Overview of the Collection Structure

Part I: Foundational Ideas

- Module 1: Using a systems view to improve undergraduate STEM education (Goals and purpose of the module collection)
- Module 2: The ecosystem of undergraduate STEM education and system change
- Module 3: Understanding STEM culture
- Module 4: Student-ready institutions

Part II: Practical strategies for key audiences

- Module 5: How institutional leaders can foster systemic change to improve undergraduate STEM education
- Module 6: How academic unit leaders can foster systemic change to improve undergraduate STEM education
- Module 7: How centers for teaching and learning can contribute to improving undergraduate STEM education

Part III: Partnerships and connections (TO COME)

- Improving connections between Academic Affairs and Student Affairs/Student Success
- Improving connections between Academia and Employers
- Improving connections between Academic Units/Departments and Disciplinary Societies

Guidance for module presentations and discussion

Share your input to inform our revisions.

For each module we will have
Short Presentations about individual foundational modules
10 minute discussion to gather some input on the choice of reflective questions

Simultaneously you may share your input via the Google Form →

We are seeking input on:

- Reflective question topics and content
- Ideas for mutually beneficial partnerships
- Ideas for resources on the key topics (there are check boxes so you can indicate which of the modules the resource is relevant for, it might be more than one)

Module 1:
Using a systems view to improve undergraduate STEM education

Module Presenter:
Mark Mitsui

This module outlines the goals and purpose of the entire collection, focusing on how a systems view can be applied to improve undergraduate STEM education. It emphasizes the importance of understanding the interconnectedness of various elements within the educational ecosystem to drive meaningful change.

Vision

- Mission of higher ed- improving quality of life for individuals and advancing society
- Roundtable vision for an equitable future of undergraduate STEM education

Why

- Why systems change is needed - challenges and opportunities in society and higher education

What

- An introduction to other modules where you will find key levers for change based on evidence and experience
- A time efficient guide that helps stakeholders use the other modules
- Gets the right reader to the right section: addresses change leaders at different levels of the organization
- The collection as a whole will help actors see HOW they can contribute to change

Key thematic features

- Focus on learners (student ready institutions)
- Partnerships and ecosystems (systemic change)
- Connecting people and structures

Module 1:
Using a systems view to improve undergraduate STEM education

Questions to reflect on

- To what extent does module 1 provide a conceptual framing for users of the toolkit?
- To what extent does module 1 provide practical guidance in the use of the other modules (i.e., who might use the toolkit and how they might use it)?
- Any other feedback on how module 1 can be more useful.

We will seek your input around 3 pm after you have heard about the other modules.

Module 2:
The ecosystem of undergraduate STEM education and system change

Module Presenter:
Noah Finkelstein

Key Topics:

<u>What</u> it means to take an ecosystems approach to systemic change in STEM education.

<u>Why</u> it is useful to take a systems (ecosystems) orientation to address STEM education challenges.

<u>How</u> your organization can take an ecosystems approach.

Module 2: Reflective Reflective Questions

What is the systemic change for which your organizat unit / institution might use this systemic ecosystem approach - ? (and if you don't know the challenge, start with q2 and return [why & goal]

What is the context (eco-system)- appropriate to your institution and systemic change, and the key elements in the context—that are most relevant for your organizational unit/ institution as you think about systemic change in undergraduate STEM education [mapping]

What does an ecosystem approach mean or look like for you / your challenge? [process]

For this systemic change, who are the most important internal and external partners ? (e.g., internal units, other educational institutions, industry, government agencies, prof. associations and organizations, and communities to prepare students for the STEM workplace and workforce?) [who and roles / to what ends]

What other modules in this Toolkit will be most helpful to your institution as you plan for systemic ecosystem change? [resources]

Module 2:
The ecosystem of undergraduate STEM education and system change

Sample Resources

ASCN: Accelerating Systemic Change Network: Suites of resources ranging from theories to model practices for change. https://ascnhighered.org/ASCN/resources.html

Increasing Student Success in STEM: Summary of a Guide to Systemic Institutional Change (Elrod and Kezar, 2017) describes a summary of 20 years of work in this area, including how to implement relevant models, examples and campus case studies.

Community College Presidents' Initiative (CCPI-STEM) focuses on advancing STEM workforce education through business partnerships and advanced technological education (NSF-ATE).

Module 3:
Understanding STEM culture

Key topic: Antiquated expectations for who is seen as a future scientist/engineer/mathematician and how they should be taught

Reflective questions:

- Are the demographics of the students in your STEM department/school similar to those in the institution as a whole? In your community?
- Do you know the pedagogical and assessment approaches being used in the courses? Are they evidenced-based? Equitable?

Module Presenter:
Archie Holmes

Module 3:
Understanding STEM culture

Key topic: Undergraduate STEM education involves complex course sequences and prerequisites

Reflective questions:

- Is it possible to complete all STEM majors in 4 years if students do not enter with AP/IB/DE credit or placement?
- Do student demographics predict who is more likely to complete a foundational STEM course or a STEM major?

Module 4:
Student-Ready Institutions

Module Presenter:
Christina Yao

Key topic/idea:

Student-ready institutions (McNair et al., 2022):

1. Know who their students are, how they are doing, and what they need to succeed
2. Are intentional
3. Foster a culture of inclusive leadership and shared ownership
4. Are self-aware and opportunistic
5. Understand the big picture and think long-term
6. Focus on behavior
7. Observe, act, innovate, and prioritize accountability

Reflective questions:

1. What does a student-ready institution look like?
2. How would we know if we are student-ready? What metrics could measure this?
3. What do we know about who our learners are, the communities they come from, and what they need from us?
4. What stakeholders or partners do we need to engage to develop student-ready practices?

Module 4: Student-Ready Institutions

Sample illustrative resources:

Already existing models that aim to multiply the impact of institutions with existing student-ready approaches, without further burdening those institutions with the work of dissemination and educating others–a key role for the Roundtable in connecting and amplifying such work.

- University of Texas at El Paso (UTEP): Model Institutions for Excellence (MIE)
- California State University, Long Beach (CSULB): BUILD Program (Building Infrastructure Leading to Diversity)
- University of Maryland, Baltimore County (UMBC): Meyerhoff Scholars Program
- …and many more

Module 5:
Practical Steps for Institutional Leaders who want to Foster Systemic Change and Create Student-Ready Institutions

Module Presenter:
Kacy Redd

NATIONAL ACADEMIES Sciences Engineering Medicine

Key Topic/Idea:

- Higher education leaders can help their institutions take a systemic ecosystem approach to creating more student-ready higher education institutions.

Reflective Questions:

- What is the change goal that our institution wants to address? What do we want to do differently in service to more effective student learning?
- How can our institution engage in systemic change to improve the learning experiences in our STEM courses and programs? In our institutional context, what levers for change would be most impactful to encourage institutional movement toward the change goal?
- How can we develop a broad coalition of supporters and allies who will understand the problem and goal, be champions, and implement solutions?
- What barriers exist at the departmental, school, and institutional levels, or in the broader context, that may impede our progress? How do we address such barriers?
- How will we know if we are making progress? What metrics and indicators can we use to track progress and make data-informed decisions throughout the change process?

Module 5:
Practical Steps for Institutional Leaders who want to Foster Systemic Change and Create Student-Ready Institutions

Key Topic/Idea:

- Leaders can help embed an equity-minded approach to change throughout their institution.

Reflective Questions:

- Why is it important to bring an equity-minded perspective to efforts to improve undergraduate STEM education?
- What are our institution's values or principles around equity and inclusion? How and when are these communicated?
- In practice, what does it look like to center equity and inclusion in institutional decision-making, resource allocation, and program design?
- How can we embed an equity-minded approach into our work to strengthen undergraduate education? How can we ensure that the change process is inclusive and takes into account the perspectives of all stakeholders, including students, faculty, staff, and the community?
- What professional development opportunities can we provide to support faculty and staff in implementing equity-minded practices?

Module 5:
Practical Steps for Institutional Leaders who want to Foster Systemic Change and Create Student-Ready Institutions

Sample Resources:

The Change Leadership Toolkit (Elrod, Kezar, and Gonzalez, 2023)

Achieving the Dream coaching on the transformation process

Shared Equity Leadership framework and tools

Module 6:
Practical Steps for Departmental/Academic Unit Leaders who want to Foster Systemic Change and Create Student-Ready Departments

Module Presenter:
Dea Follmer

Key Topic/Idea:

The goal of this module is to translate the features of student-ready STEM education to the department level and help move them into action through:

1. Improved understanding of student needs: the foundation for effective improvement
2. Adoption of growth-oriented mindsets that assume responsibility for improving the student experience and student outcomes
3. Self-assessment, reflection and improvement of specific dimensions of student-readiness

Reflective Questions:

1. How do we define student success? How do our students define it?
2. How can we create an academic environment that respects and values the diverse aspirations and backgrounds that our students bring to it?
3. What can our faculty and staff do differently to help students achieve their goals?
4. How can we create “shared ownership” with students?

Module 6:
Practical Steps for Departmental/Academic Unit Leaders who want to Foster Systemic Change and Create Student-Ready Departments

Sample Illustrative Resources:

- Institutional examples/models listed for Module 4:
- Ecosystem framework:

- Ecological systems framework for humanizing STEM education
- Departmental self-Assessment tools drawing on:
  - National Academies Press Indicators for Monitoring Undergraduate STEM Education
  - NASEM Roundtable product: STEM Equity Indicators