

NCATS

COLLABORATE. INNOVATE. ACCELERATE.

Translational Science and the NCATS Education Branch

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Education Branch

National Center for Advancing Translational Sciences



NIH National Center
for Advancing
Translational Sciences

NCATS Education Branch

- The Education Branch providing central leadership and coordination to translational science education across the Center. This includes developing new initiatives led by the Branch and leading Center-wide committees focused on translational science education.
- **Goals of Education Branch**
 - Improve understanding of translational science
 - Develop and disseminate evidence-based tools and best practices
 - Expand and diversify the translational science workforce



Core Competencies in Clinical and Translational Research

- Clinical and Translational Research Questions
- Literature Critique
- Study Design
- Research Implementation
- Sources of Error
- Statistical Approaches
- Biomedical Informatics
- Clinical Research Interactions
- Scientific Communication
- Cultural Diversity
- Translational Teamwork
- Leadership
- Cross Disciplinary Training
- Community Engagement

Seven fundamental character traits of a translational scientist

CHARACTERISTICS OF A TRANSLATIONAL SCIENTIST

Translation is the process of turning observations in the laboratory, clinic and community into interventions that improve the health of individuals and the public – from diagnostics and therapeutics to medical procedures and behavioral changes. The professionals involved in this process, either developing interventions or improving the process itself, are *TRANSLATIONAL SCIENTISTS*.

RIGOROUS RESEARCHER

Conducts research at the highest levels of rigor and transparency, possesses strong statistical analysis skills, and designs research projects to maximize reproducibility.

SYSTEMS THINKER

Evaluates the complex external forces, interactions and relationships impacting the development of medical interventions, including patient needs and preferences, regulatory requirements, current standards of care, and market and business demands.

SKILLED COMMUNICATOR

Communicates with understanding with all stakeholders in the translational process across diverse social, cultural, economic and scientific backgrounds, including patients and community members.

DOMAIN EXPERT

Possesses deep disciplinary knowledge and expertise within one or more of the domains of the translational science spectrum ranging from basic to clinical to public health research and domains in between.

PROCESS INNOVATOR

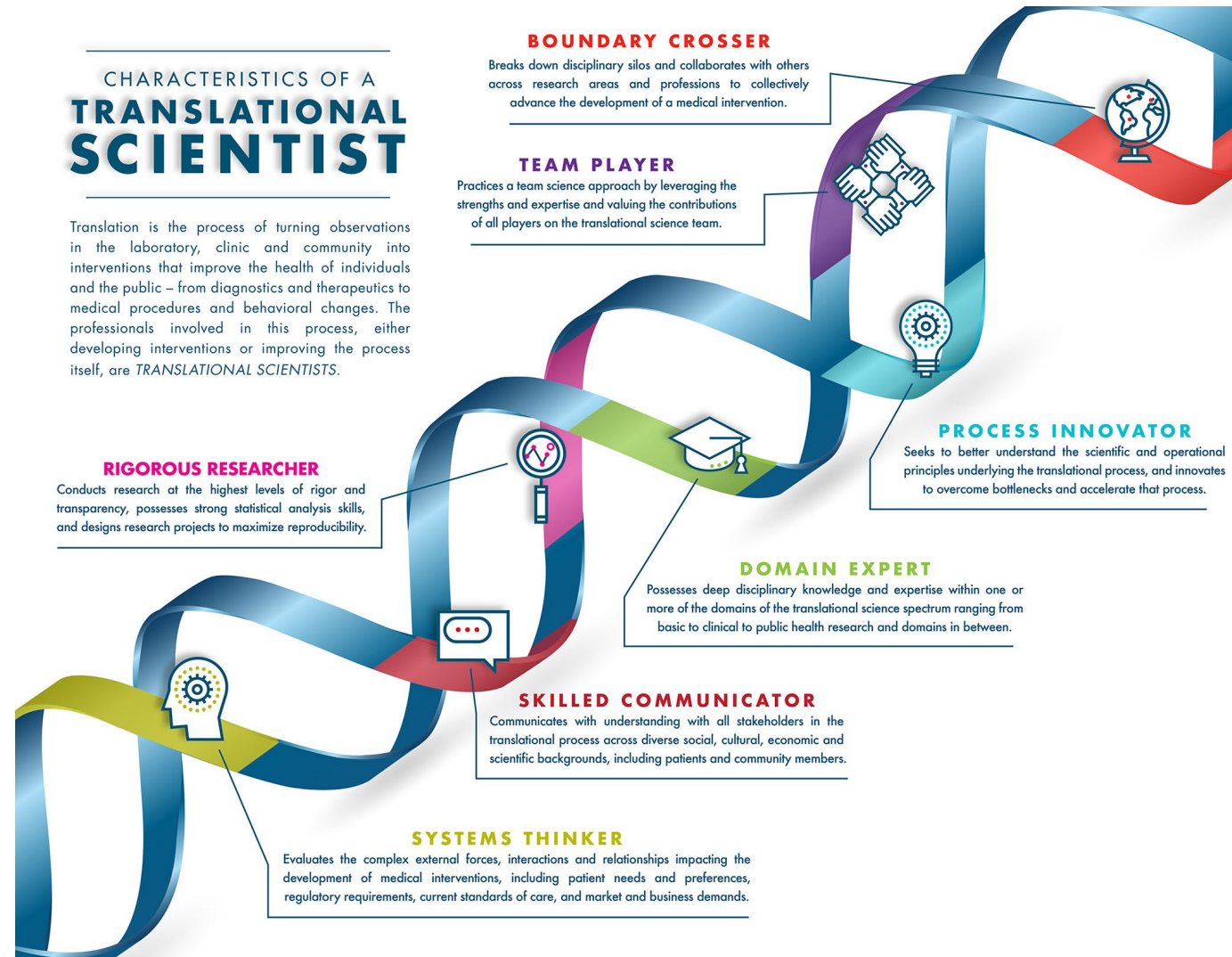
Seeks to better understand the scientific and operational principles underlying the translational process, and innovates to overcome bottlenecks and accelerate that process.

TEAM PLAYER

Practices a team science approach by leveraging the strengths and expertise and valuing the contributions of all players on the translational science team.

BOUNDARY CROSSER

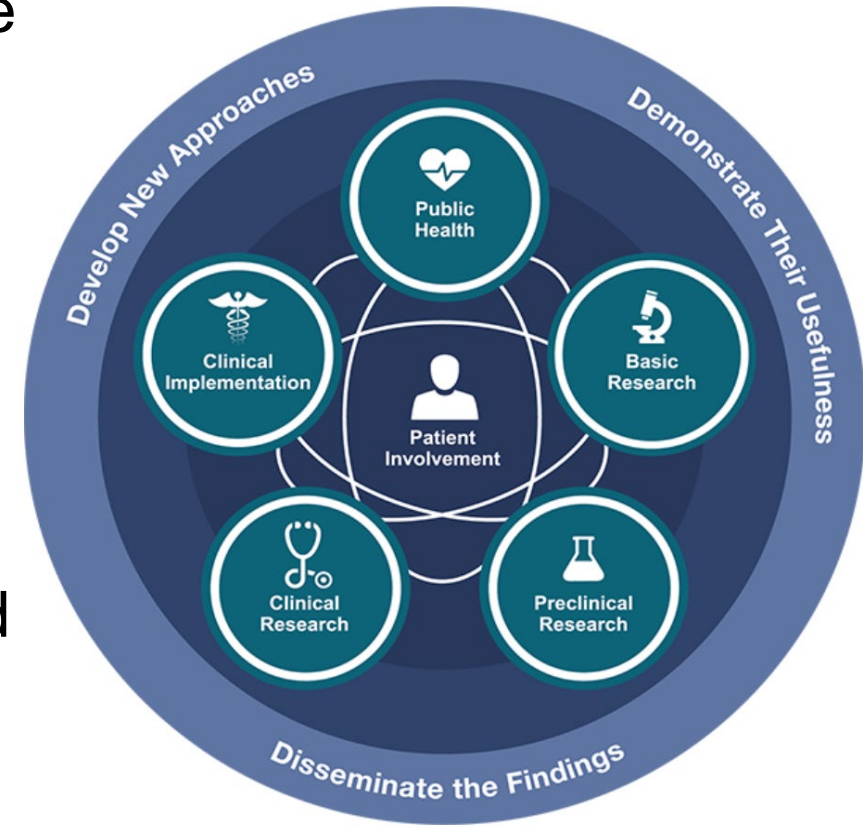
Breaks down disciplinary silos and collaborates with others across research areas and professions to collectively advance the development of a medical intervention.



Translational Science

The **field of investigation** focused on understanding the **scientific and operational principles** underlying each step of the translational process.

Developing solutions that employ these principles and will be applicable to many research areas, diseases, and conditions.



Translational Science Principles

- **Scientific** - Focus on factors directly related to the selection of the research question, research approaches, and research methods
- **Operational** - Focus on how team functioning, organizational environment, and the culture of science influence the research
 - Operational principles facilitate the science.



Process for Identifying Initial TS Principles

Education



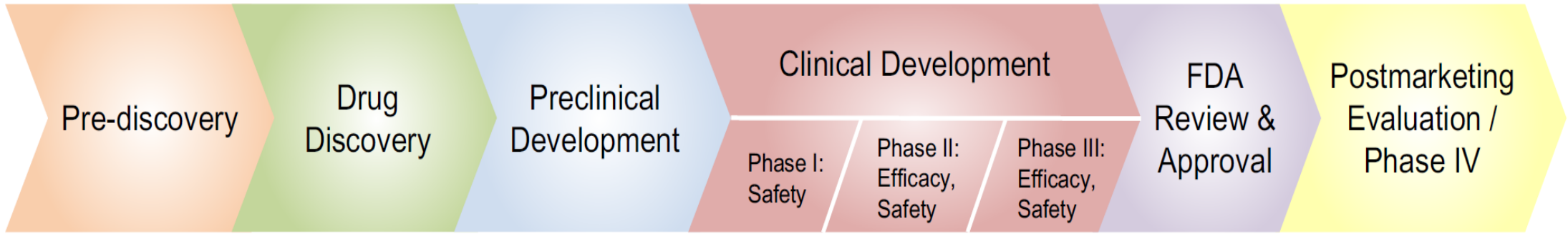
Knowledge



Research

Drawn from case studies of diverse research NCATS has led or supported





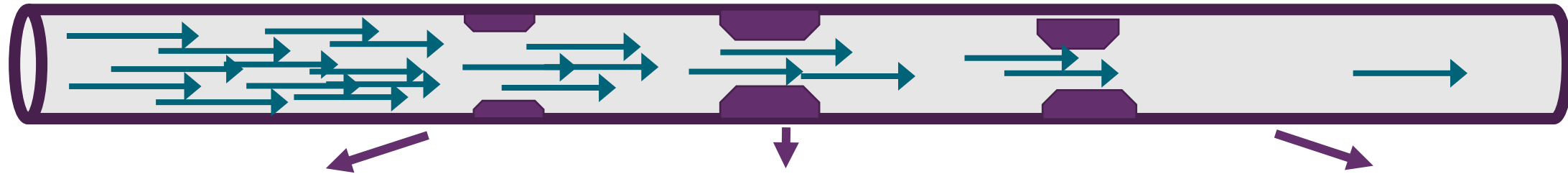
Scientific Initiatives

Scientific Bottlenecks

Operational Bottlenecks

Additional Bottlenecks

New Intervention Available and Used in Target Population



Translational Science Challenges	Example of Approach/Translational Science Principles Applied	Example Solution	NCATS Programs
Thousands of diseases without treatments or cures	Prioritize initiatives that address unmet needs; produce crosscutting solutions for common and persistent challenges	Platforms that support testing of compounds for multiple disease at once; derisking of research where there are low incentives via government investments	Platform Vector Gene Therapy (PaVe-GT)
Preclinical and animal models do not adequately predict toxicity or effectiveness in humans	Produce crosscutting solutions for common and persistent challenges; emphasize creativity and innovation	Microphysiological systems that model human organs	Tissue Chip for Drug Screening
Technical and partnership barriers to rapid collection and harmonization of clinical data to address urgent public health needs	Utilize boundary-crossing partnerships; enhance efficiency and speed of translational research	Centralized data integration, harmonization, and utilization	National COVID Cohort Collaborative (N3C)

Translational Science Principles

Scientific Principles



Prioritize initiatives that address unmet needs



Produce cross-cutting solutions for common and persistent challenges



Emphasize creativity and innovation



Leverage cross-disciplinary team science

Operational Principles



Enhance efficiency and speed of translational research



Utilize boundary-crossing partnerships to advance translation



Pursue bold advances

Utilizing Translational Science Principles

- Literature review
- Course development
- Continued expansion and refinement



Literature Review -- Context and Goals

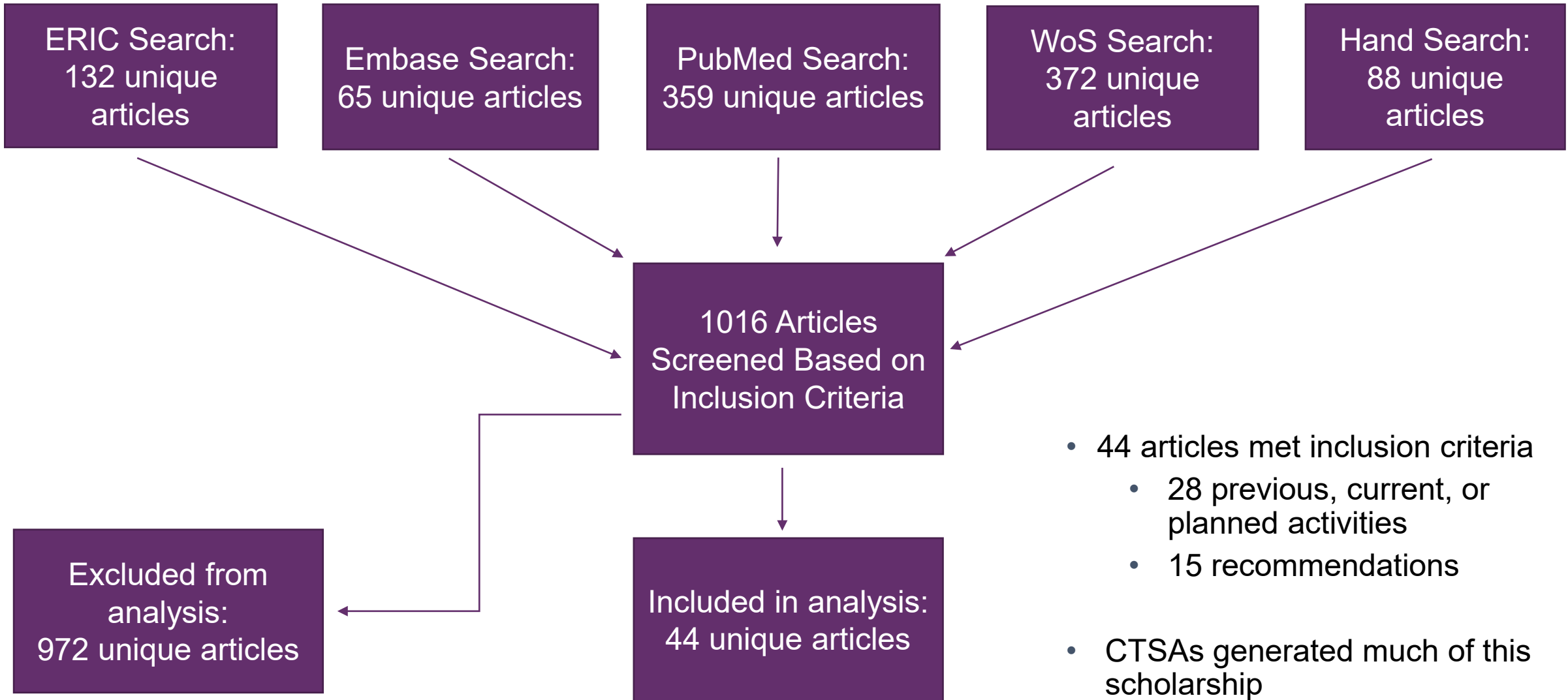
Context

- Conducted scoping literature review on translational science education and training (E&T) to inform the Branch's activities and provide a resource for the scientific community
- Findings shared here are in a manuscript-in-preparation

Goals

- Identify and describe the peer review literature on E&T in translational science specifically (vs E&T in content specific to CTR skills, e.g., study design, research ethics)
- Describe the breadth of translational science content being taught and how this aligns with the translational science principles
- Describe modalities used for E&T, participants, and evaluations
- Identify strengths and areas for growth in translational science E&T





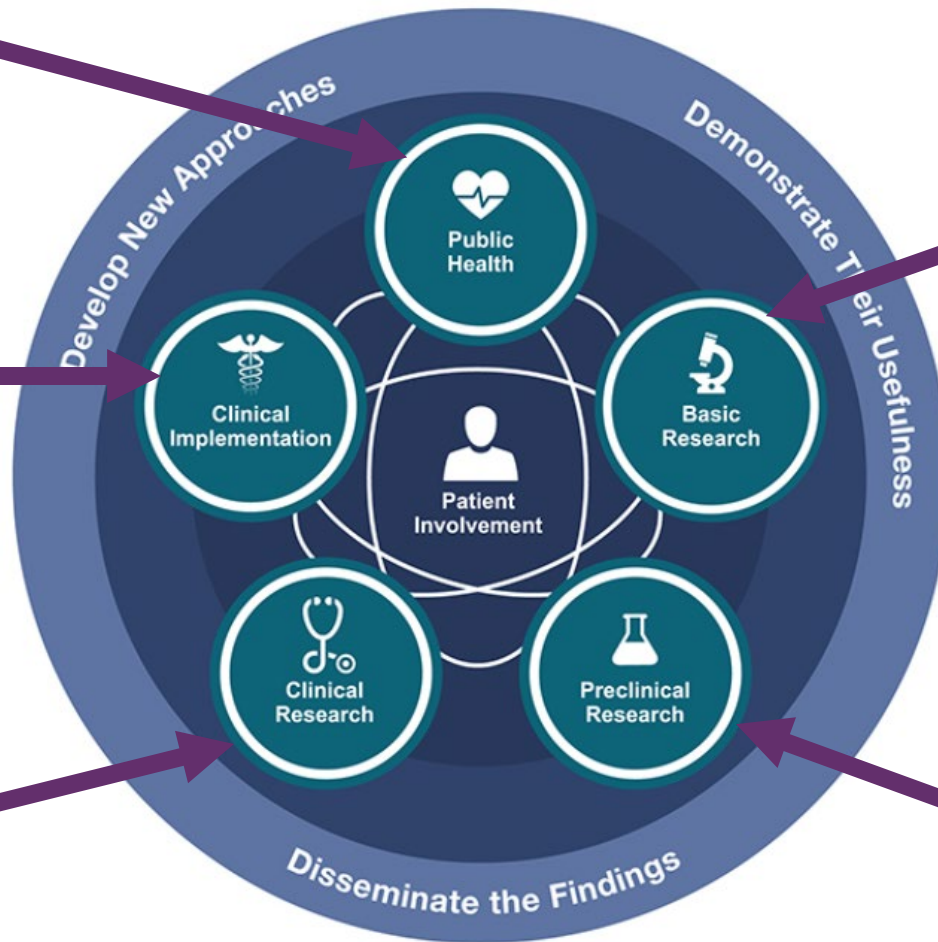
E&T Opportunity Educational Goals Spanned the Translational Spectrum

Examples

Provide training in CVD health disparities research that advances translation across epidemiology, health services research and behavioral sciences

Introduce participants to D&I concepts, strategies, and design principles

Train students in the most rigorous, efficient and effective clinical research designs and implementation approaches, and facilitate translation of findings into publications, practice, and policy



Train researchers to have the necessary knowledge and skills to investigate clinically significant biological questions from a basic science viewpoint

Examine drug D&D successes and failures to enable students to improve the process



Article #	Basic Research	Preclinical Research	Clinical Research	Implem. Science	Pop. Science
1	✓	✓			
2	✓	✓	✓		
3	✓	✓	✓		
4		✓			
5			✓		
6		✓	✓		
7		✓	✓		
8		✓	✓		
9		✓	✓		
10		✓	✓		
11		✓	✓		
12		✓	✓	✓	✓
13		✓	✓	✓	✓
14			✓	✓	
15				✓	
16				✓	
17				✓	✓
18 – 28	✓	✓	✓	✓	✓

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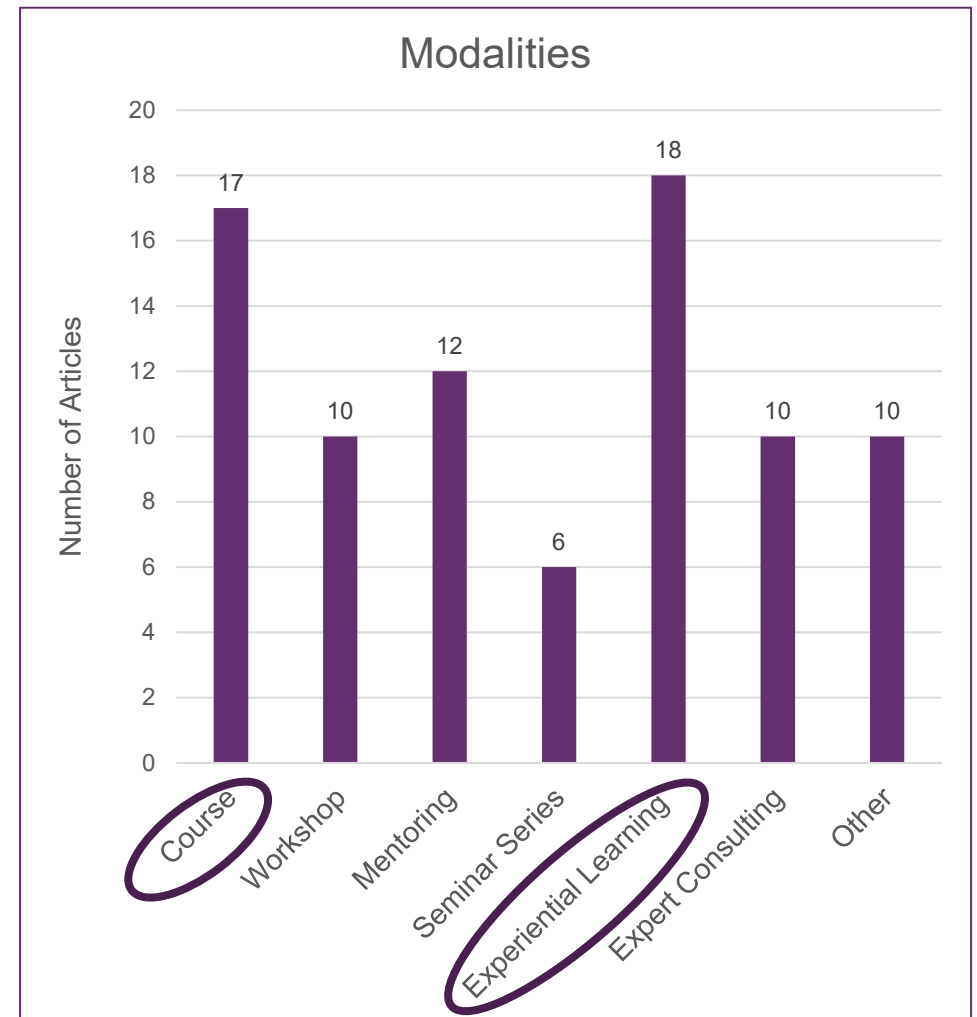
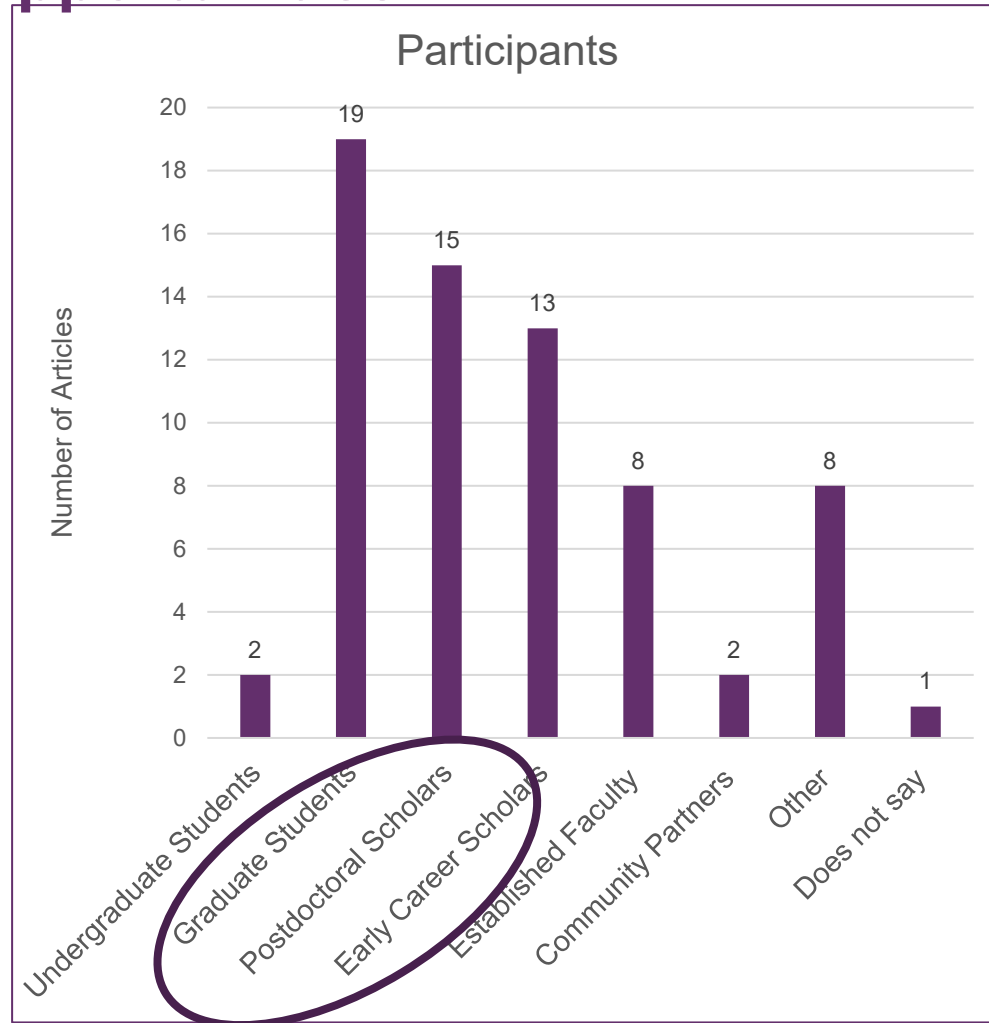
Among the 28 articles that described TS T&E opportunities....

- 11 articles (41%) articles– in gray – discussed the value of TS as applied to advancing research all along the full translational spectrum
- 17 articles addressed the value of TS to particular stages of the translational spectrum
 - 11 of these 17 articles focused on TS to advance preclinical to clinical research



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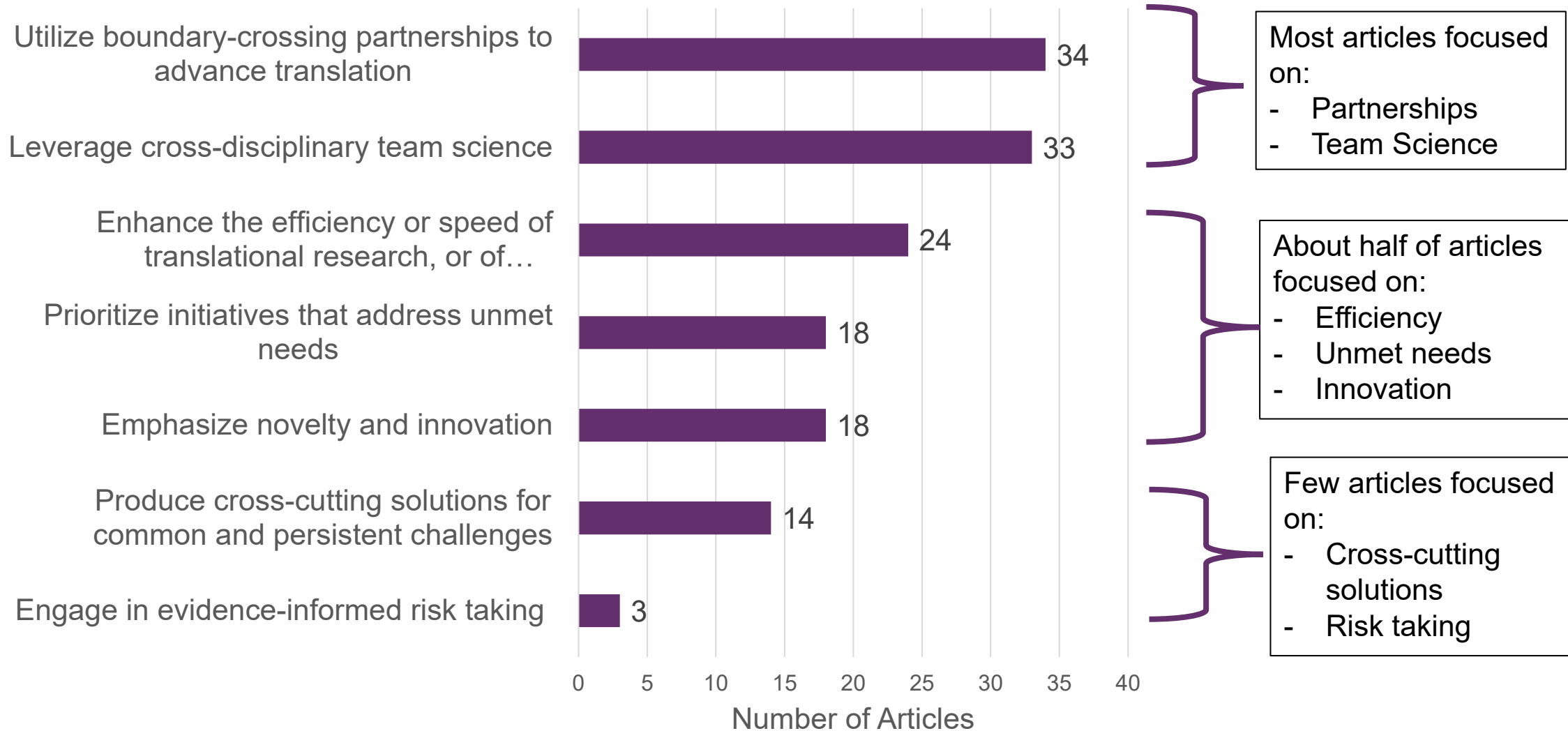
Looking at the 28 articles that described translational science E&T opportunities...



- 7 described a degree program (masters or doctoral) or certificate; the rest describe a more finite E&T opportunity.
- 11 described in-person opportunities; 8 described in person/online hybrids; 9 did not say.



Looking at all 44 Articles -- What translational science content is being taught or recommended?



Note: Multiple TS principles were emphasized in each article



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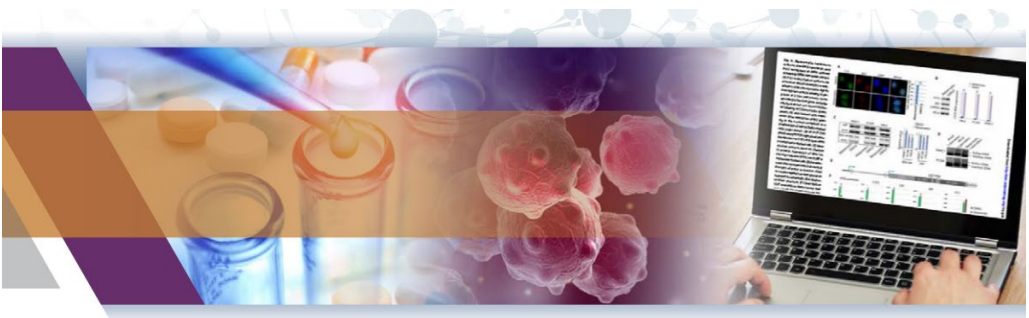
Key Takeaways: Areas of strength and where growth is needed

	Strengths	Where Growth is Needed
Stages of Translation Being Considered	Focus on the value of TS to advance research across spectrum; strong focus on preclinical and clinical research	TS training with relevance to advancing translation involving basic research, implementation science, population science
Audiences Being Reached	Grad students, postdocs, and early career faculty	Expanded access to TS education to earlier and later training and career stages
Modalities Being Leveraged	Courses and experiential learning	Non-traditional modalities – workshops, seminars, etc. – shorter duration/more accessible to broader audiences; online ed.
TS Principles Being Conveyed	Partnerships (cross-sectoral, community) and Team Science	<ul style="list-style-type: none"> - Other TS Principles – Efficiency, addressing unmet needs, innovation, cross-cutting solutions, risk taking
In Addition....	Half (n=15) the articles about E&T opportunities included evaluation; Literature reflects national expertise in TS	<ul style="list-style-type: none"> - Evaluations: more rigor needed (pre/post; comparison groups) - Expansion of expertise in TS - Additional development of TS Principles/Content to be Conveyed



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Education Opportunities to Advance Understanding of Translational Science Principles



MEDI 501: Principles of Preclinical Translational Science
A CASE STUDY FROM CANCER DRUG DISCOVERY AND DEVELOPMENT



MEDI 502: Translational Science in the COVID-19 Pandemic
ACCELERATING AND ENHANCING OUR RESPONSE ACROSS PRECLINICAL, CLINICAL AND POPULATION HEALTH RESEARCH



Prioritize initiatives that address unmet needs



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Pursue bold advances



Philosophy Guiding NCATS Education Branch Translational Science (TS) Courses

- Teach generalizable scientific and operational principles guiding TS approaches
- Demonstrate how TS principles are exemplified across a wide range of scientific initiatives and research projects
- Teach TS in a manner that is accessible to individuals at all training and career stages
- Use the case study format to teach TS principles through real-life examples of successful translational research activities
- Leverage scientists involved in the research as faculty (behind the curtain view)
- Rigorously evaluate our courses, and use findings for continuous quality improvement



MEDI 501 NCATS Online Translational Science Course

(1 credit hour, 7 weeks)

Student demographics (session 1&2, n=95):

- **67%** employed in academia, **24%** in govt
- **48%** with PhD, **26%** with Bachelors
- **28%** current students
- **30+** degree disciplines represented
- **52%** no drug discovery background
- **65%** less than 2 years of TR experience
- **68%** current work contributes to TR
- **93%** course was valuable
- **99%** unique window into translational science

Other Resources

- NCATS Translational Science Principles – <https://ncats.nih.gov/training-education/translational-science-principles>
- Videos highlighting NCATS initiatives and use of translational science principles –
 - Metarrestin (preclinical drug discovery and development) Project: <https://youtu.be/HquJvskqJKk>
 - Rare Disease Registry (RaDaR) Program: <https://youtu.be/qQWcp3rNDok>
- Upcoming publications -



Acknowledgements

- All members of the NCATS Education Branch and trans-NCATS Committees contributing to this work
- MEDI 501 and MEDI 502 course faculty
- NCATS Communications Branch
- FAES, for partnership to field the online courses



Your Charge – Possibility thinking – innovating on training the next generation of translational scientists

- How would teaching the principles of translational science augment core competencies that have been identified
- How do we turn core competencies and teaching the principles of translational science into consistent components for training the next generation of translational scientists
- How do we share knowledge that addresses the vast pre-clinical and clinical translational science pipeline
- How do we innovate on training and coordinate training better
- How do we reach the full breadth of the translational science workforce with our education activities



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