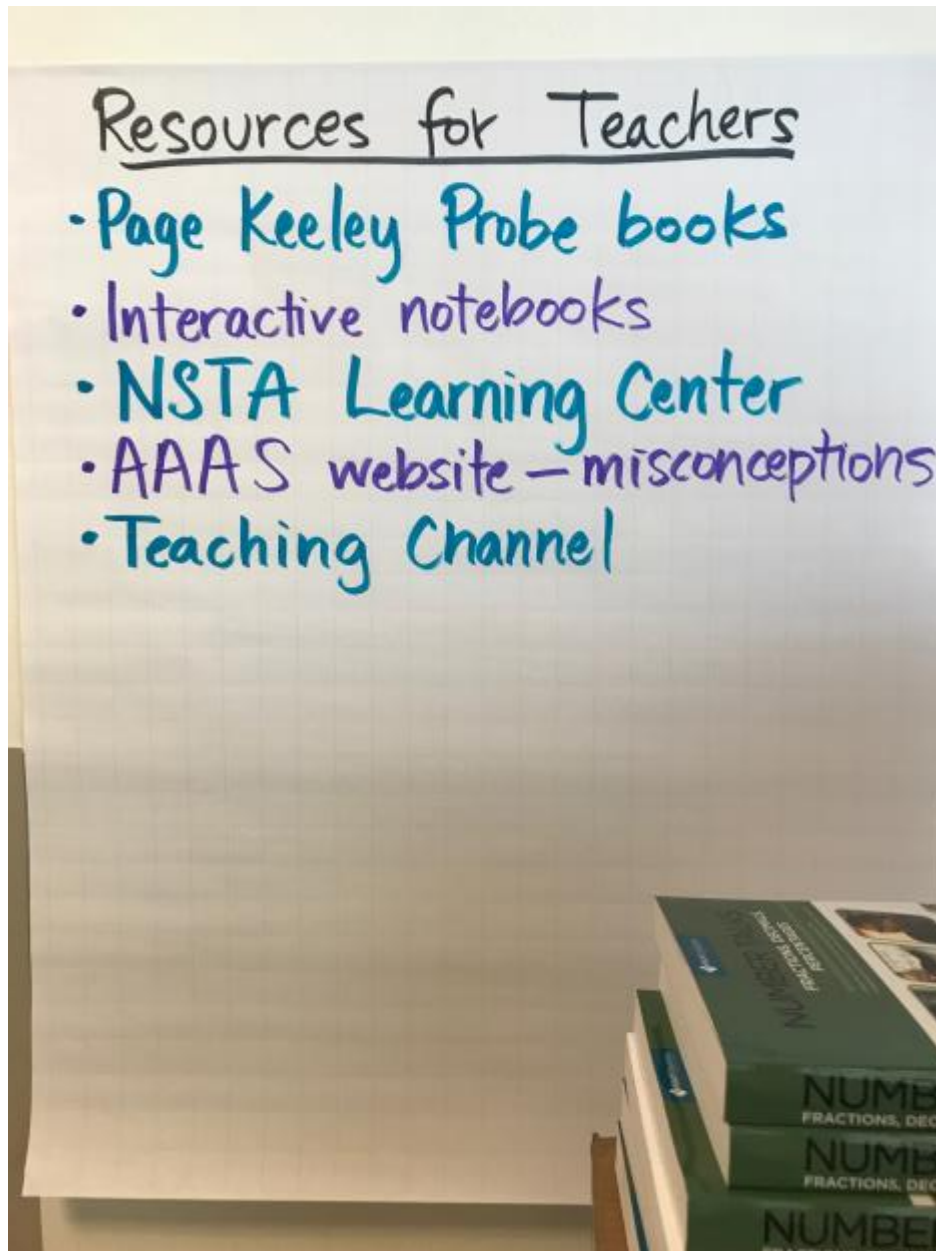


## High Quality Science Instruction

- High Engagement — student to student, student to T., in groups, etc.
- Messy, organized chaos
- Processing time
- Real world connection, relevant
- Discussion, Reading, Writing
  - ↓
  - NORMS/listening
  - ↓
  - C-E-Rs
- Using common academic vocab.
- Takes time, builds over time
- Kids should be doing
- T. asks probing & clarifying Q.s



Resources for Teachers:



## Resources for Teachers

- Page Keeley Probe books
- Interactive notebooks
- NSTA Learning Center
- AAAS website - misconceptions
- Teaching Channel