

Boston Energy in Science Teaching

Boston Science Partnership: Phase II



Defining Student Success

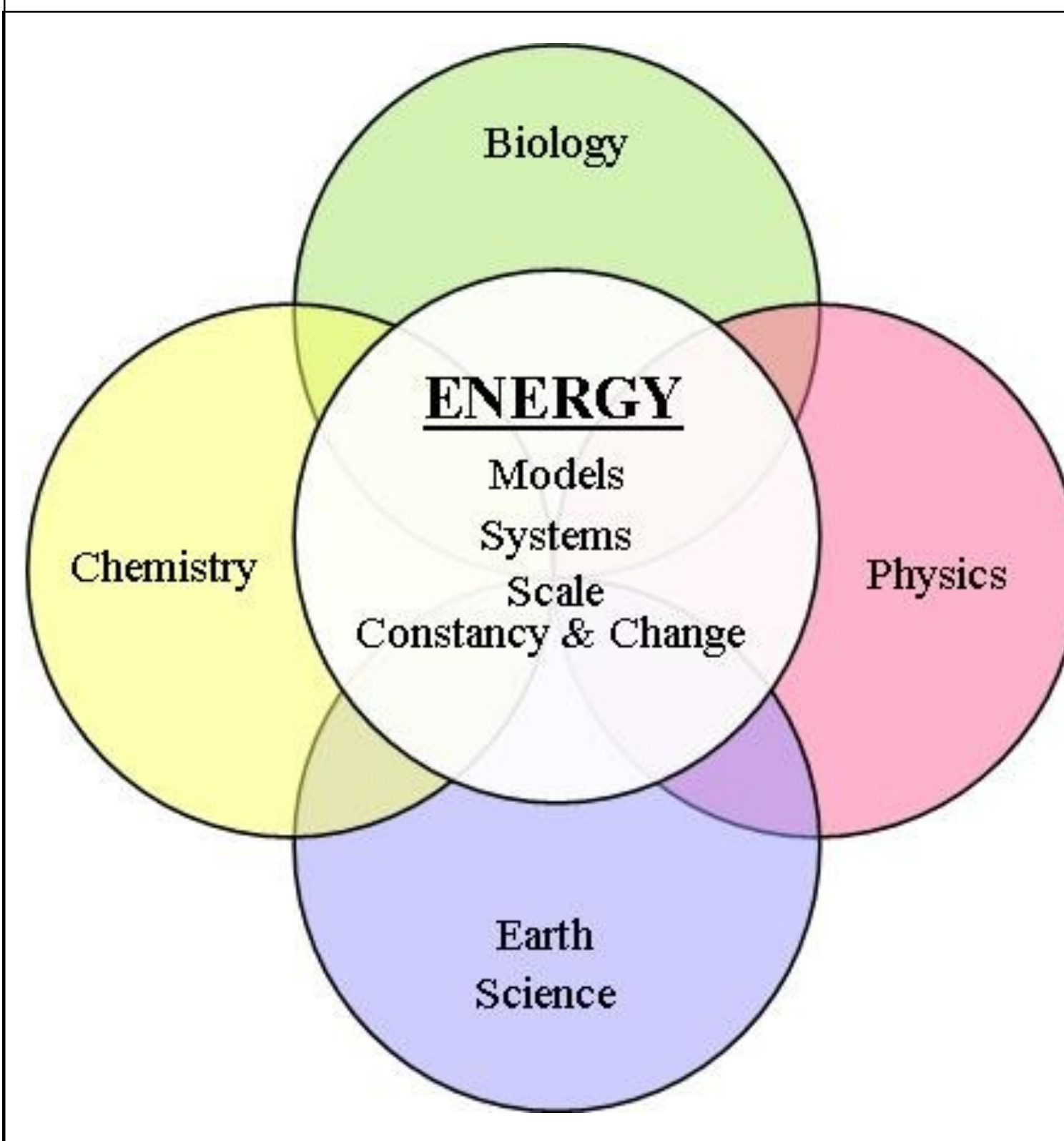


Fig 1. Energy is one of the big ideas of science that pervades four of the large areas of science.

Boston Energy in Science Teaching (BEST) defines student success as the ability to connect prior knowledge to a new situation. For BEST, we are striving to have students be able to transfer big ideas of energy between science disciplines (Fig. 1).

Characteristics of student success include:

- Ability to identify big ideas underlying problems.
- Confidence in approaching a problem.
- Increased interest and engagement.
- Increased performance on assessments.
- Persistence in challenges and STEM.
- Ability to relate science to real world.

Research Design

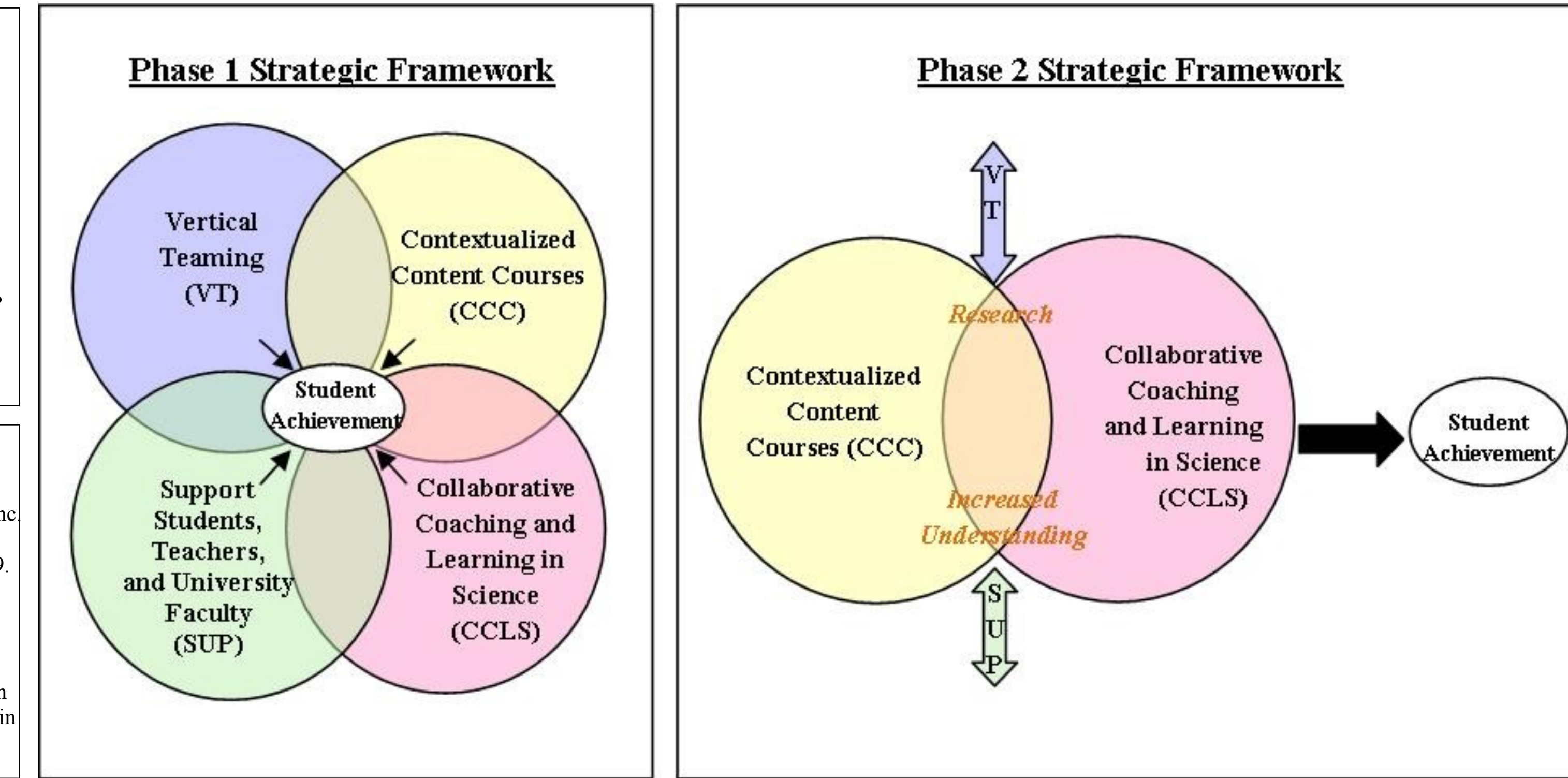
The purpose of BEST is to compare the impact of concept-based Professional Development (PD) in energy vs. discipline-based PD on student success.

- Design: Apply Boston Science Partnership (BSP) strategies developed for biology, chemistry, physics, and earth science to the concept of energy.
- Student success research question (1 of 4 research questions): Do students of teachers who participated in concept-driven PD differ in their understanding of or interest in science compared to the students of teachers who participated in discipline-driven PD at the grade 3-8 level?
- Instruments: Pre-post, matched-pair student/teacher ATLAST assessments¹, observations, surveys, teacher interviews, district exams, and MCAS².
- Analysis: Compare BEST teachers and their students to non-BEST, BSP teachers and students.
- Outcome: Determine for whom, when, and in what situation concept-driven PD has a greater impact than discipline-driven PD.

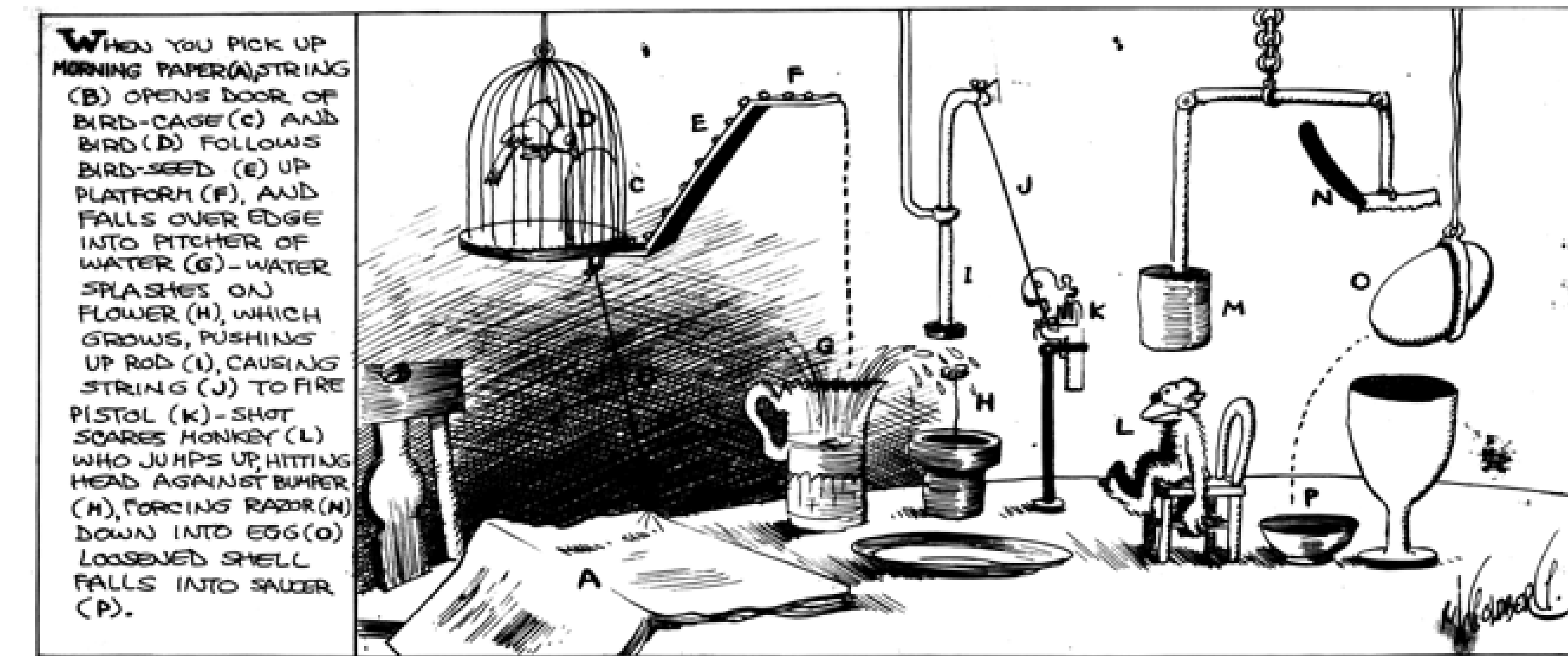
Fig 2. Graphical representation of Phase I and Phase II implementation plans.

References:.

¹ ATLAST is an instrument developed by Horizon Research, Inc. The instrument we are using is the "Flow of Matter and Energy", 2009. This instrument is being used with teachers and students to assess changes in content knowledge.
² MCAS is the Massachusetts Comprehensive Assessment System and is the state exam students take in grades 5, 8, and high school for science.



Overcoming Challenges



- Teacher Success to get Student Success
 - High quality professional development based on successful BSP strategies
 - How to improve the way we assess the transference of new teacher knowledge to changes in student knowledge?
- Appropriate Instruments & Compelling Evidence
 - Triangulate data through various types of instruments
 - Will it be enough to show demonstrate change?
- Attribution between Phase I and Phase II
 - Comparison group for Phase II is Phase I
 - What about other PD teachers take and student experiences?
- Culture around curriculum/Buy-In
 - Use Energy II course and VT to demonstrate to teachers that energy isn't extra—connecting the FOSS kits through energy

Partnership

Developing and implementing high quality, concept-driven PD for BPS teachers; PD will lead to more effective and efficient instruction.

Acronym Key

CCC = Contextualized Content Courses
CCLS = Collaborative Coaching and Learning in Science
VT = Vertical Teaming
PD = Professional Development

Univ. of Massachusetts Boston (UMB)

Energy I-Developed Energy CCC during BSP; trying with new teaching teams.

Energy II-Developing blended CCC/CCLS graduate class for teachers; focuses on where energy is in the curriculum and how to connect energy across content.

Energy Seminars-Developing a CCLS model for university setting; testing impact on faculty instruction.



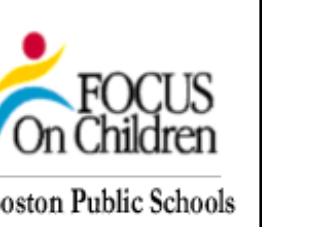
Boston Public Schools (BPS)

Energy I-BPS teacher co-instructs Energy I at UMB and NEU; makes the class relevant to BPS curriculum.

Energy II-BPS teacher co-instructs Energy II; helps make connections to curriculum.

Energy CCLS-School-based CCLS groups that will look at teaching and learning through energy lens.

VT-Leads VT to identify energy connections in curriculum.



Northeastern University (NEU)

Energy I-Implementing Energy I to test scalability of course to other universities.

Energy Seminars-Developing a CCLS model for university setting; testing impact on faculty instruction.



Education Development Center (EDC)

Research to determine if concept-driven PD can positively impact student success compared to Phase I.



Roxbury Community College (RCC)

Energy I-Adapting Energy I content to intro science class for freshman to increase engagement and effectiveness.

Energy Seminars-Part of seminars to increase connections across courses for increased student learning.



PERG, Lesley University

External evaluator of project. Evaluating new and adapted strategies.



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