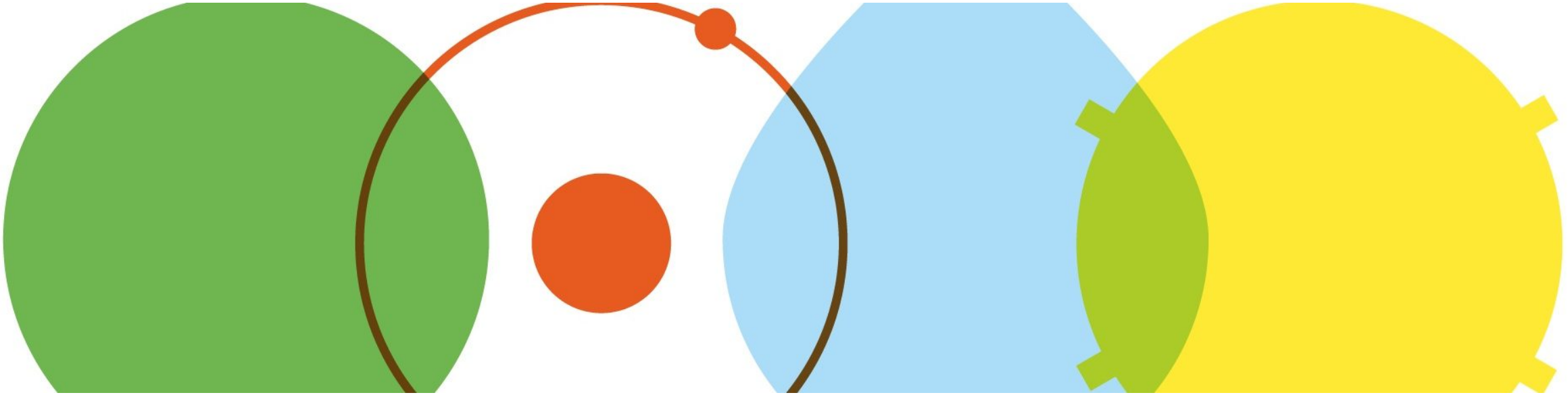


National Collaborative for Research on Food, Energy, and Water Education (NC-FEW)

NC-FEW Webinar

May 1, 2020

Webinar Logistics

- 30-40-minute presentation
- Q&A, moderated by leadership team
- Please mute your mic and type questions into the chat box at any time during the presentation
- Webinar slides will be posted on the website later

Introductions: NC-FEW Leadership Team

- *Cory Forbes* (Director and Lead PI), Ph.D., Associate Professor of Science Education, University of Nebraska-Lincoln
- *Hannah Scherer* (Co-PI), Ph.D., Assistant Professor and Extension Specialist Teacher and Learning, Virginia Tech, Informal/Non-formal Working Group Lead
- *Nicole Sintov* (Co-PI), Ph.D., Assistant Professor of Behavior, Decision Making and Sustainability, The Ohio State University, Postsecondary Working Group Lead
- *Hui-Hui Wang* (Co-PI), Ph.D., Assistant Professor of Agricultural Sciences Education and Communication, Purdue University, K-12 Working Group Lead

NC-FEW - Overview

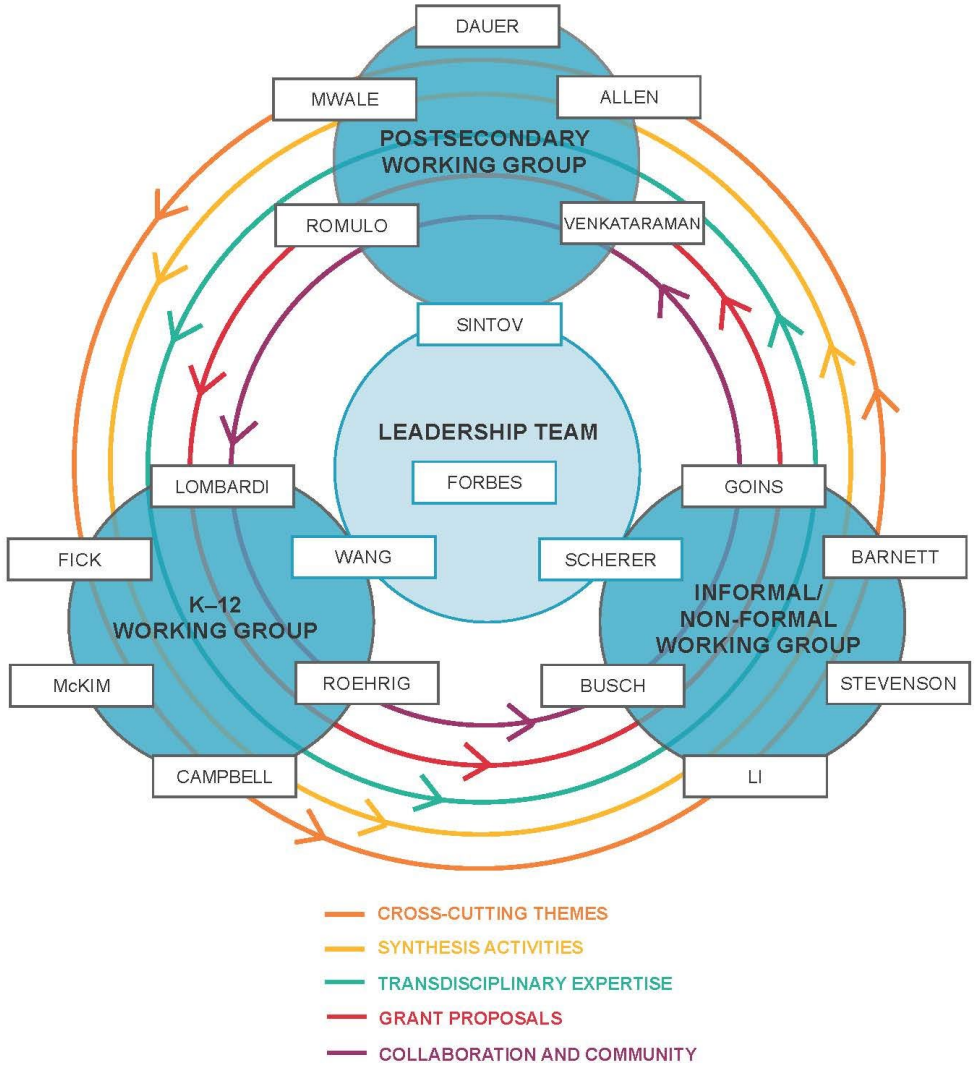
- *National Collaborative for Research on Food, Energy, and Water Education* (NC-FEW)
- Hub of innovation for education research on FEW-Nexus educational programming at all levels and in a variety of settings
- An emergent professional community involving a broad array of transdisciplinary collaborators who represent STEM and FANH sciences and span traditional STEM/FANH departments, education, and agricultural and natural resources

NC-FEW – Mission and Goals

- **Mission** is to establish NC-FEW as a hub for a networked improvement community (NIC) that will advance education research and educational programming grounded in the FEW-Nexus.
- **Goals:**
  1. Synthesize current education research on educational programming grounded in the FEW-Nexus
  2. Identify and promote best practices in education research on educational programming grounded in the FEW-Nexus
  3. Foster collaboration among community members representing diverse disciplines, fields, expertise, and institutions
  4. Enhance capacity for extramural funding in support of education research on educational programming grounded in the FEW-Nexus
  5. Cultivate a community identity among NC-FEW participants

NC-FEW - Organizational Structure

- Leadership team
- Working groups (postsecondary, K-12, informal/non-formal)
- NC-FEW community members
- External evaluation
- Advisory board



Deliverable-Driven Activities

- ‘Crosswalking’ standards for teaching and learning
- Synthesis activities (e.g., literature reviews/edited book)
- FEW-Nexus-based ‘teaching tools’
- Research training (workshops and online module)
- Funding proposals for FEW-Nexus-focused programs

Standards Crosswalks

- Focal standards and policy documents
  - STEM literacy (NGSS Lead States, 2013)
  - Agricultural literacy (National Agriculture in the Classroom, 2014)
  - Earth science literacy (Earth Science Literacy Initiative, 2010)
  - Energy literacy (U.S. Department of Energy, 2012)
  - Climate literacy (U.S. Global Change Research Program, 2009)
  - Geography literacy (GENIP, 2012)
- Organize around priority themes and food, energy, water

Research Synthesis

- Synthesizing FEW-Nexus-focused education research from an array of fields
- Best practices articulated in literature review methodologies (e.g., Cooper, 2010 and Xiao & Watson, 2017)
- Develop inclusion/exclusion criterion, collect qualifying studies, develop consensus regarding research foci, document ideas within the research themes, and use standard data extraction techniques and thematic coding to compare similarities and differences across studies.

FEW-Nexus-Based ‘Teaching Tools’

- Develop and disseminate a set of resources, aligned with concepts and constructs central to NC-FEW activities, that support delivery of FEW-Nexus-based education, training, and outreach programming across contexts.
- Modeled after Teaching Tools for STEM Education (http://stemteachingtools.org)
- short, concise, and concrete summaries of research-based information, directly targeted at educators, about fundamental topics that can be used to guide teaching and learning grounded in the FEW-Nexus

Research Training

- Develop and implement workshop and online module
- Primary audience of the workshop and module will be faculty, postdoctoral scholars, graduate students, external evaluators, and educators actively engaged, or anticipate future engagement, in educational programming and associated education research on FEW-Nexus.
- Workshops at conferences and meetings
- Online module (i.e., graduate course) offered through CIRTL network

Funding Proposals

- New, innovative ideas for FEW-Nexus-focused educational programs and research
- NSF, USDA-NIFA, IES, EPA, etc.
- Fostering collaboration among NC-FEW participants
- Activities at invited conferences, webinars, information exchange, etc., to enhance these activities

Working Groups

- 3 groups – Postsecondary, K-12, informal/nonformal
- **Synthesis activities** around NC-FEW core themes
- Key questions
  - What are evidence-based ‘best practices’ in FEW-Nexus education?
  - What has prior research shown about FEW-Nexus teaching and learning?
  - What are measurement strategies, instruments, and/or methodologies used in FEW-Nexus-focused education research?

NC-FEW K-12 Working Group

- Core members

Dr. Todd Cambell
U of Connecticut

Dr. Sarah Fick
U of Virginia

Dr. Doug Lombardi
U of Maryland

Dr. Aaron McKim
Michigan State U

Dr. Gillian Roehrig
U of Minnesota

The Goal of K-12 Working Group

The goal of K-12 working group is to foreground the food, energy, and water nexus (FEW-Nexus) as central to scientific literacy for K-12 learners that is supportive of a sustainable future and necessary for responsible citizenship.

The K-12 Working Group focuses on…

- Examining, and refining how FEW-Nexus scientific literacy can be embodied in performances of K-12 learners
- Identifying and developing educational resources to support K-12 educators

FEW-Nexus and K-12 Education

- 21st Century Grand Challenges (FEW-Nexus complex problems) (e.g., providing access to clean water and energy).
- There is rapidly growing worldwide interest in research about education and discourse around the FEW-Nexus (Forbes et al., 2018)
- Pressing and complex local and global FEW challenges require increased scientific literacy, including
  - Development of more critical reasoning
  - Engaged participation in scientific practices for addressing FEW problems, and
  - Deeper knowledge and ability to apply fundamental principles underlying FEW concepts
  - Development of connected thinking that bridges disciplines

Action Steps

1. Research and synthesize a variety of national standards, such as Next Generation Science Standards that relate to FEW-Nexus complex problems
2. Map standards to the United Nations Sustainable Development Goals (e.g., Clean Water: Clean water protects people from disease, yet three in 10 people lack access to it)
3. Identify and/or produce pedagogical support to K-12 educators
    - Learning/phenomenon progression
    - System thinking
    - Argumentation/evidence-based reasoning

Examples (NGSS)

Subjects	Performance Expectations	S & E practices	Disciplinary Core Ideas	Crosscutting Concepts
Life Science	HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy	Developing and Using Models	LS1.C: Organization for matter and energy flow in organism	System models can be used to represent systems and their interactions, such as energy, matter and information flows
Physical Science	HS-PS3-2 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other components and energy flows in and out of the system are known	Developing and Using Models	PS3.A: Definitions of Energy	Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system

Potential Scholarly Outcomes

- Development of Curricular Resources
  - We are interested in pilot testing and thinking about the integration of FEW phenomena, with resources aligned with the NGSS…
  - ...and how to develop effective teacher professional development and instruction to support students' integrated and holistic understanding of FEW phenomena within the bounds of these resources.
- Manuscripts
- Grant proposals






Post-secondary Working Group

Nicole Sintov, The Ohio State University School of Environment & Natural Resources, Chair

Craig Allen, School of Natural Resources, University of Nebraska-Lincoln

Jenny Dauer, School of Natural Resources, University of Nebraska-Lincoln

Marizvikuru Mwale, Institute for Rural Development, University of Venda

Chelsie Romulo, Department of Geography, GIS, & Sustainability, Northern Colorado University

Bhawani Venkataraman, Eugene Lang College of Liberal Arts, The New School

Main objective

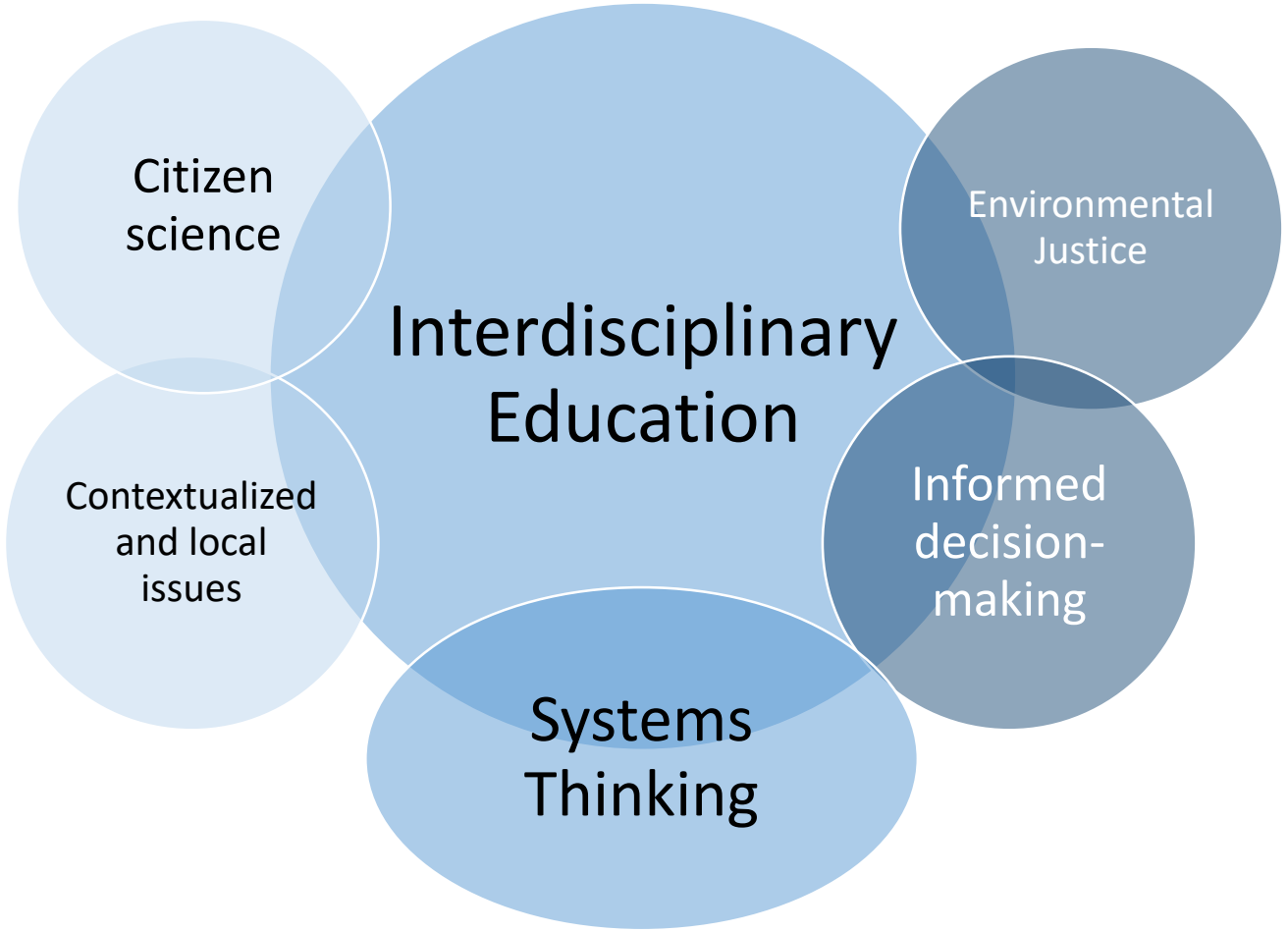
Understand and strengthen approaches to interdisciplinary STEM/FANH education amongst postsecondary students

Learners we are targeting:

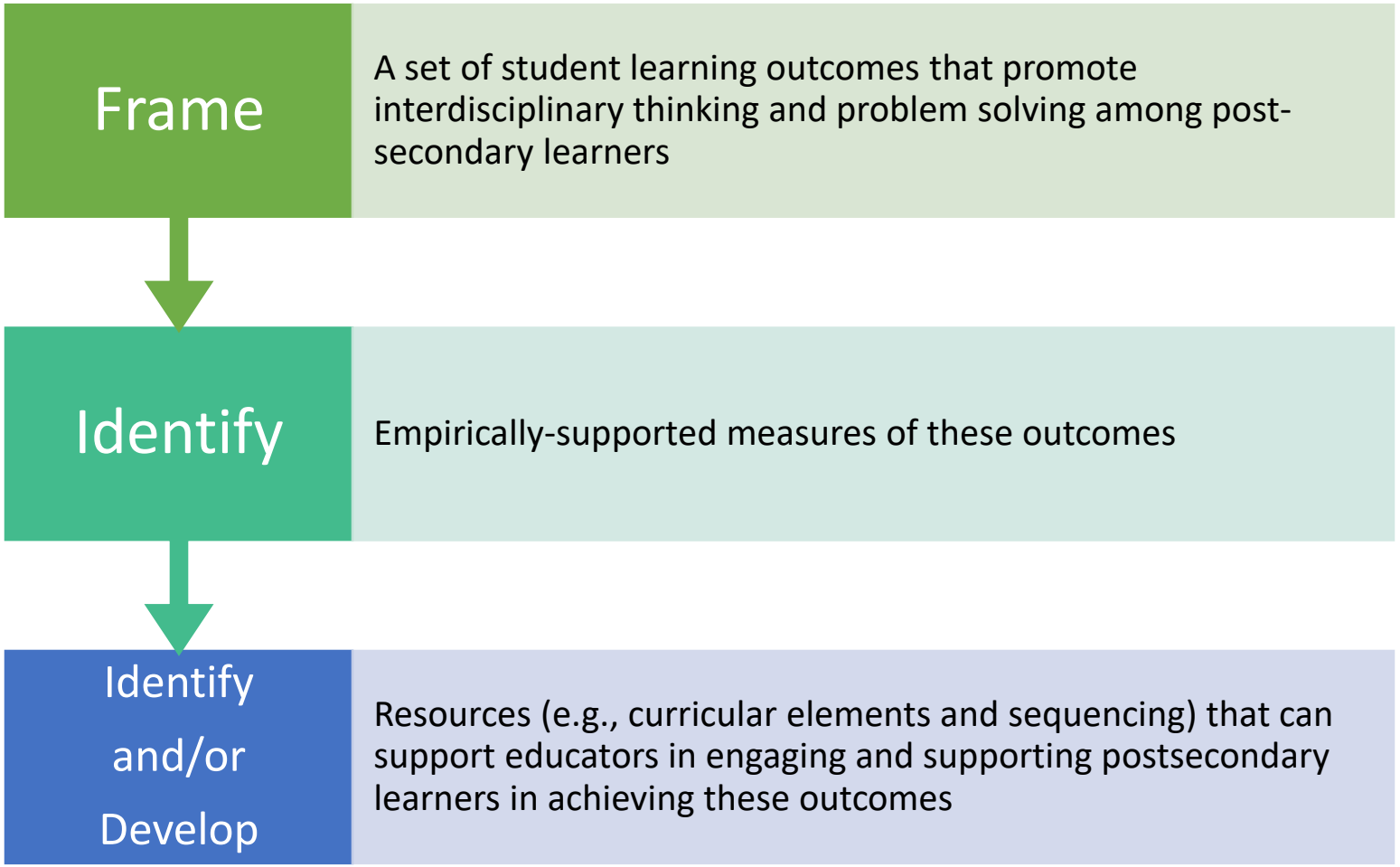
- Undergraduate (inc. honors)
- Master’s
- PhD

Interdisciplinary education

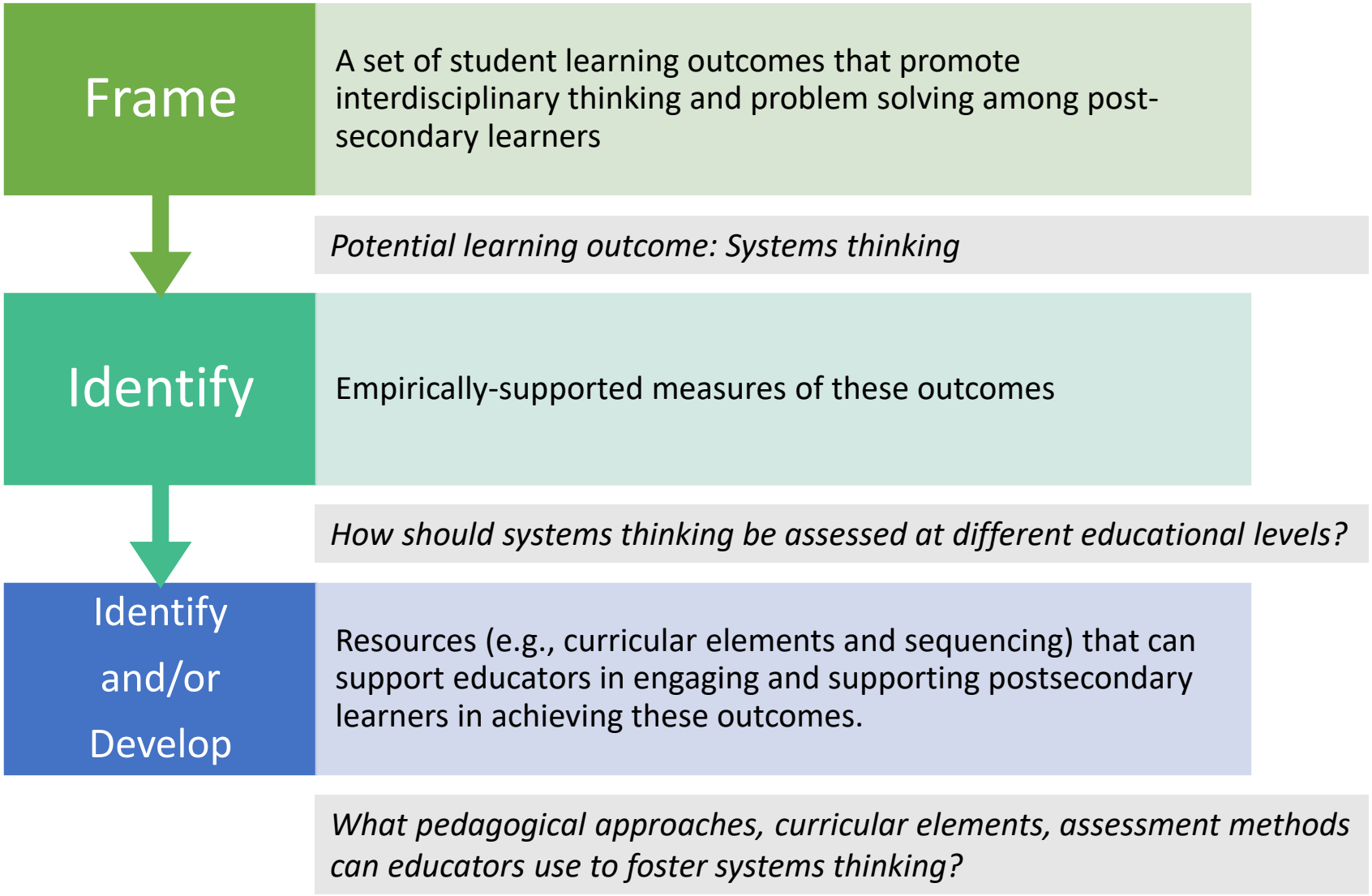
- Broad framework
- Potential to yield a variety of outputs
- Intersects with many other NC-FEW themes



Approach


Frame
A set of student learning outcomes that promote interdisciplinary thinking and problem solving among post-secondary learners
Identify
Empirically-supported measures of these outcomes
Identify and/or Develop
Resources (e.g., curricular elements and sequencing) that can support educators in engaging and supporting postsecondary learners in achieving these outcomes

Example: Systems Thinking



Informal/Non-formal WG

Hannah Scherer, Virginia Tech, Chair

K.C. Busch, College of Education, NC State University
Christine Li, College of Agriculture, Food and Natural Resources, University of Missouri
Gregory D. Goins, Department of Natural Resources and Environmental Design, NC A&T State University
Jamie Loizzo, Department of Agricultural Education and Communication, University of Florida
Michael Barnett, Lynch School of Education and Human Development, Boston College

Who are we? Everything that's not formal education!

Non-formal education and communication

Characteristics

- Structured educational activities
- More often led by trained educators
- May follow a curriculum

Examples

- Scouts
- 4-H Clubs
- Afterschool programs
- Camps

Informal education and communication

Characteristics

- Free choice encounter, less structure
- More often volunteers, not trained educators
- No formal curriculum or credits

Examples

- Science Centers/ Museums
- Media
- Recreational activities
- Family discussions at home

We are interested in thinking about…

What are the possibilities for using the FEW-Nexus perspective to support education and communication in informal/non-formal settings?

In what ways might the FEW-Nexus be used to support science learning in informal/non-formal settings? 6 strands (NRC, 2009):

- *Experience excitement, interest, and motivation to learn about phenomena in the natural and physical world*
- *Come to generate, understand, remember, and use concepts, explanations, arguments, models, and facts related to science*
- *Manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world*
- *Reflect on science as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena*
- *Participate in scientific activities and learning practices with others, using scientific language and tools*
- *Think about themselves as science learners and develop an identity as someone who knows about, uses, and sometimes contributes to science*

What are design characteristics for FEW education and communication in different informal and non-formal settings?

National Research Council (2009). *Learning Science in Informal Environments: People, Places, and Pursuits.* Washington, DC: The National Academies Press. https://doi.org/10.17226/12190
National Academies of Sciences, Engineering, and Medicine (2017). *Communicating Science Effectively: A Research Agenda*. Washington, DC: The National Academies Press. doi: 10.17226/23674

We want to foreground practitioners in answering these questions.

Potential approaches

- **Document and disseminate innovative cases** where FEW-Nexus education and communication is already happening in informal and non-formal educational spaces
- **Investigate the possibilities** for incorporating a FEW-Nexus approach from the perspective of informal and non-formal education and communication practitioners

Working Groups Key Questions

1. What are evidence-based ‘best practices’ in FEW-Nexus education?
2. What has prior research shown about FEW-Nexus teaching and learning?
3. What are measurement strategies, instruments, and/or methodologies used in FEW-Nexus-focused education research?

What publications focused on FEW-Nexus educational programming and education research do you know about that may help answer these questions?

NC-FEW Products

- Questions afford opportunities for NC-FEW members to plug in
- Answers to these questions contribute to community resources and deliverables
  - Publications (e.g., lit reviews, conceptual perspectives, summaries, etc.)
  - FEW-Nexus-based ‘teaching tools’
  - Training module specific to FEW-Nexus education research
  - Grant proposals
- NC-FEW participants will leverage these deliverables for their own work

Contributing to Working Groups

- Submit the interest form and complete the onboarding survey to become an NC-FEW Affiliate
- Participate in webinars and invited events
- Participate in working group-led activities and tasks
- Share your ideas and work
- Explore opportunities for productive collaboration

Next Steps

- NC-FEW activities for spring/summer 202 significantly impacted by COVID-19
- Working ideas to advance NC-FEW
  - 2020 Virtual Showcase
  - Collaboration facilitation
  - Identifying and collecting published work on FEW-Nexus-focused education
- We welcome your ideas and suggestions!
- Questions? Contact us at admin@ncfew.org or individual working group leaders

Thank you!

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