



RESEARCH + PRACTICE COLLABORATORY

Design-Based Implementation Research for Improving Undergraduate STEM Education

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Design-Based Implementation Research

An approach to research and development

focused on addressing persistent problems of practice

from multiple stakeholders points of view

that engages educators, subject matter specialists, and educational researchers in collaborative, iterative design

and that develops knowledge and theory while also building capacity for continuous improvement



Design-Based Implementation Research

An approach to research and development

focus
practices

Answers the question: How do we organize our effort to improve an educational system

Encompasses a range of more specific methodologies, such as improvement research, design-based research

Embraces multiple methods, including (when appropriate) experimental studies of impact

Relevance is an important criterion for rigor

and that develops knowledge and theory while also building capacity for continuous improvement



Design-Based Implementation Research

An approach to research and development

focused on addressing persistent problems of practice

from multiple stakeholders points of view

The focus of the research and development is squarely on the improvement of practice.

The focal problem is the “presenting problem of practice.”

The “problem” definition should be agreed upon by key stakeholders.

Negotiating the definition of the problem takes time and benefits from specific tools and routines.

in



Design-Based Implementation Research

Iteration is key to improvement: Get it mostly right fast.

Collaboration is required, because implementation requires ownership and generates new dilemmas that practitioners can help solve.

Design embodies specific conjectures about how best to support learning across levels.

that engages educators, subject matter specialists, and educational researchers in collaborative, iterative design

and that develops knowledge and theory while also building capacity for continuous improvement



Design-Based Implementation Research

An approach to research and development

Knowledge, theory, and practices can all be products of DBIR.

Theories that are useful span multiple levels of educational systems: classroom, faculty department, university, professional associations.

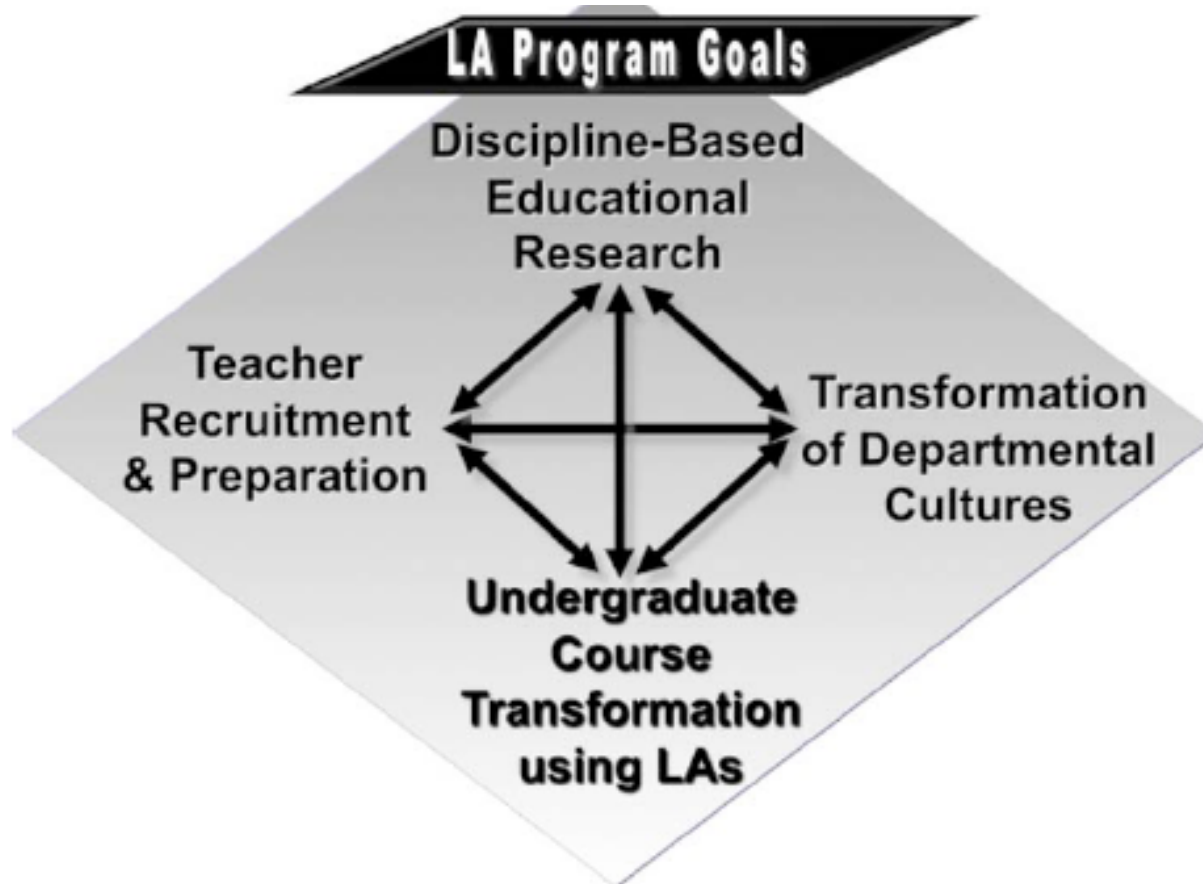
Capacity building is a goal and requires new skill development for both research and practice.

In DBIR, capacity building can entail a continuous but evolving partnership.

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Example: Learning Assistant Model



Learning Assistant Program
UNIVERSITY OF COLORADO BOULDER



Improving STEM Teaching: Negotiating the Problem

Stakeholder Group	Aim	Challenge
Faculty	<p>Provide “<i>permission</i>” and incentives to transform undergraduate courses</p> <p>Increase awareness and agency in educational change</p>	Lack of external reward or incentive for course transformation; resources; few opportunities to participate in faculty development
Student Learning Assistants	Increase awareness about educational issues and agency in educational change	Faculty not as familiar with learning theories and pedagogical strategies; clickers are misused
Program leaders	Participate in collaboratives that result in the building and continued support of leaders in educational change on the local and national scale	Low value assigned to improving teaching (departmental norms). Institutional rewards and incentives are poorly aligned.



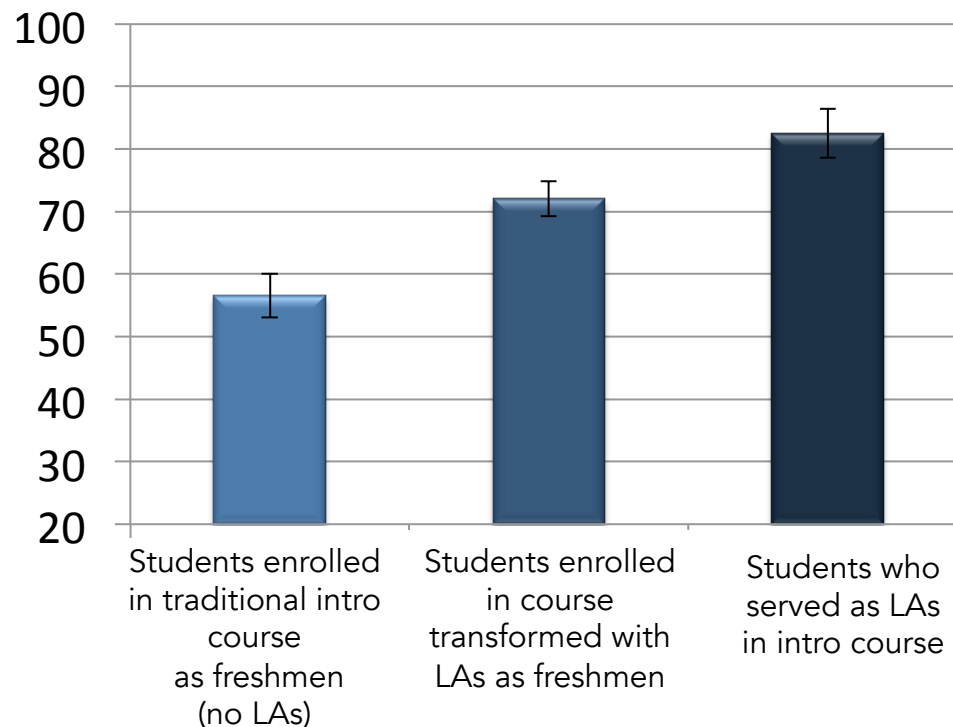
Collaborative Program Design

- Science, Math & Engineering research faculty and School of Education faculty, as well as grad/undergrad students are involved in design and redesign of key program elements.
- Strategic involvement of Provost, Deans, Department Chairs, and university-level administrators to provide strategic support
 - University and department policies and norms are integral targets of of iterative design, when institutional challenges are uncovered.



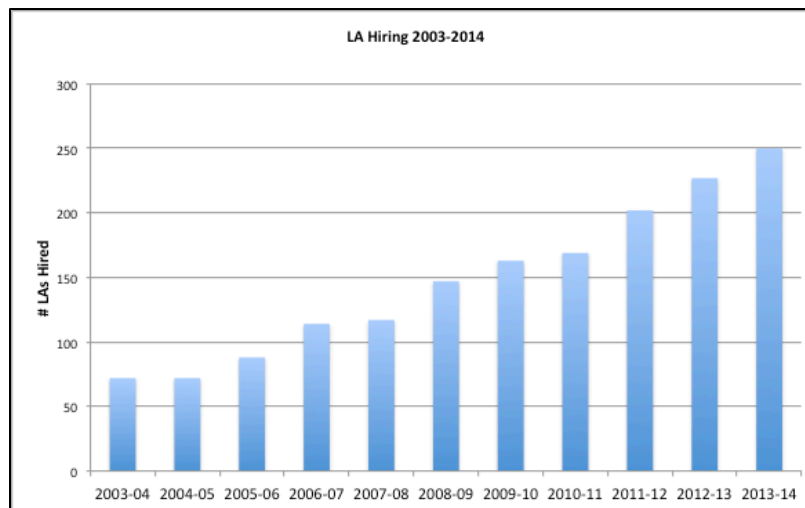
Building Knowledge and Theory

- Evidence indicates that Learning Assistant Program can improve learning outcomes for students in classes with LAs....

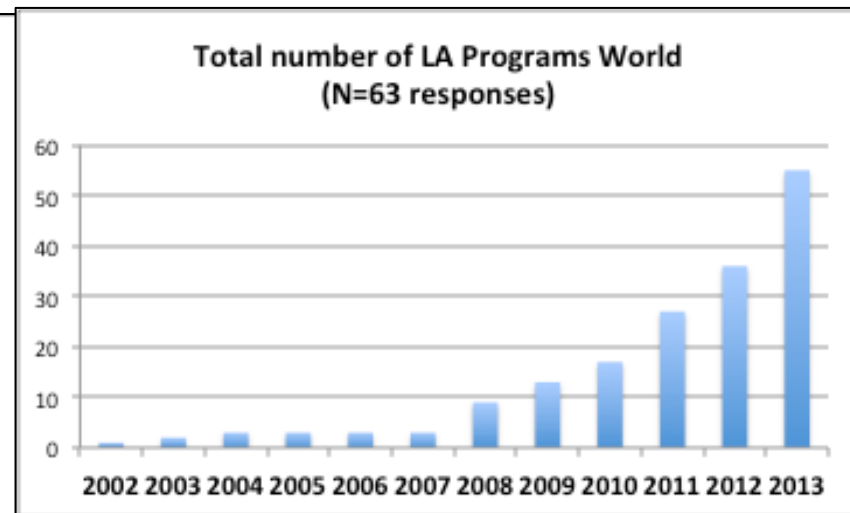


Building Knowledge and Theory

- The fact that it is growing within CU and expanding to other institutions provides a diversity of contexts, so we can design research to learn from variation....



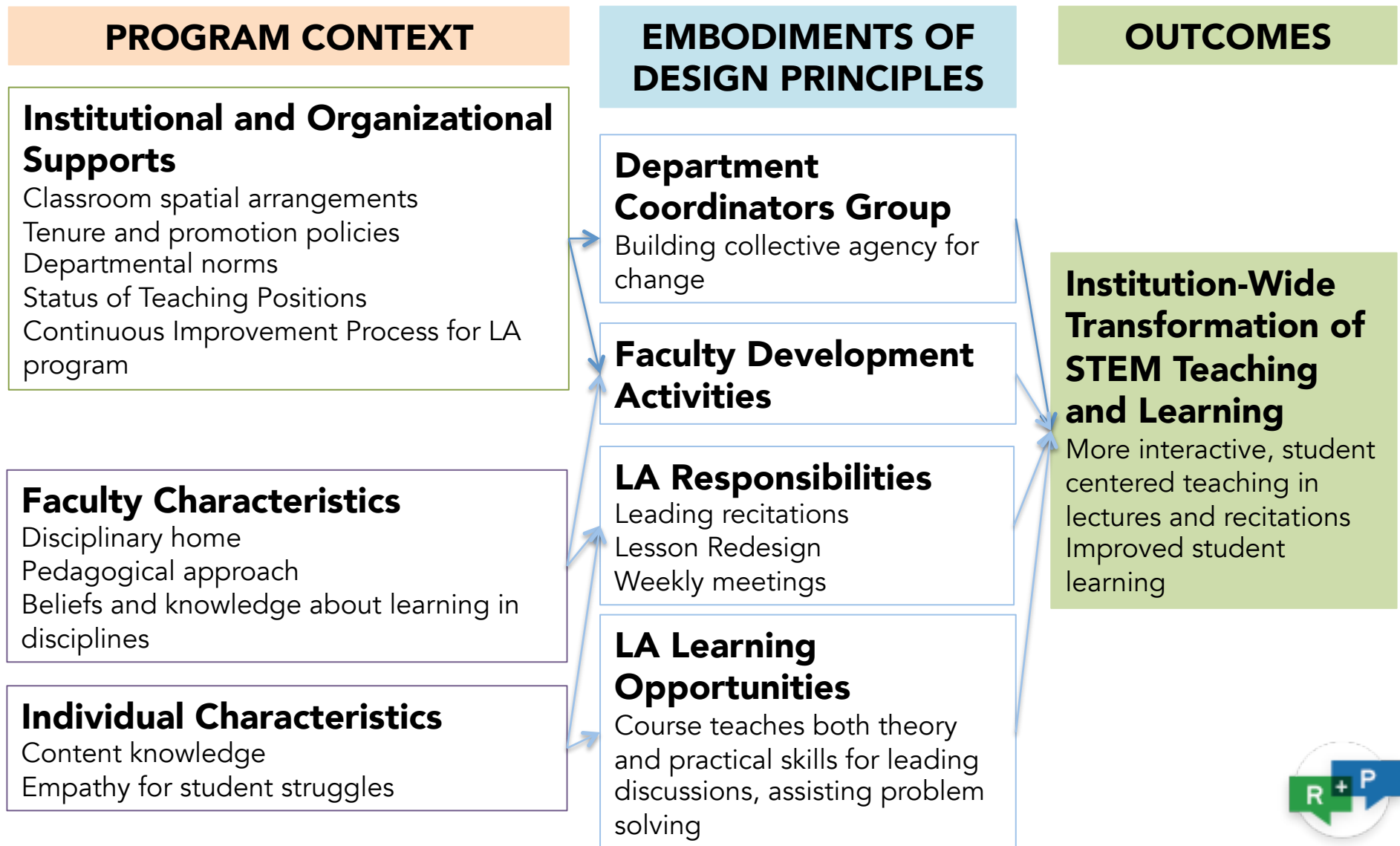
Growth at CU (# of LAs hired)



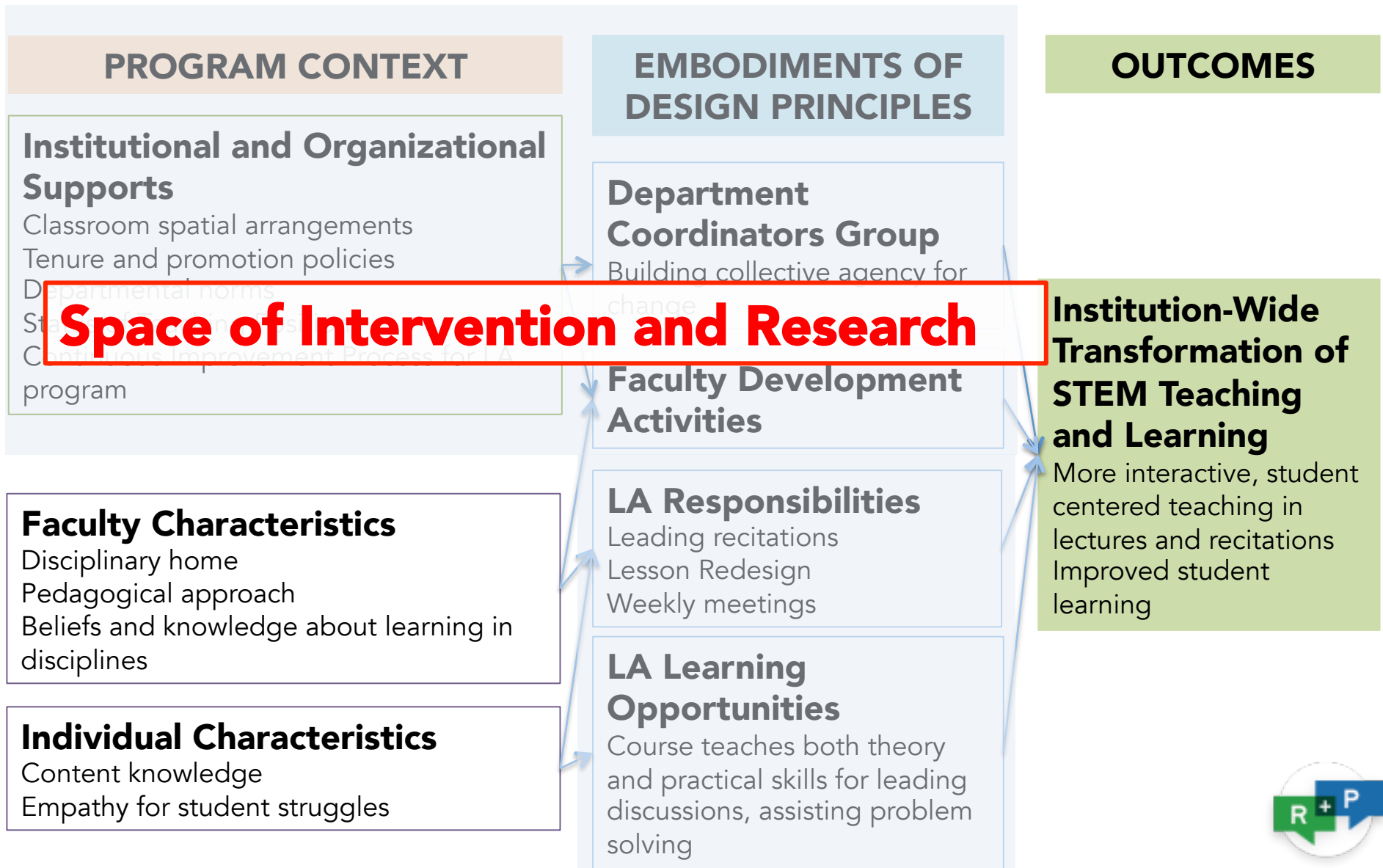
Growth Worldwide (# of Programs)



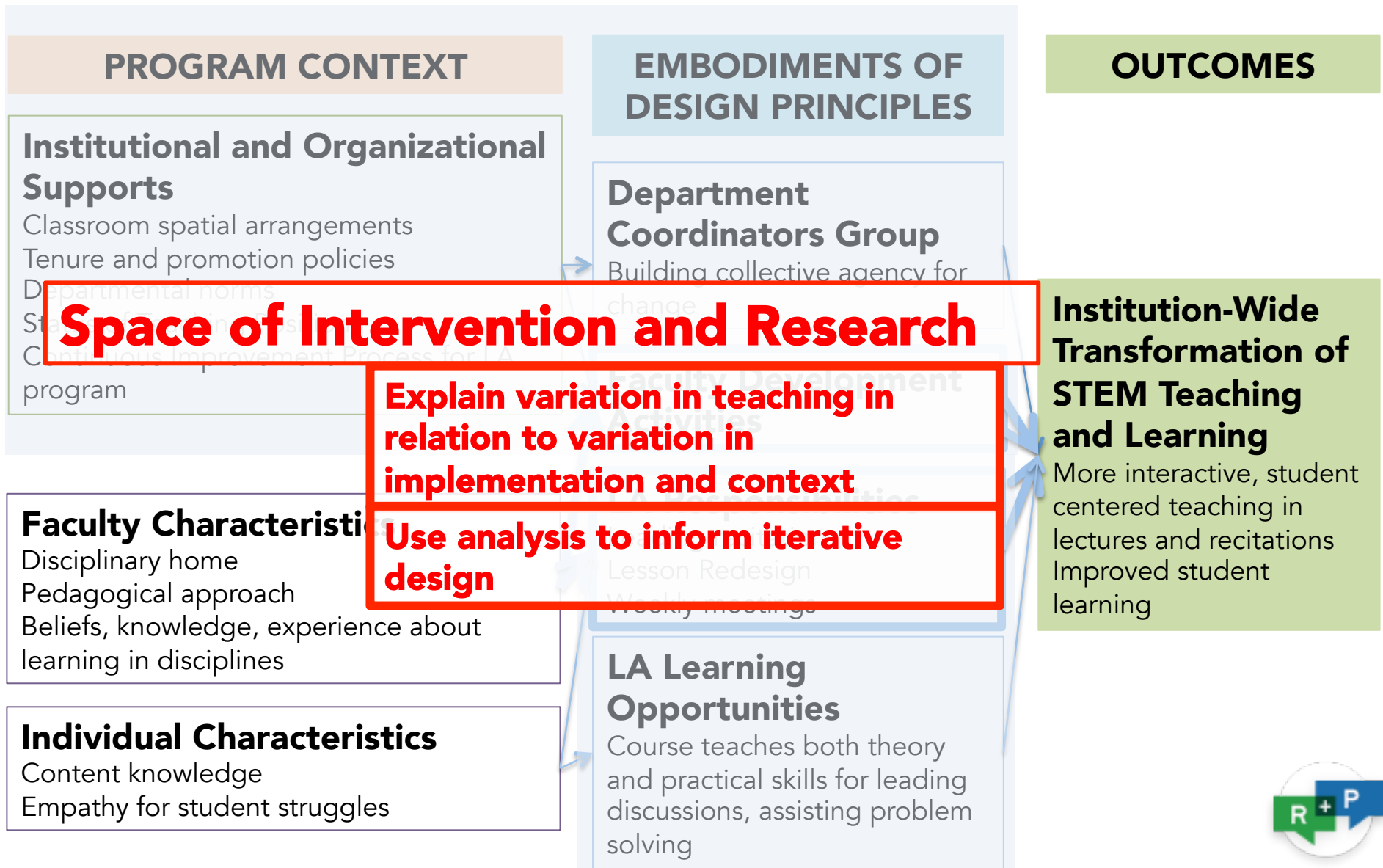
Building Knowledge and Theory



Building Knowledge and Theory



Building Knowledge and Theory



Building Capacity

- Strengthening cycle of improvement through implementation research
- Supporting a network of LA programs at multiple institutions worldwide “Learning Assistant Alliance”
- Supporting a network of educational change leaders through LA model –Regional Workshop Leadership Team at universities throughout the nation
- Leadership built through mentoring at institution and regional scale.



Thanks

Laurie Langdon, Co-Director
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University of Colorado
Boulder



For More

R+P Collaboratory

Website

[http://
researchandpractice.org](http://researchandpractice.org)

Twitter

@RPCollaboratory

DBIR

Website

<http://learndbir.org>

Twitter

@LearnDBIR

Colorado LA Model:

<http://laprogram.colorado.edu>

International LA Alliance:

<http://www.learningassistantalliance.org>





LA Model - Mission

To develop, influence, and empower agents of change among different stakeholders in science, math, and engineering education by influencing norms, practices, and values among participants.

The change we seek is equitable science education especially for students from groups traditionally underrepresented in these disciplines, where the discipline is the mechanism, rather than the obstacle, for connecting to the lives and loves of the people.

Stakeholders: science teacher educators, policy makers, funding agencies, and science educators and their students at all levels, K-20

