NCATS

COLLABORATE. INNOVATE. ACCELERATE.

The NCATS Translational Science Principles

Applications to Education and Training

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https://ncats.nih.gov/training-education/education-branch

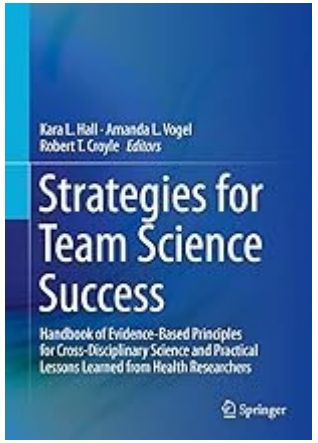
National Center for Advancing Translational Sciences

Outline

- Introduce myself and the NCATS Education Branch
- The NCATS Translational Science (TS) Principles
  - Why and how they were generated
- Applications to TS Education and Training
  - NCATS Education Branch Courses in TS
  - Review of the Literature
- Discussion

About me

- 14 Years at NIH – NCI; NCATS
- Areas of expertise:
  - Team science and SciTS
  - Programmatic evaluation
  - Education and training in translational science
- Training:
  - PhD, Health Policy and Management; Healthcare Delivery Research, JHSPH
  - MPH, Social Epidemiology, Community Based Public Health, HSPH



INSciTS

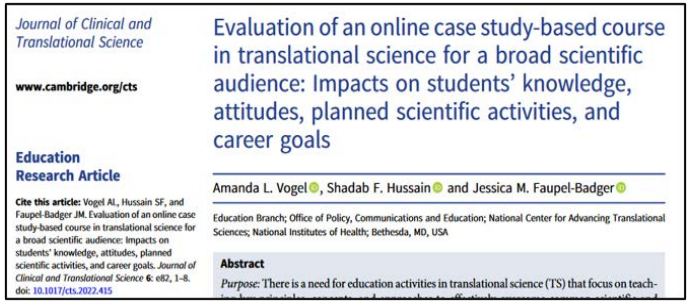
CTS Clinical and Translational Science

REVIEW | Open Access

Advancing translational science education

Jessica M. Faupel-Badger, Amanda L. Vogel, Christopher P. Austin, Joni L. Rutter

First published: 31 August 2022 | https://doi.org/10.1111/cts.13390


Journal of Clinical and Translational Science

www.cambridge.org/cts

Education Research Article

Cite this article: Vogel AL, Hussain SF, and Faupel-Badger JM. Evaluation of an online case study-based course in translational science for a broad scientific audience: Impacts on students' knowledge, attitudes, planned scientific activities, and career goals. *Journal of Clinical and Translational Science* 6: e82, 1–8. doi: 10.1017/cts.2022.415

Evaluation of an online case study-based course in translational science for a broad scientific audience: Impacts on students' knowledge, attitudes, planned scientific activities, and career goals

Amanda L. Vogel, Shadab F. Hussain and Jessica M. Faupel-Badger

Education Branch; Office of Policy, Communications and Education; National Center for Advancing Translational Sciences; National Institutes of Health; Bethesda, MD, USA

Abstract

Purpose: There is a need for education activities in translational science (TS) that focus on teach-

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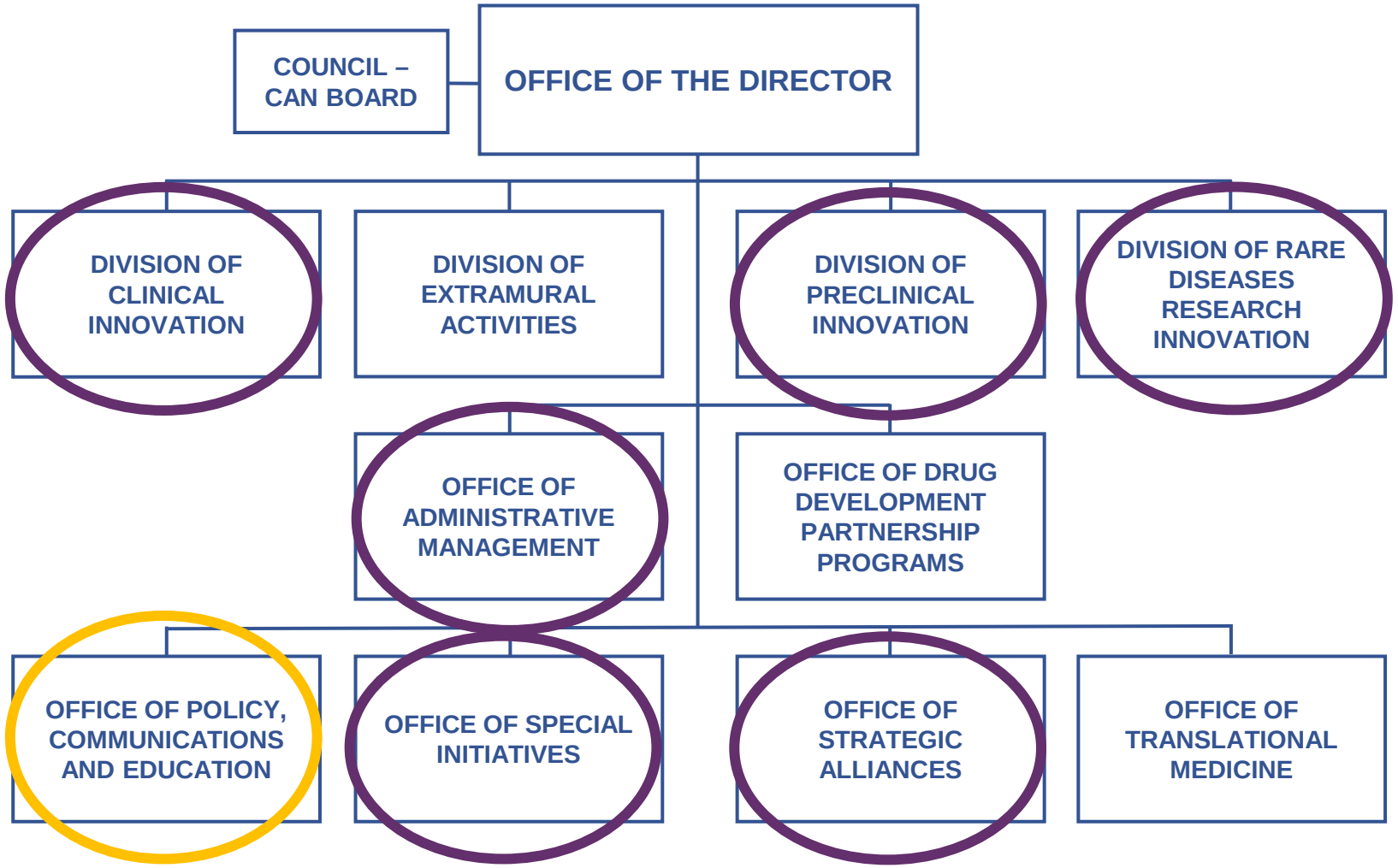
NCATS Organizational Chart



Learn more about our staff: ncats.nih.gov/staff

Education Branch

<u>Vision:</u> A highly **skilled, large, and diverse** TS workforce equipped with the competencies needed to **accelerate progress along the translational pipeline** toward more health solutions for all people

<u>Our work includes:</u>

- Collaborating across NCATS Offices/Divisions to advance shared understanding of TS, and produce a unified vision for TS education and training
- Piloting and disseminating innovative TS educational resources for our trainees and the scientific community
- Running intramural training office for our in-house fellows (n~100)
- Producing original scholarship

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NCATS Translational Science Principles
Why and How they were Created

https://ncats.nih.gov/training-education/translational-science-principles

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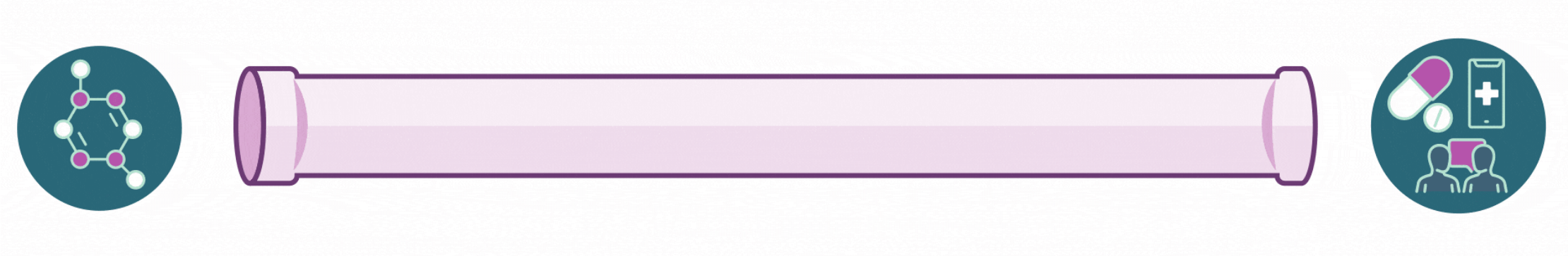
NCATS' MISSION

Turn research observations into health solutions <u>through translational science</u>

Translational Science

Translational Science is the field that generates scientific and operational innovations that overcome longstanding challenges along the translational research pipeline.



Goal: To speed the process by which research discoveries are turned into health solutions. And ultimately lead to move treatments for all people, more quickly.

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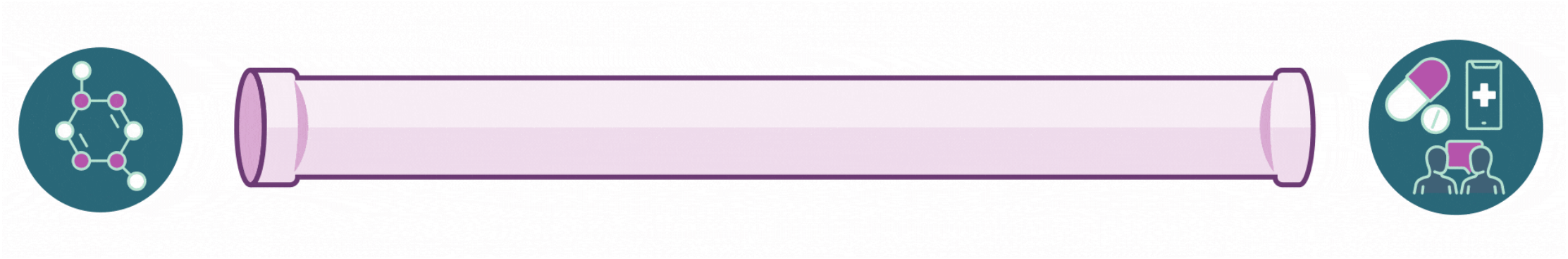
Reengineering the Translational Pipeline

NCATS addresses long-standing bottlenecks in the translational research pipeline so that new treatments reach people faster.



Challenges:

- Incompatible databases
- Administrative burden for study start-up
- Insufficient tools and technologies to accurately predict toxicity and efficacy of new drugs

NCATS Solutions:

- Data interoperability and integration (e.g., N3C)
- Streamlined business processes (e.g., SMART IRB)
- Models that mimic the structure and function of human tissues (e.g., tissue chip for drug screening program)

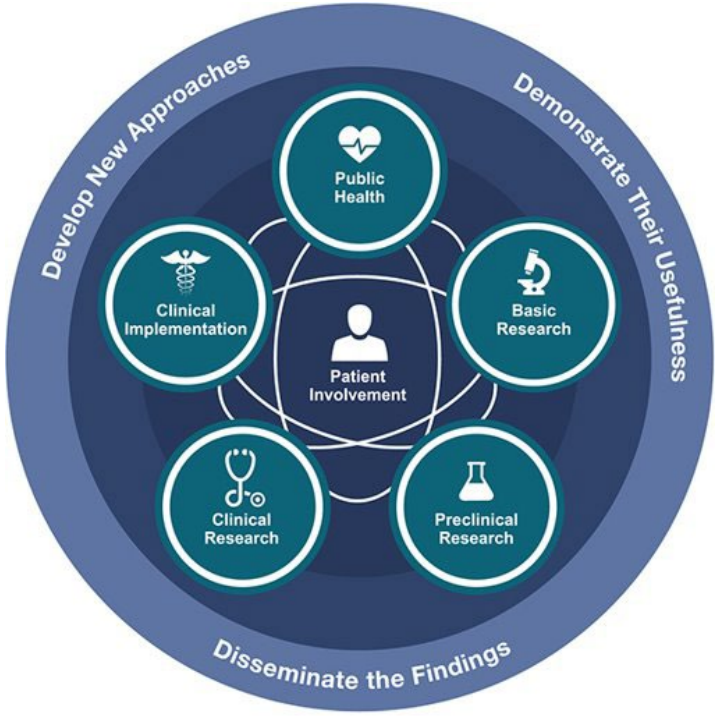
Why Develop Translational Science Principles?

Why?

- Help to explain **how** TS advances progress – how it solves challenges, and enhances speed and impact of the research
- Inform **efforts to further develop content** for TS education and training
- Provide a resource to help guide **strategic thinking** in current and ongoing translational science initiatives

Response:

- Develop a set of TS Principles that exemplify effective approaches to overcome common translational challenges and advance translational progress
    - Relevant across T0-T4; disciplines and fields; operational and scientific challenges



Credit: National Center for Advancing Translational Sciences

Developing the TS Principles

- NCATS' expertise – internal research program, extramural initiatives
- Prior scholarship
- In depth case studies of highly successful NCATS-led or supported translational science initiatives

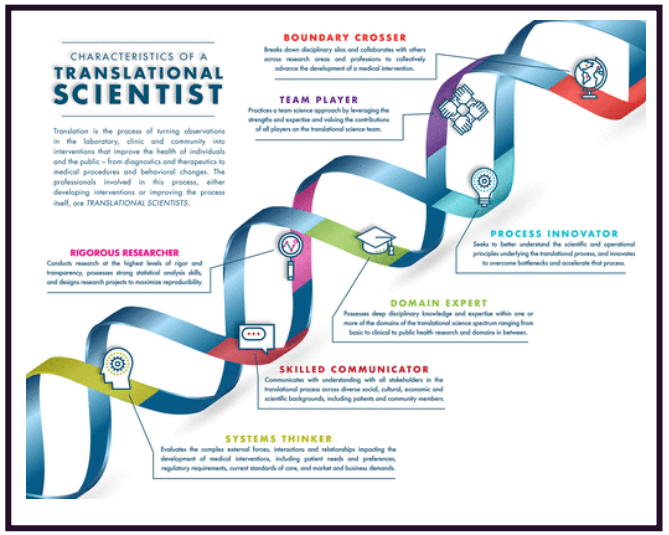
https://www.youtube.com/watch?v=FOp-IX3NY6E

https://ncats.nih.gov/research/research-activities/tissue-chip

CTSA Clinical & Translational Science Awards

Core Competencies in Clinical and Translational Research (2011)

https://clic-ctsa.org/education/competencies



https://pubs.acs.org/doi/10.1021/acsptsci.9b00022

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Informed by NCATS' Experience Leading and Partnering in Translational Science

Case Studies of Translational Science in Action

Partnering with Patient Advocates to Advance Research on All Rare Diseases
- Eric W.K. Sid MD MHA

Discovery and Development of Metarrestin for Cancer Metastasis
- Samarjit Patnaik PhD

Developing Tissue Chips to Transform Drug Discovery and Development
- Passley Hargrove-Grimes PhD

Videos at: https://ncats.nih.gov/training-education/translational-science-principles

Additional case studies in **NCATS Directors Message Series** https://ncats.nih.gov/director/june-2023

Translational Science Principles

Translational Science is the field that generates scientific and operational innovations that overcome longstanding challenges along the translational research pipeline.

Prioritize initiatives that address unmet needs

Produce crosscutting solutions for common and persistent challenges

Emphasize creativity and innovation

Leverage cross-disciplinary team science

Enhance the efficiency and speed of translational research

Utilize boundary-crossing partnerships

Use bold and rigorous research approaches

Advance diversity, equity, inclusion and accessibility in research

Applying the TS Principles to TS Education and Training

- Adds to the national conversation on core content for TS education and training that aligns with the NCATS focus on translational science as the field that advances translational progress
- Can be applied broadly to education and training for individuals working across the translational continuum, in a range of disciplines and fields
- Can be used to expand access to TS knowledge to diverse learners –
  - Effectively convey core concepts to broad audiences
  - Learners across roles in the translational enterprise: scientists, administrators, patient advocates, community partners


CTS Clinical and Translational Science

REVIEW | Open Access

Advancing translational science education

Jessica M. Faupel-Badger, Amanda L. Vogel, Christopher P. Austin, Joni L. Rutter

First published: 31 August 2022 | https://doi.org/10.1111/cts.13390

https://ascpt.onlinelibrary.wiley.com/doi/epdf/10.1111/cts.13390

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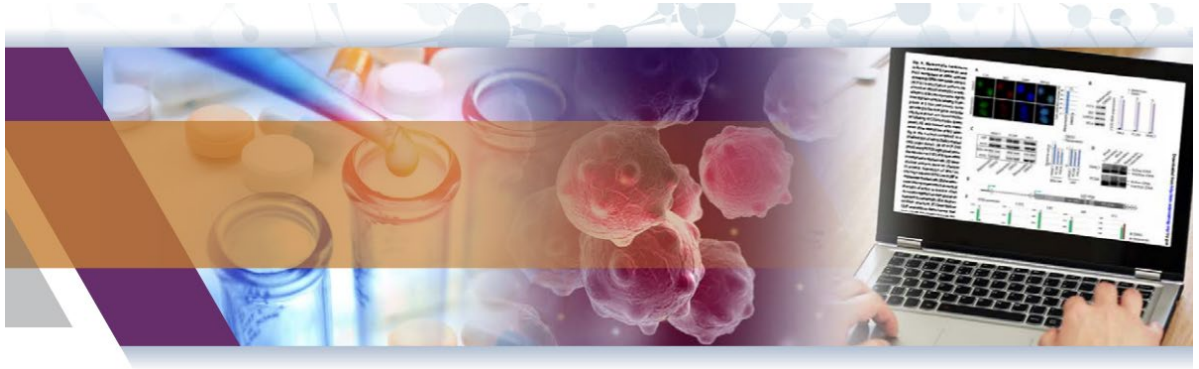
Short Online Courses in Translational Science for the Broad Scientific Community

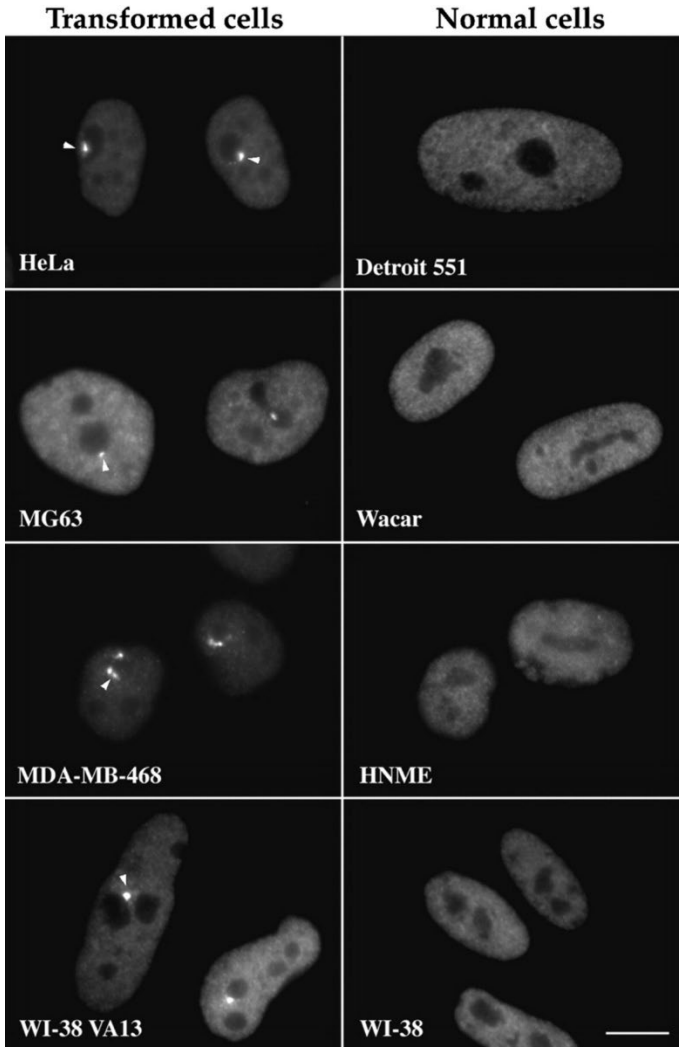


MEDI 501: Principles of Preclinical Translational Science
A CASE STUDY FROM CANCER DRUG DISCOVERY AND DEVELOPMENT

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

More info: https://ncats.nih.gov/training-education/resources

MEDI 501 Case Study: Metarrestin



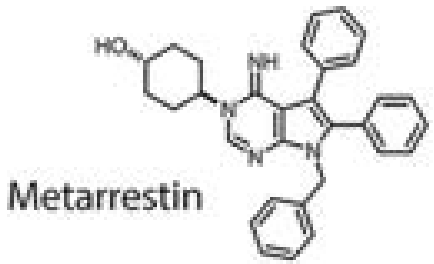
JCB

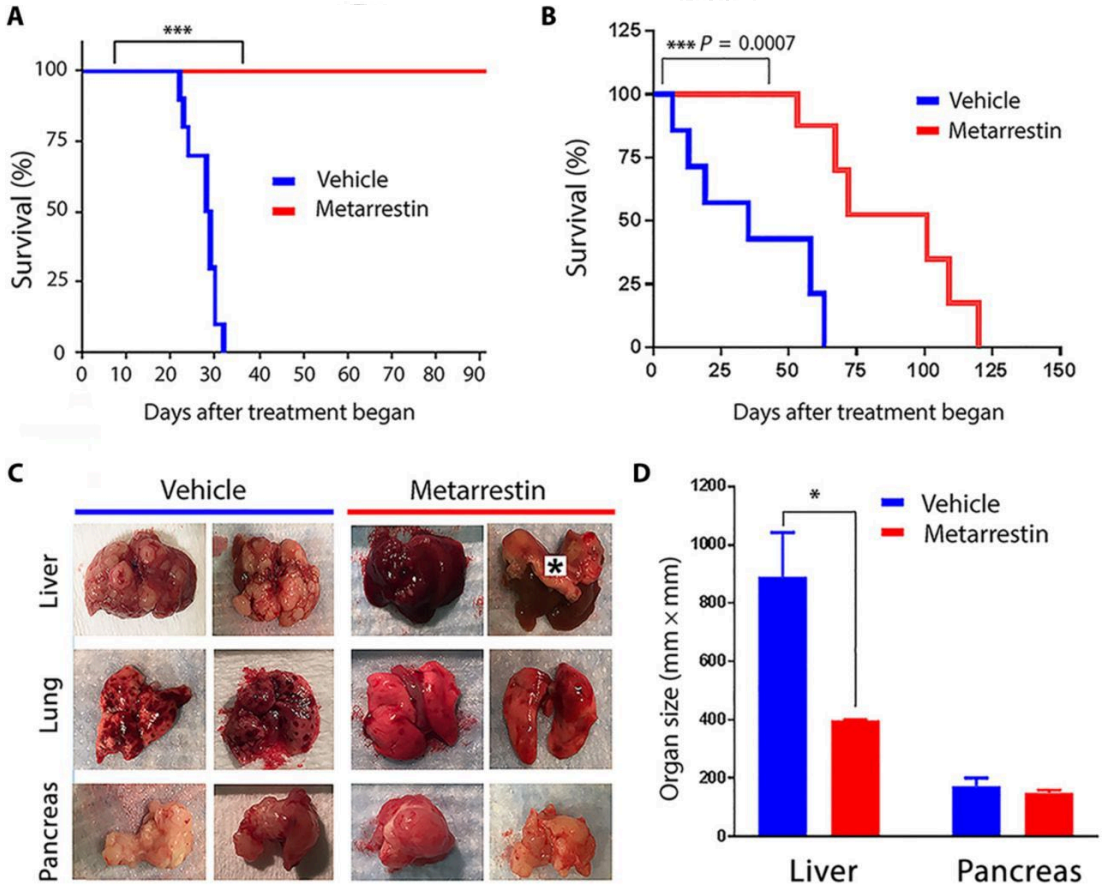
Sui Huang et al. J Cell Biol 1997;137:965-974

The PNC is predominantly present in human cancer cells.

TO

Metarrestin, a perinucleolar compartment inhibitor, effectively suppresses metastasis





Kevin J. Frankowski et al., Sci Transl Med 2018;10:eaap8307

Metarrestin: An NCATS Translational Partnership

Translational problem: 90% of cancer deaths are the consequence of metastatic spread, yet *there are no drugs developed to specifically inhibit metastasis*

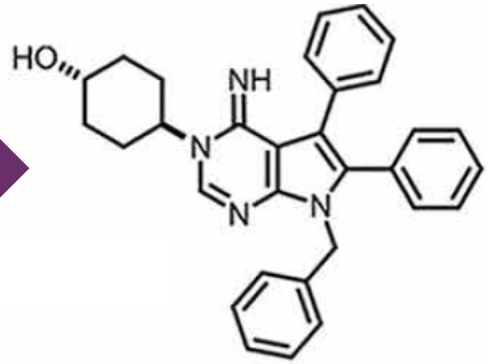
Collaboration established → Assay Dev & HTS → Medicinal chemistry → Preclinical evaluation

Kevin Frankowski
University of North Carolina

Sui Huang
Northwestern University

Frank Schoenen
Kansas University

Early Translation Branch
NCATS



ML246 / Metarrestin

Udo Rudloff
NCI

Therapeutic Development Branch
NCATS

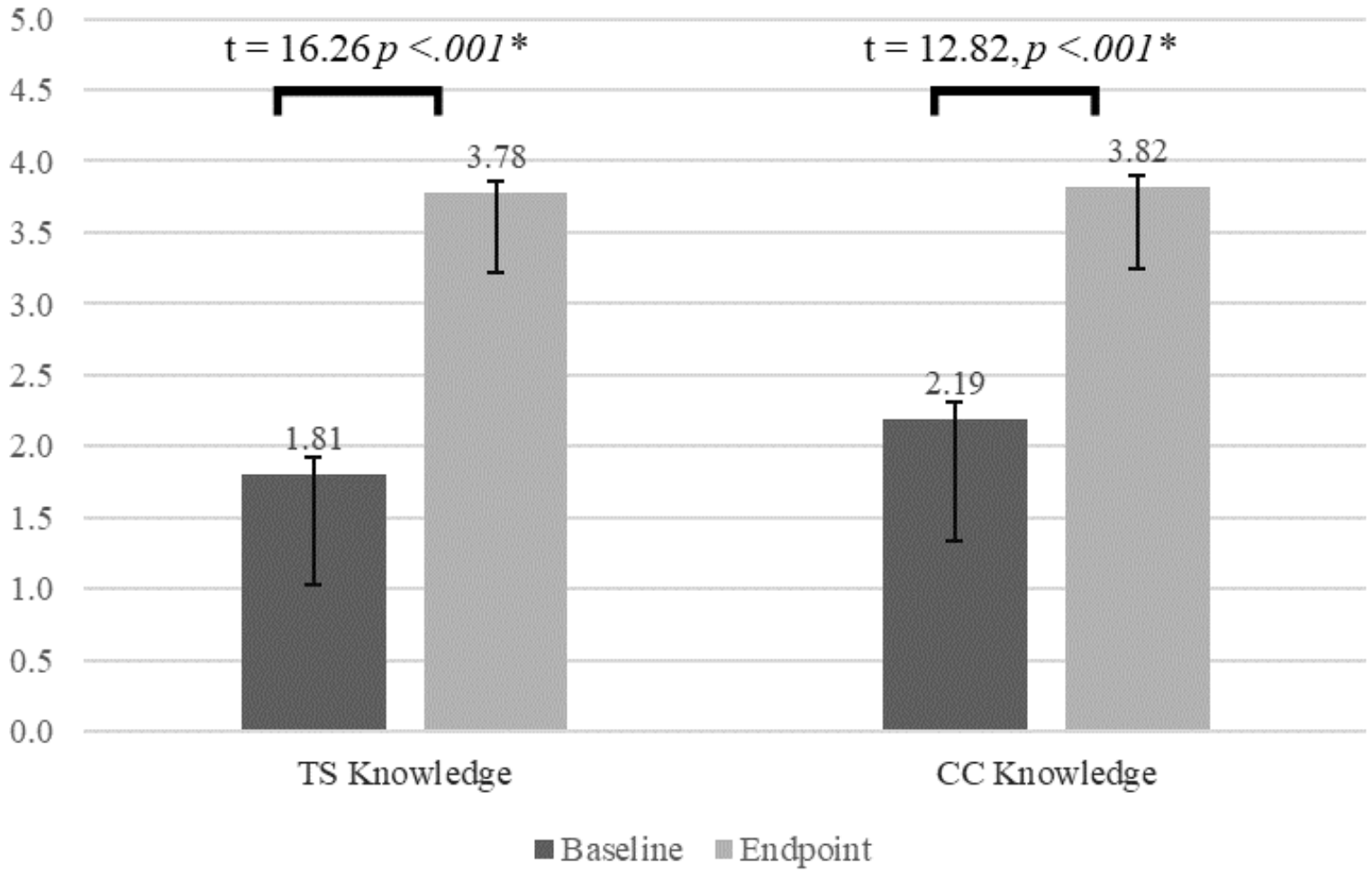
Frankowski KJ, Wang C, Patnaik S, et al. Metarrestin, a perinucleolar compartment inhibitor, effectively suppresses metastasis. *Sci Transl Med*. 2018;10(441):eaap8307. doi:10.1126/scitranslmed.aap8307

Teaching Approach -- Examples

	Creativity and Innovation	Team Science	Efficiency and Speed	Boundary Crossing Partnerships
CORE CASE STUDY – Scientific lectures by scientists who conducted the research	Phenotypic-based drug discovery approaches	Hand-offs and feedback loops between medicinal chemistry and toxicology	High Throughput Screening	Scientific contributions of multiple participating universities and NIH Institutes/Centers
OVERLAY – Added lectures aligned with TS Principles by outside experts	Enabling creativity in teams and organizations – *Industrial/Org. Psychologist*	Strategies for effective cross-disciplinary team interactions – *SciTS Scholar*	Project management Organizational environment – *Project Manager, Organizational Leaders*	Principles and Management of Intellectual Property – *Lawyer*

Statistically Significant Increases in TS Knowledge

Mean Change in Students' Translational Science Knowledge (TS), and Course Case Study Related Knowledge (CC), Results of Paired Sample T-Tests (n=48)



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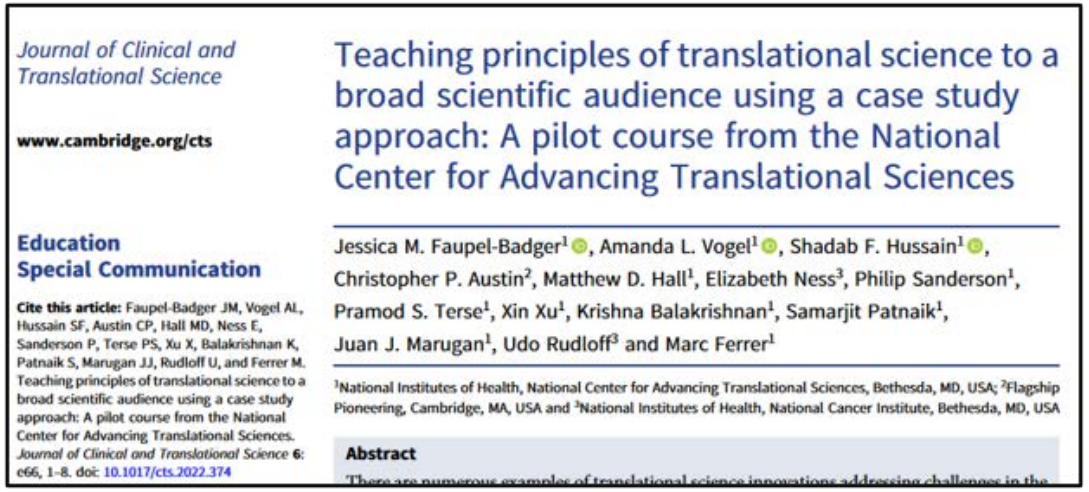
To Learn More



Journal of Clinical and Translational Science

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Education
Special Communication

Cite this article: Faupel-Badger JM, Vogel AL, Hussain SF, Austin CP, Hall MD, Ness E, Sanderson P, Terse PS, Xu X, Balakrishnan K, Patnaik S, Marugan JJ, Rudloff U, and Ferrer M. Teaching principles of translational science to a broad scientific audience using a case study approach: A pilot course from the National Center for Advancing Translational Sciences. *Journal of Clinical and Translational Science* **6**: e66, 1–8. doi: 10.1017/cts.2022.374

Teaching principles of translational science to a broad scientific audience using a case study approach: A pilot course from the National Center for Advancing Translational Sciences

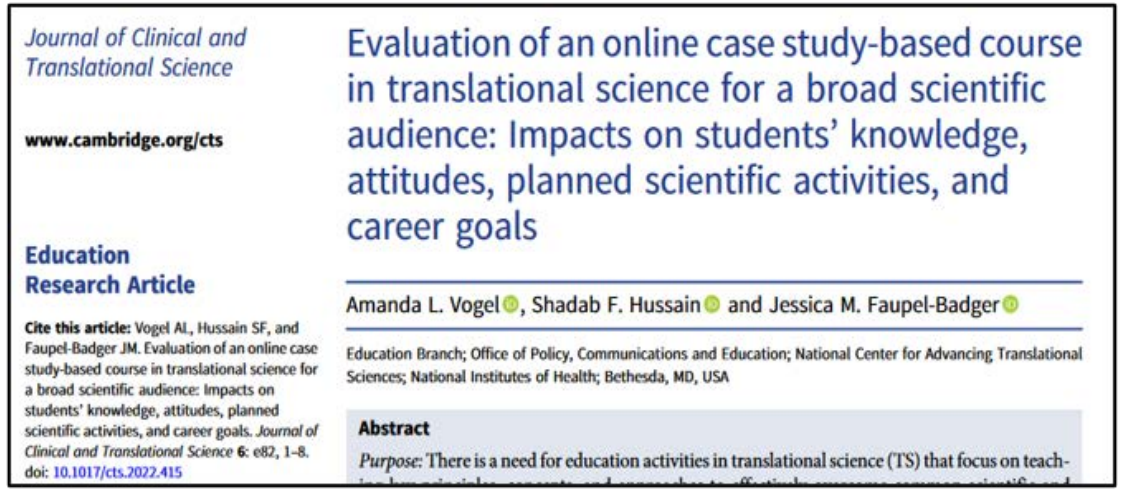
Jessica M. Faupel-Badger[1], Amanda L. Vogel[1], Shadab F. Hussain[1], Christopher P. Austin[2], Matthew D. Hall[1], Elizabeth Ness[3], Philip Sanderson[1], Pramod S. Terse[1], Xin Xu[1], Krishna Balakrishnan[1], Samarjit Patnaik[1], Juan J. Marugan[1], Udo Rudloff[3] and Marc Ferrer[1]

[1]National Institutes of Health, National Center for Advancing Translational Sciences, Bethesda, MD, USA; [2]Flagship Pioneering, Cambridge, MA, USA and [3]National Institutes of Health, National Cancer Institute, Bethesda, MD, USA

Abstract

There are numerous examples of translational science innovations addressing challenges in the

https://doi.org/10.1017/cts.2022.374



Journal of Clinical and Translational Science

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Education
Research Article

Cite this article: Vogel AL, Hussain SF, and Faupel-Badger JM. Evaluation of an online case study-based course in translational science for a broad scientific audience: Impacts on students' knowledge, attitudes, planned scientific activities, and career goals. *Journal of Clinical and Translational Science* **6**: e82, 1–8. doi: 10.1017/cts.2022.415

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Abstract

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https://doi:10.1017/cts.2022.415

Forthcoming:

Evaluating Translational Science Knowledge Gains Among Diverse Learners in an Online Course

Vogel AL, Hussain SF, and Faupel-Badger JM

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Applying the NCATS TS Principles to Understand the TS Education and Training Landscape

CTS Clinical and Translational Science
Open Access

SYSTEMATIC REVIEW | Open Access

Areas of strength and opportunities for growth in translational science education and training: Results of a scoping review from the NCATS Education Branch

Amanda L. Vogel, Brittany M. Haynes, Shadab F. Hussain, Lameese D. Akacem, Marcus G. Hodges, Josh A. Duberman, Gisela Butera, Jessica M. Faupel-Badger

First published: 02 August 2023 | https://doi.org/10.1111/cts.13570

https://ascpt.onlinelibrary.wiley.com/doi/full/10.1111/cts.13570

CTSA News

September 27, 2023

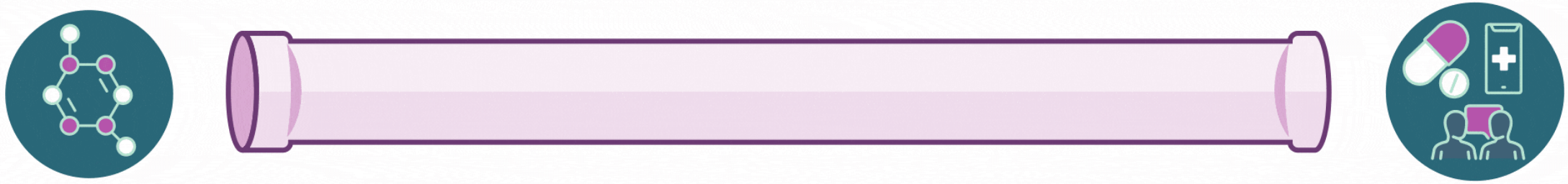
Literature Review Shines a Light on CTSA Leadership in Translational Science Education and Training

https://ccos-cc.ctsa.io/news/Literature-Review-Shines-a-Light

National Center for Advancing Translational Sciences

Scoping Review of the Peer Review Literature

What is the state of translational science education and training, nationally, that aligns with NCATS' understanding of Translational Science?



- **Very specific focus:** Articles on education and training with a stated aim of conveying content **relevant to accelerating progress along the translational pipeline,** from biomedical research to health solutions

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Scoping Review of the Peer Review Literature

- **Databases searched:** ERIC, Embase, PubMed, WoS
- **Articles screened:** 1,016
- **44 Included Articles:** English language, peer reviewed articles, 2005-2021, and either….
  - **29 described the curriculum** of past/current E&T opportunities with our specific focus
  - **15 offered recommendations** for E&T opportunities with this focus
- **Analysis framed around learning more about what colleagues in the field are doing:**
  - What strategies and approaches are being taught, to whom, and using what teaching modalities?
  - What stages of the translational continuum are addressed? And what fields and disciplines are involved?
  - What evaluation approaches are being used, and what have they found?
  - What do leaders in the field recommend for each of the above?

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Included Articles: Some Points of Interest

- **CTSAs are Leading this Work**
  - Over three-quarters (*n*=34, 77%) of included articles had one or more authors affiliated with a CTSA supported institution

- **Translational Science Lens is being Applied Broadly**
  - A third of articles (*n* = 15; 34%) focused on incorporating TS content into education and training on specific research topics, disciplines, or fields
    - E.g., Health Disparities; Regenerative Medicine; Behavioral Science; Informatics; Precision Medicine

  - Half of the articles (n=22, 50%) framed translational science strategies and approaches as generalizable to the full translational spectrum, from T0- T4

  - Half focused on particular phases, T0-T4, with a strong focus on preclinical and clinical research and the transition between them

Translational Science

Translational Science is the field that generates scientific and operational innovations that overcome longstanding challenges along the translational research pipeline.

Prioritize initiatives that address unmet needs

Produce crosscutting solutions for common and persistent challenges

Emphasize creativity and innovation

Leverage cross-disciplinary team science

Enhance the efficiency and speed of translational research

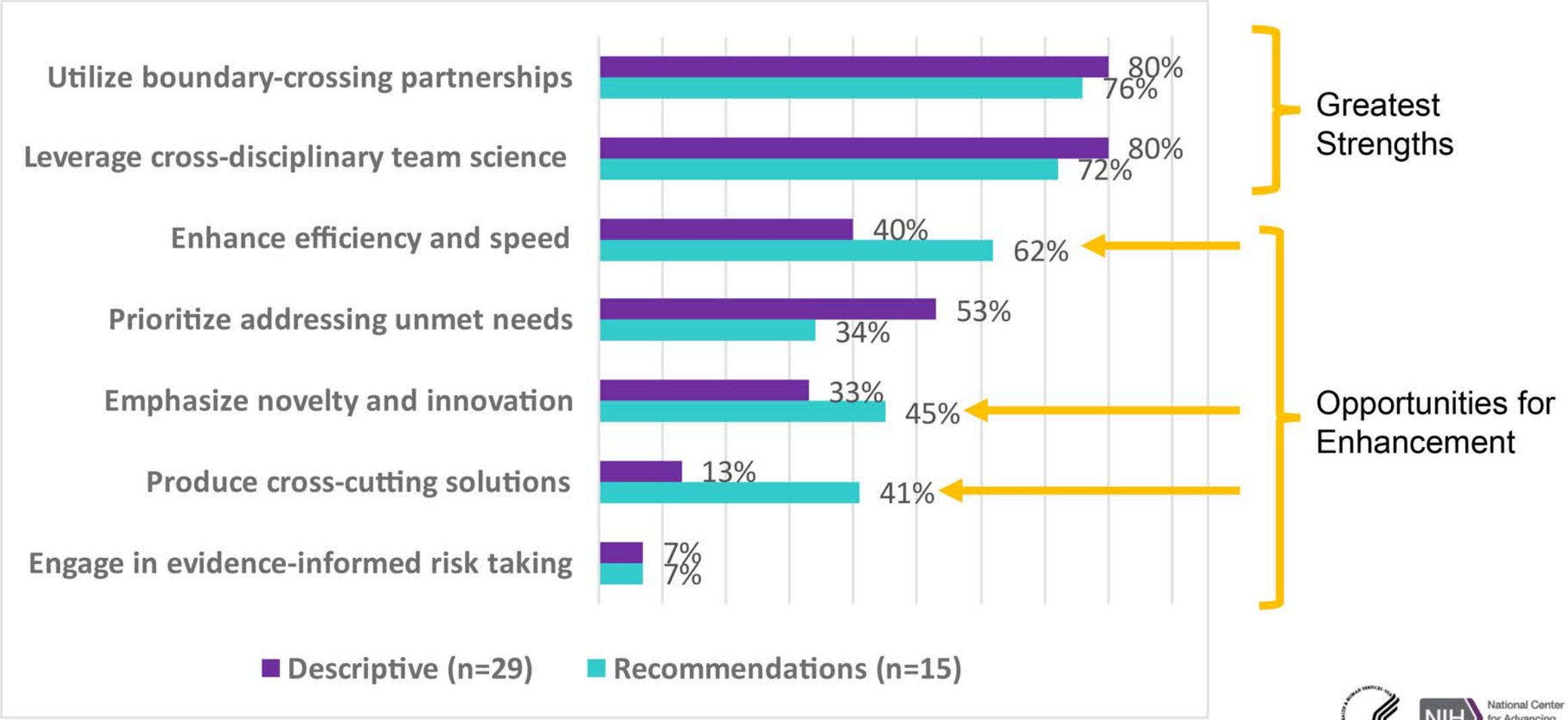
Utilize boundary-crossing partnerships

Use bold and rigorous research approaches

Advance diversity, equity, inclusion and accessibility in research

Detailed descriptions: https://ncats.nih.gov/training-education/translational-science-principles

Representation of TS Principles in all 44 Articles



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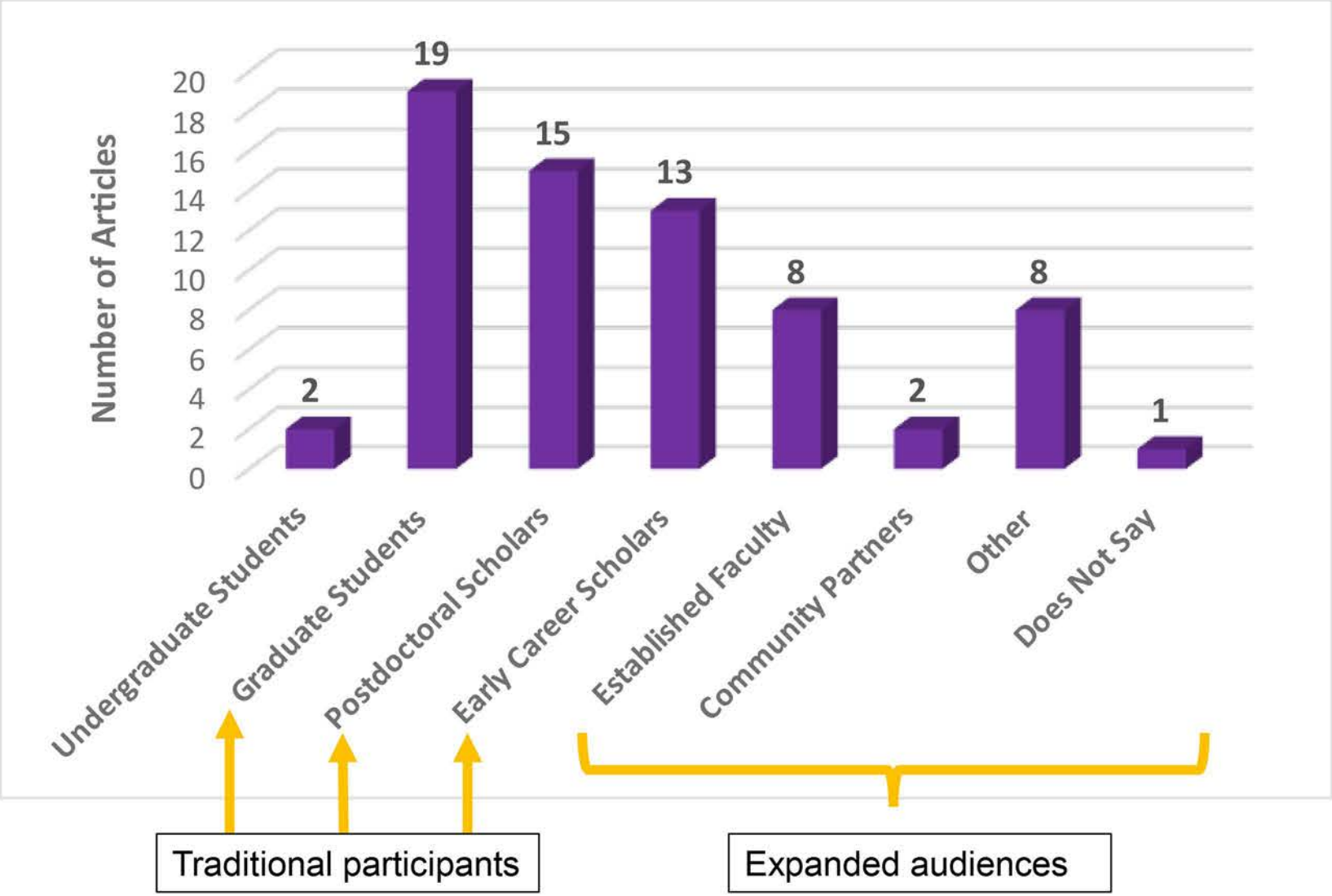
Participants, Described E&T Opportunities



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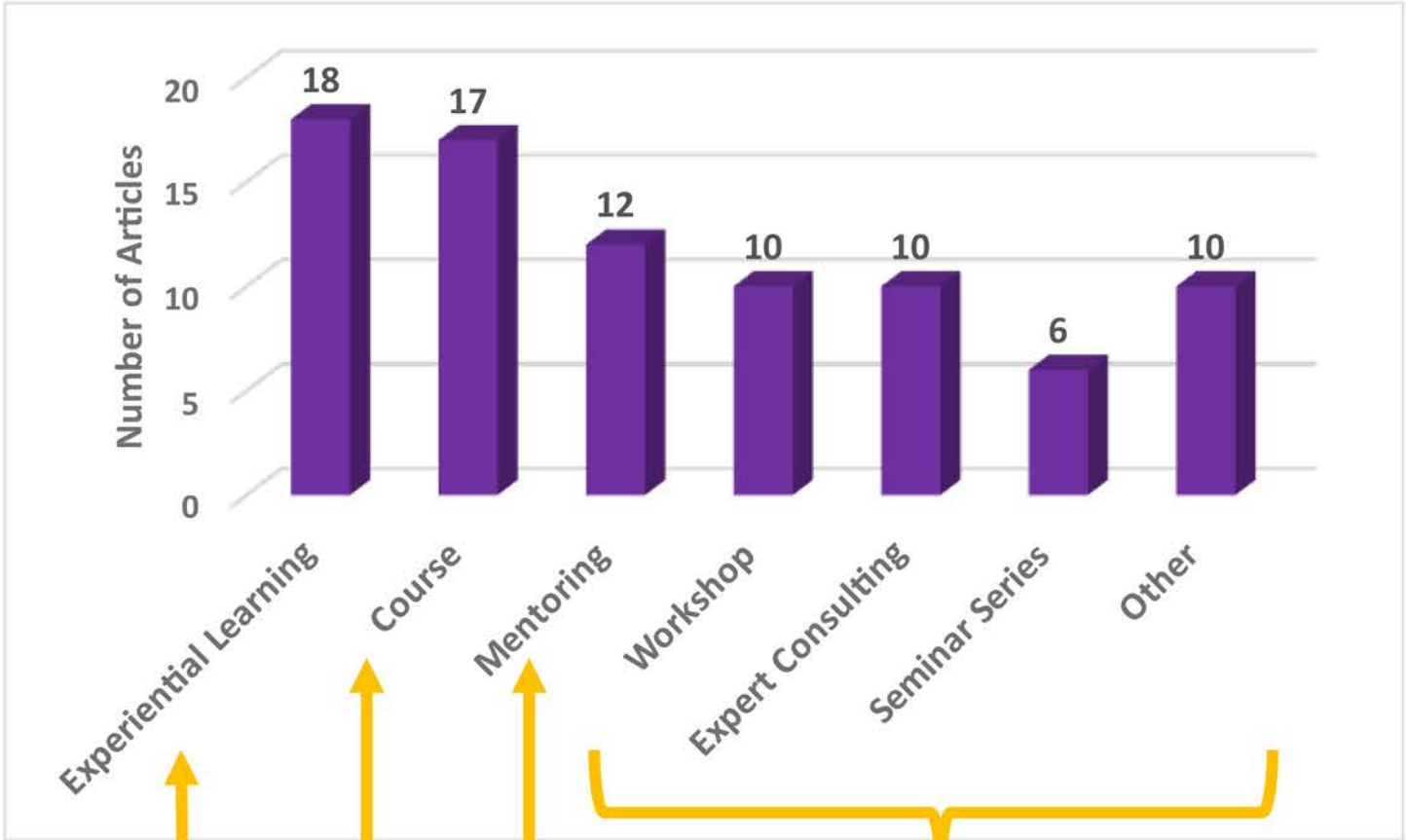
Teaching Modalities, Described E&T Opportunities



Core approaches for developing the translational workforce

Opportunities to expand access to more diverse participants, across training stages, and roles in the translational ecosystem

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Key Take-aways from the Literature Review

- Highlights the **leadership role of the CTSA community** in advancing education and training that aligns with NCATS' focus on advancing translational progress
- **Article provides a resource for continued development of TS education and training:**
  - Points to current strengths and opportunities for future growth
  - Provides references/models for education and training both in areas of strength, and less-represented content areas, participants, and teaching modalities that nonetheless align with NCATS' focus on TS and goal to expand and diversify the TS workforce
- **Limitations:** We recognize there is limited literature in this area; there is a need for more dissemination and varied approaches to dissemination

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Summary

- Background on the NCATS Education Branch
- The NCATS Translational Science Principles
  - Why and how they were generated
- Applications to TS Education
  - NCATS Education Branch Courses
  - Review of the Literature
- Discussion