

Assessing the Impact of the MSPs: K–8 Science

Examining the Importance of Evidentiary Phenomena in Learning Science

Eric R. Banilower
Joan D. Pasley
Horizon Research, Inc.

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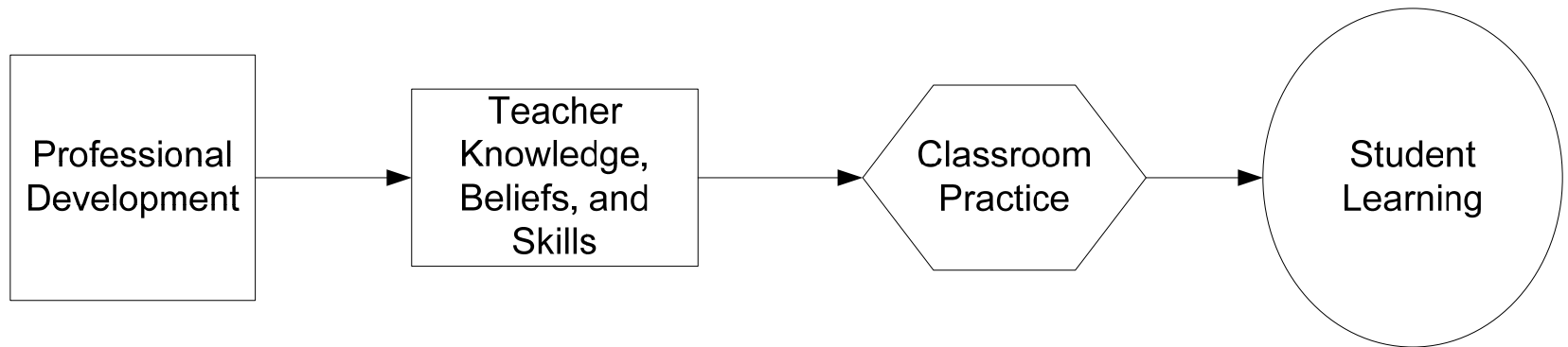
What Constitutes Student Success?

- Examine the two assessment items.
- Which would you use to assess student learning? Why?

Student Success for AIM

- Learners should have deep conceptual understanding of:
 - Important science ideas
 - The evidence-based nature of science as a way of knowing

PD Theory of Action (Big Picture)



What Makes PD Effective?

- Although there is a great deal of “wisdom of practice” about effective PD...
- There is little empirical research for many of these ideas.
- In addition, there is a lot that we don't know about what makes PD effective.

Why Don't We Know More from the Empirical Research?

- In applying standards of evidence, the MSP-KMD project often found vague or incomplete documentation of programs or interventions.
- Consequently, we know something worked, but we don't know a lot about what "it" was.

Why Don't We Know More

- Studies tended to be more like program evaluations rather than research on particular strategies.
- We know the overall experience worked, but we don't know how much particular interventions contributed to the gains.

Why Don't We Know More

- We often found serious limitations with study research designs, including:
 - Selection bias in samples and contexts
 - Lack of comparison groups or criteria
 - Idiosyncratic instrumentation, without evidence of validity/reliability/credibility

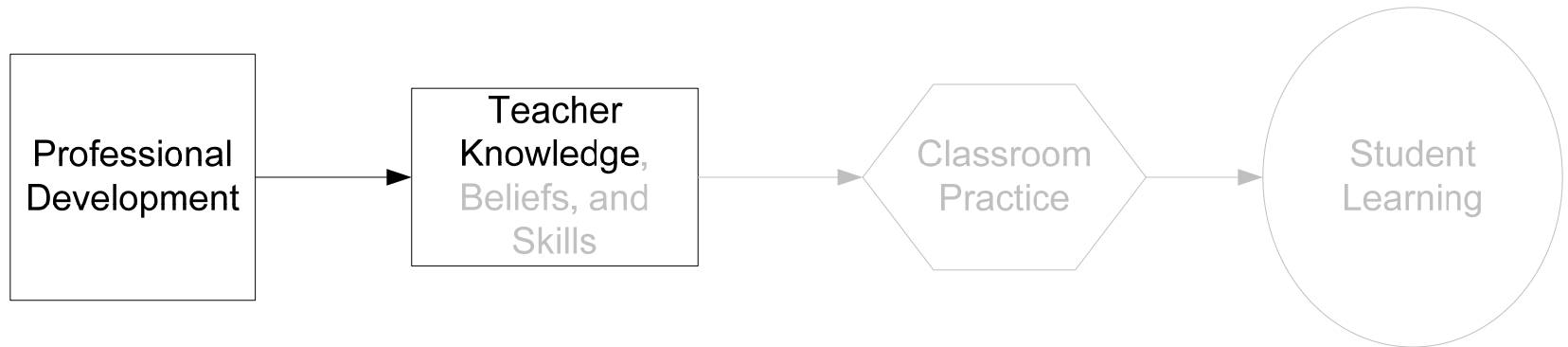
Why Don't We Know More

- There are too few studies of any one phenomenon to be able to have confidence in the robustness of the findings in any case.
- High quality research is expensive, which may explain why so many in-depth studies in the literature involved fewer than 5 teachers.

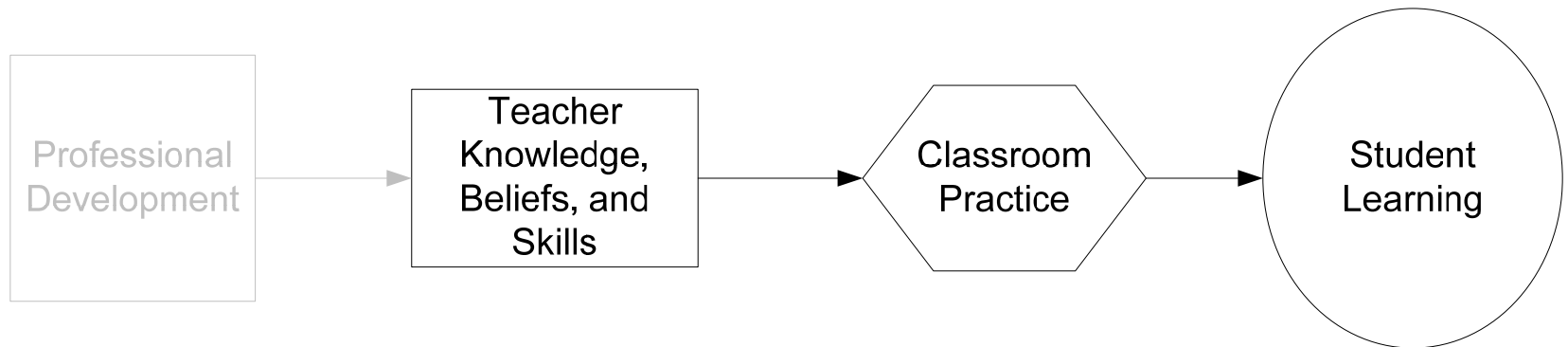
AIM: K–8 Science

- AIM is a MSP RETA
- AIM has the opportunity to develop instruments and collect data that single MSP projects typically do not have the resources to do.

Study Component 1



Study Component 2



Topics

1. Force and Motion
2. Populations and Ecosystems (i.e., Interdependence)
3. Evolution and Diversity
4. Properties of and Changes in Matter

Instruments

PD-Provider Log

- Captures what teachers experience in PD.
- PD providers complete a log at the end of each day of PD on the targeted topic.
- 15 minutes or fewer to complete.
- Honorarium of \$15 per completed log

Log Components

- Log asks about features of the PD
 - Ideas addressed
 - Time spent on different goals
 - How teachers were engaged
 - Alignment of PD with learning theory

Teacher and Student Assessments

- Each assessment will take about 30 minutes to administer (all multiple choice).
- All teacher assessment items are set in the context of work that teachers do, e.g., using content knowledge to analyze student thinking.

Classroom Practice

- Teacher questionnaire
 - Beliefs about effective instruction
 - Teacher efficacy
 - Contextual factors that affect science instruction
 - Instructional practices (alignment with learning theory)

Student Success

- Learners should have deep conceptual understanding of:
 - Important science ideas
 - The evidence-based nature of science as a way of knowing

- Our hypothesis is that both of these outcomes are more likely when learners are intellectually engaged with evidentiary phenomena

What is Meant by Evidentiary Phenomena?

- Evidentiary phenomena provide evidence for the targeted idea
- Doesn't always have to be a hands-on activity but students need to be able to understand the phenomena or data.

Key Features of Evidentiary Phenomena

- Phenomena/examples must be accessible to the learners
- Instruction must focus learners on the relevant aspects of the phenomena/examples

An Example

- Read the two vignettes
- Which lesson is more likely to result in students understanding the science idea and the evidence for that idea?

A Bone's Size and Shape Provide a Clue to its Function

- Students are given rodent bones and asked to “reconstruct” the skeleton using a key.
- Teacher focuses students’ attention on the fact that some bones are very similar and some are very different.
- Students divide into small groups to (1) individually document the physical characteristics of the different types of bones, and (2) examining where the bone is on the skeleton, students discuss what function each bone might have.
- Students are given “mystery” mammal bones and each student is asked to predict what function each serves based on its shape.

Challenges

- AIM's research design relies on substantial variation in teachers' professional development experiences. In our first year of data collection (2009–10), we found much less variation than we had anticipated.

- Another challenge AIM has faced is capturing the extent to which instruction (professional development or classroom) allows learners to engage with and draw meaning from evidentiary phenomena without having to observe it all.

Study Component 3

- We are planning a week-long professional development program for elementary teachers that will focus on deepening teachers' understanding of science content and learning theory-based science instruction, as well as how to apply this knowledge in their own classrooms.
- Teachers attending the PD will also participate in Components 1 and 2 of AIM.

Burning Question

Can Additional Projects Participate?

Yes!

What's Required to Participate

- Component 1:
 - Complete PD-provider logs
 - Submit teacher attendance data
 - Administer content assessment to teachers pre- and post-PD
 - Allow PD to be observed (if selected for observation)

What's Required to Participate

- Component 2:
 - Administer content assessment to teachers prior to their teaching of the unit on targeted topic
 - Administer student content assessment at the beginning and end of unit on targeted topic
 - Administer teacher questionnaires

AIM: K–8 Science

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