NCSU Conference 2015: Applying a Scale Research Framework to an NSF Math Science Partnership Grant

Friday Institute, NC State University

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Advancing education through innovation in teaching, learning and leadership, the Friday Institute (FI) brings together students, teachers, researchers, policy-makers, educational professionals, and other community members to foster collaborations in improving education.

Friday Institute for Educational Innovation

THE WILLIAM & IDA FRIDAY INSTITUTE FOR EDUCATIONAL INNOVATION

NC STATE College of Education

Friday Institute Evaluation Team

Staff: 2 Leads, 10 Researchers, 4 GRAs, 2 CED Faculty

Projects: ~22 (…if RttT counts as 1)

Awards: Current $6.5M; Proposals $1.7M

Friday Institute Evaluation Team

Conducts large-scale research and evaluation studies of innovations in school, districts, and community college settings that inform state and local decisions about educational policies, programs, and funding.

Students *Discover*

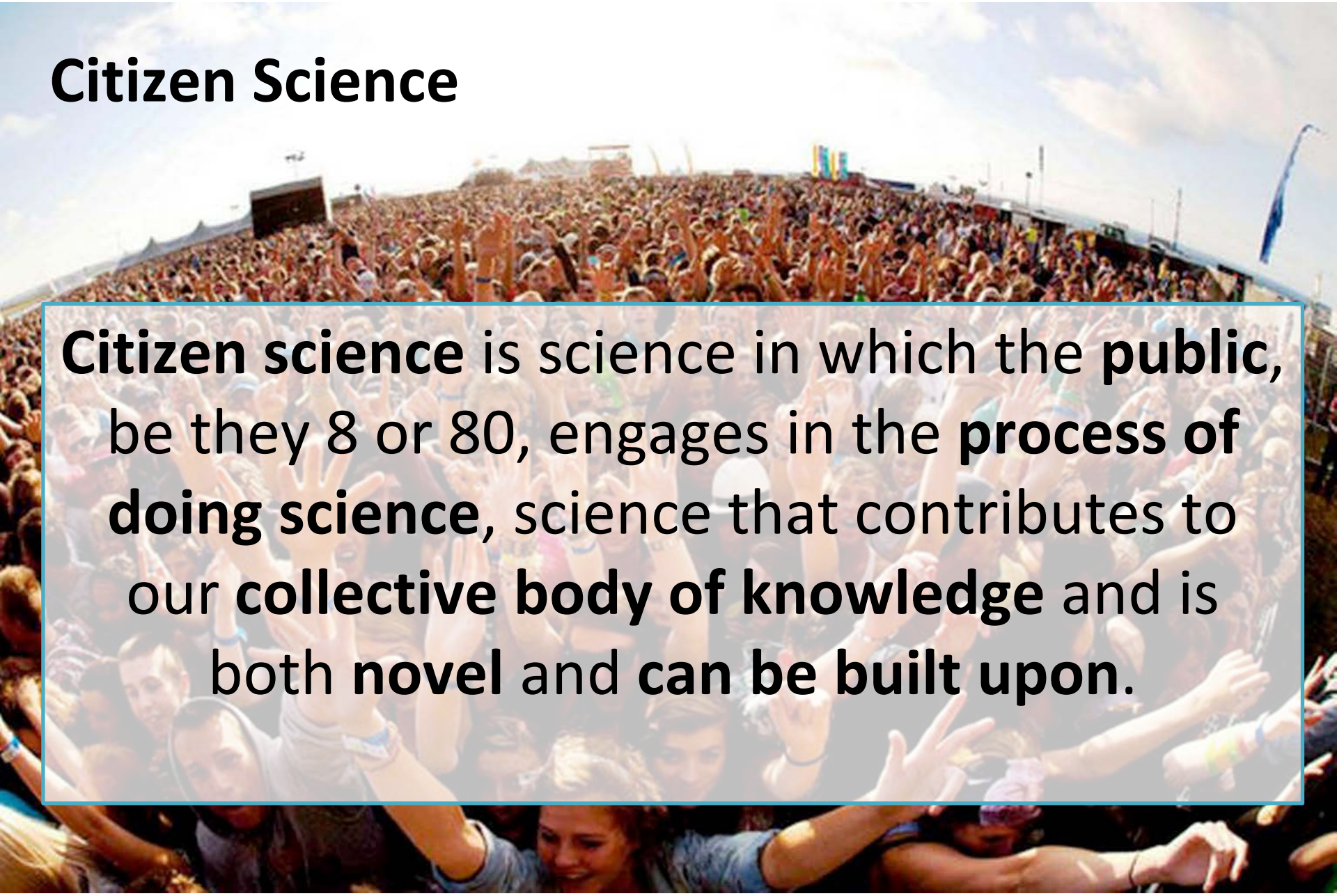
--because mysteries wait outside every classroom

GOAL: Improve STEM education by implementing hands-on citizen science – "real science" in middle school classrooms

NSF-funded Math Science Partnership (MSP) study (Award #1319293)

Citizen Science

Citizen Science



Citizen science is science in which the **public**, be they 8 or 80, engages in the **process of doing science**, science that contributes to our **collective body of knowledge** and is both **novel** and **can be built upon**.

Students Discover Partners

NC STATE UNIVERSITY

NORTH CAROLINA Museum of Natural Sciences

Durham Public Schools

Madison County PUBLIC SCHOOLS

Pitt County Schools

PENDER COUNTY SCHOOLS

Alamance-Burlington SCHOOL SYSTEM

WAKE COUNTY PUBLIC SCHOOL SYSTEM

Duplin County Schools

THE WILLIAM & IDA FRIDAY INSTITUTE FOR EDUCATIONAL INNOVATION

KENAN FELLOWS PROGRAM

Your Wild Life

THE SCIENCE HOUSE

Core Educational Challenge

One of the great challenges of educational improvement is the difficulty of scaling-up locally successful innovations to a wide variety of settings while maintaining effectiveness, affordability, and sustainability (Dede, 2005).

Students Discover Scale Research Team

- ***Purpose***: Examine the process for moving the citizen science curriculum innovation (process/product) from the more ideal settings of original implementation to a variety settings where conditions for success may be less favorable
- ***Role***: Embedded researchers constantly probing about modifications to the innovation to improve scalability across contexts

Exploring the Process of Scaling Up

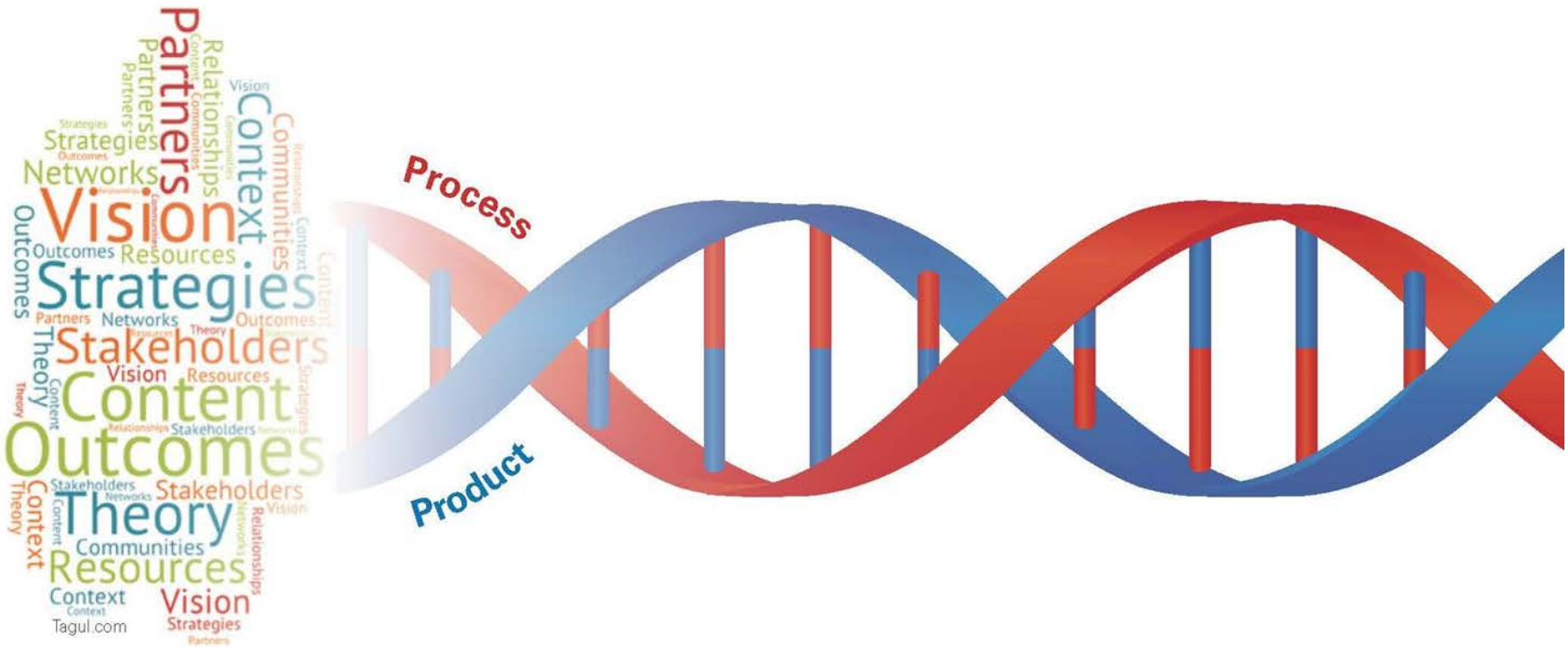
What are the steps—and traps—in moving from innovation to broad-based adoption and consequential change?

Dimensions of Scale	**Depth**	**Sustainability**	**Spread**	**Shift**	**Evolution**
Taking an educational innovation completely to scale involves five dimensions that reflect different aspects of making an intervention effective in one setting useful across a wide spectrum of contexts.	Getting to scale produces deep and consequential changes in practice. Requires evaluation and research to understand and enhance the causes of effectiveness.	Sustaining scaled growth means maintaining these changes in practice over substantial periods of time. Requires robust design to enable adapting to negative shifts in context.	Scaling up is achieved by diffusion of the innovation to large numbers of users. Requires modifications to retain effectiveness while reducing the resources and expertise required.	Ownership of the innovation is assumed by users, who deepen and sustain the innovation via adaptation. Requires moving beyond "brand" to support users as co-evaluators, co-designers, and co-scalers.	The innovation as revised by its adapters is influential in reshaping the thinking of its designers. Requires learning from users' adaptations about how to rethink the innovation's model.
Sources of Leverage	**Evaluation and Research**	**Robust Design**	**Reducing Resources and Expertise**	**Moving Beyond Brand**	**Rethinking the Model**
Each dimension provides leverage for the scaling process by evolving the intervention to increase its power, durability, applicability, and flexibility.	What are the sources of the innovation's effectiveness? What conditions does each source depend on for success? How sensitive is each source to these conditions? How consistent is the innovation with the current political and cultural context of educational improvement?	How can the innovation be modified so that it functions in various types of inhospitable conditions? How typical is each condition for success in the target population of users? How can developers support varied users while evolving toward conditions for success that enable full effectiveness?	How much is the overall power of the innovation affected by reducing its cost or the knowledge required to implement it? How much power is retained in a light version that requires fewer resources or less expertise of its users? How can developers support light users to achieve full effectiveness?	How can developers support users going beyond what the originators have accomplished? How can developers build users' capacity as co-evaluators, co-designers, and co-scalers? How can users form a "community of practice" that helps answer questions about scale?	How can developers unlearn their initial beliefs, values, and assumptions about the innovation, and generate willingness to start the innovation process over again? How can developers facilitate reconceptualization and discontinuous evolution? How can developers form a "community of reflective redesign" with other innovators?
Traps to Avoid	**Trap of Perfection**	**Trap of Mutation**	**Trap of Optimality**	**Trap of Origination**	**Trap of Unlearning**
Evolving along each dimension requires the developers of the innovation to overcome traps that have both cognitive and affective aspects.	Developers should not seek an unattainable goal of perfection at the cost of deflecting resources from other dimensions of scale. (The great should not be the enemy of the good.)	Developers should ensure that the ways they modify the innovation to adapt to various inhospitable contexts do not undercut its core conditions for success.	Developers should realize a somewhat less powerful innovation that reaches much greater numbers of users is a step forward.	Developers should not attempt to control the original innovation in ways that deter adaptation and further innovation by users.	Developers' unwillingness to take a fresh look can prevent genuine evolution.

Source: Christopher Dede, Harvard University Graduate School of Education; Cynthia Coburn, "Rethinking Scale: Moving Beyond Numbers to Deep and Lasting Change," *Educational Researcher* (2005).

Illustration by Patrick Corrigan

Scale Evaluation



Scale Research Components

Identify the Innovation

- The Process
- The Product

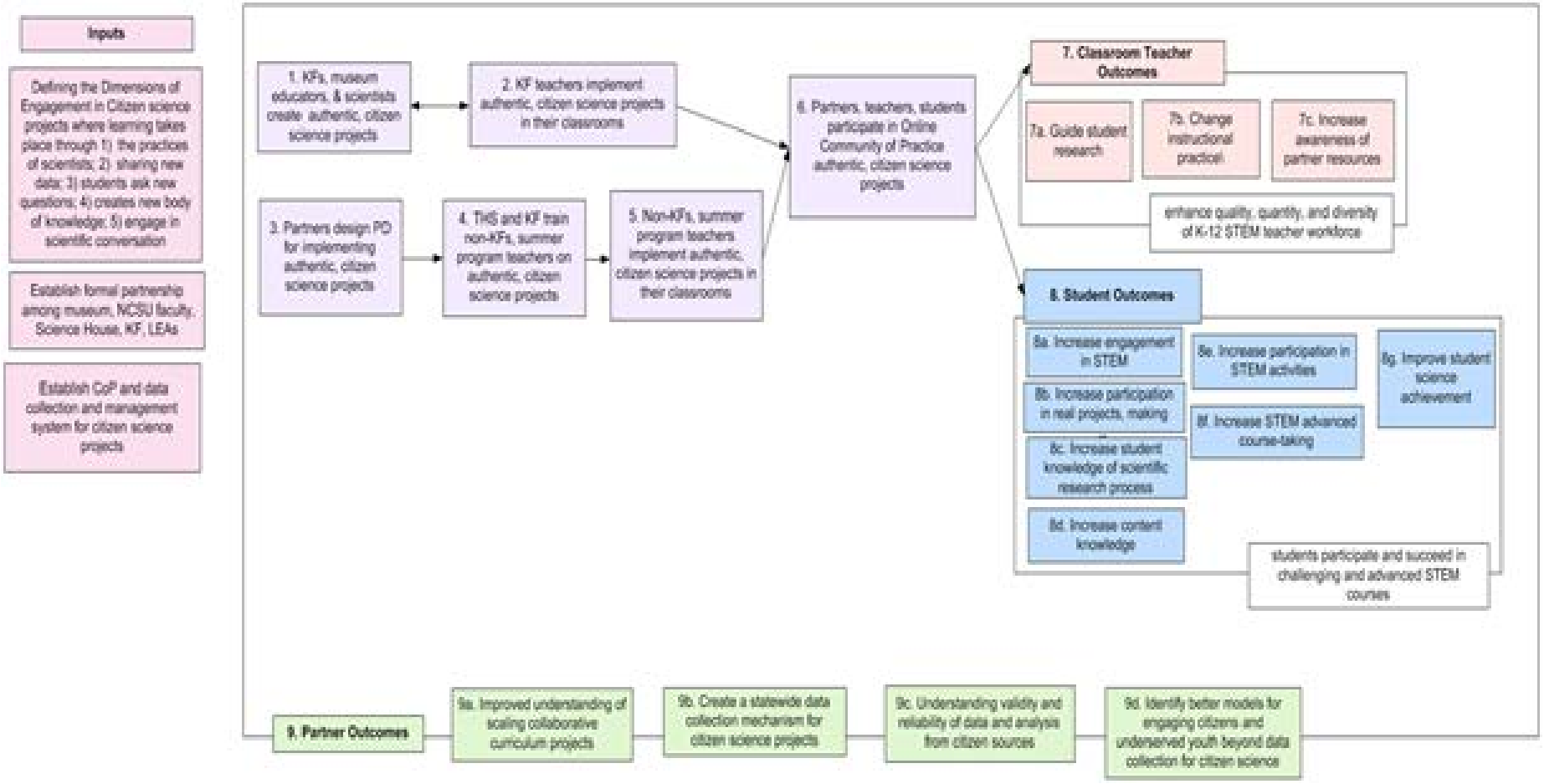
Utilize DBIR Approach

- Interviews
- Observations
- Surveys
- Evidence of Impact
- Network Analysis

Facilitate Scale Support Activities

- Scale Workshops
- Leadership Meetings
- Formative Research Memos
- Network Mapping Work Sessions

Students Discover Logic Model



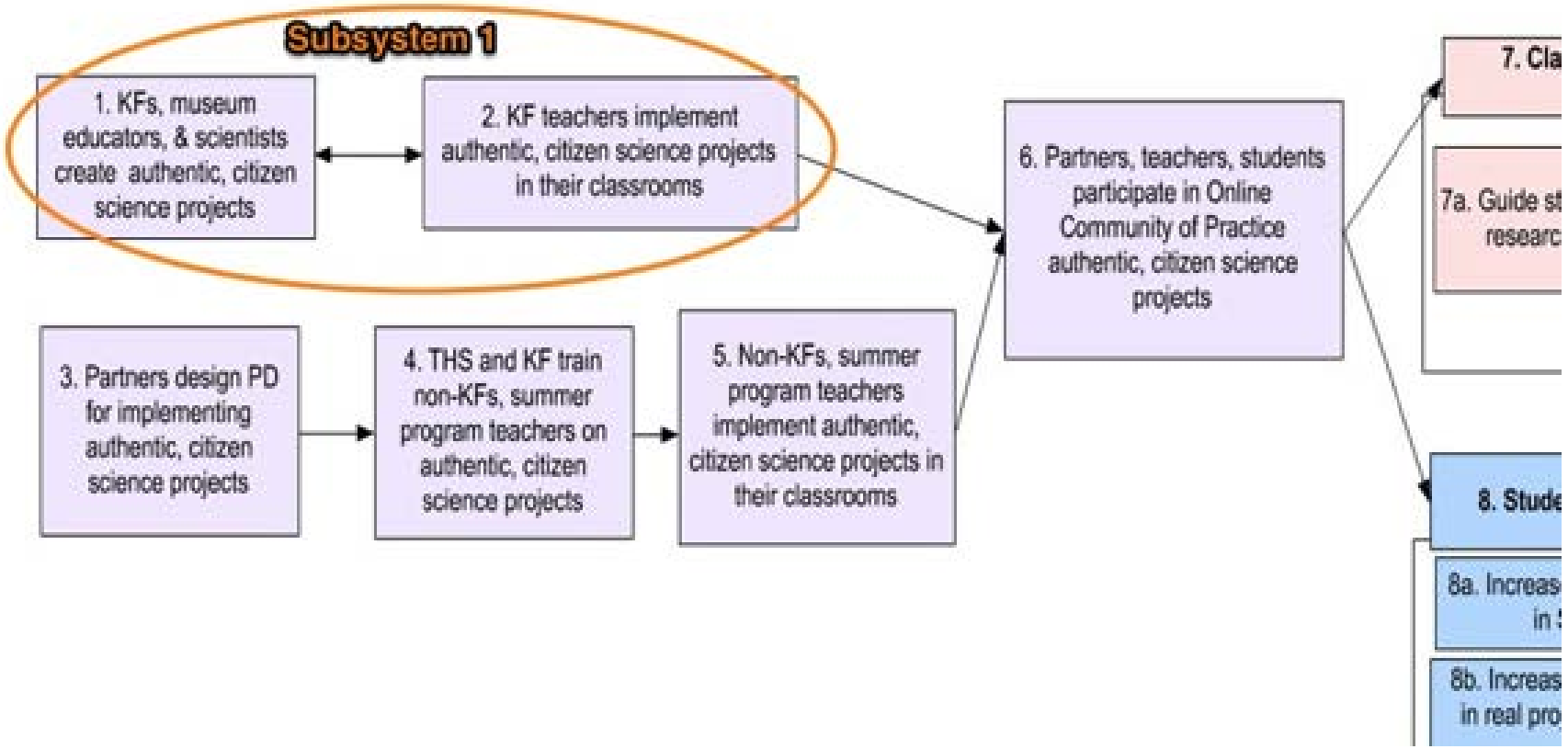
Overall System

Initial Findings

Several *challenges* impacted the health of the overall system:

- sporadic and inconsistent communication among project partners
- lack of clarity on partner roles
- competing definitions of “citizen science”
- differing conceptualizations of “scale”
- tensions between partner priorities

Subsystem 1: Teachers and Scientists

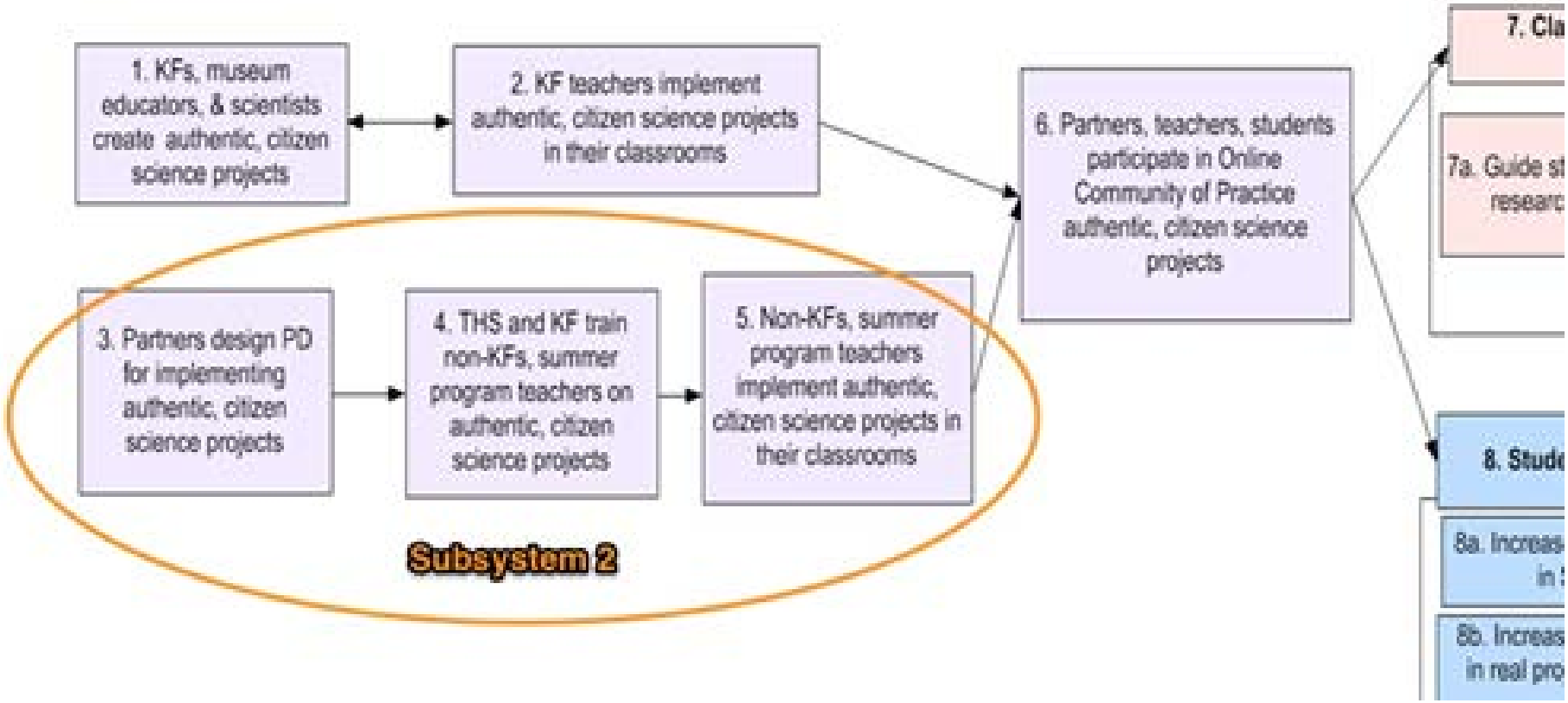


Subsystem 1: Initial Findings

Several *challenges* impacted the health of the Teacher-Scientist System

- lack of existing citizen science projects from which curriculum modules could be developed
- no outward facing data submission mechanisms
- temporary nature of the postdoctoral scientist position
- misalignment between the research areas and middle school curriculum standards
- lack of administrative support at the school and district

Subsystem 2: Professional development providers-teachers



Subsystem 2: Initial Findings

Several *challenges* impacted the health of the Teachers-Professional Development Providers System

- communication or coordination between teams
- postdoctoral scientist leaving
- provide professional development for citizen science projects that were ending

Lessons Learned

- **Resonates** with educators and policymakers
- Identifying *the* **innovation** can be difficult
- Educational innovations need to be studied in **nested learning contexts** with focus on forming district partnerships
- Works well with a **design-based implementation** approach
- Mixed methods with **qualitative** emphasis
- Annual scale workshops that do a deep dive on a single dimension (depth then sustainability then spread then shift then evolution)

Questions/Comments

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