



Pratt MSCI

Exploring Transdisciplinary Approaches to STEM Teaching and Learning

Chris Jensen, Heather Lewis, & Mark Rosin

Pratt Institute, Brooklyn, NY

June 17th, 2024

Transdisciplinarity at Pratt



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Sustainability



“Coming together of two (or more) nominally different disciplines to create something greater than the sum of the parts”



Applied Technology

Gallery exhibition photos by Draven Zhao

Professor Christopher Jensen
cjensen@pratt.edu
<http://www.christopherxjjensen.com/>

Transdisciplinary Epistemic Practices



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Noticing & questioning

Exploring materiality

Defining the problem space

Producing tentative representations

Conducting principled iterations

Engaging multiple modalities and materials

Finding relevance

Critical engagement

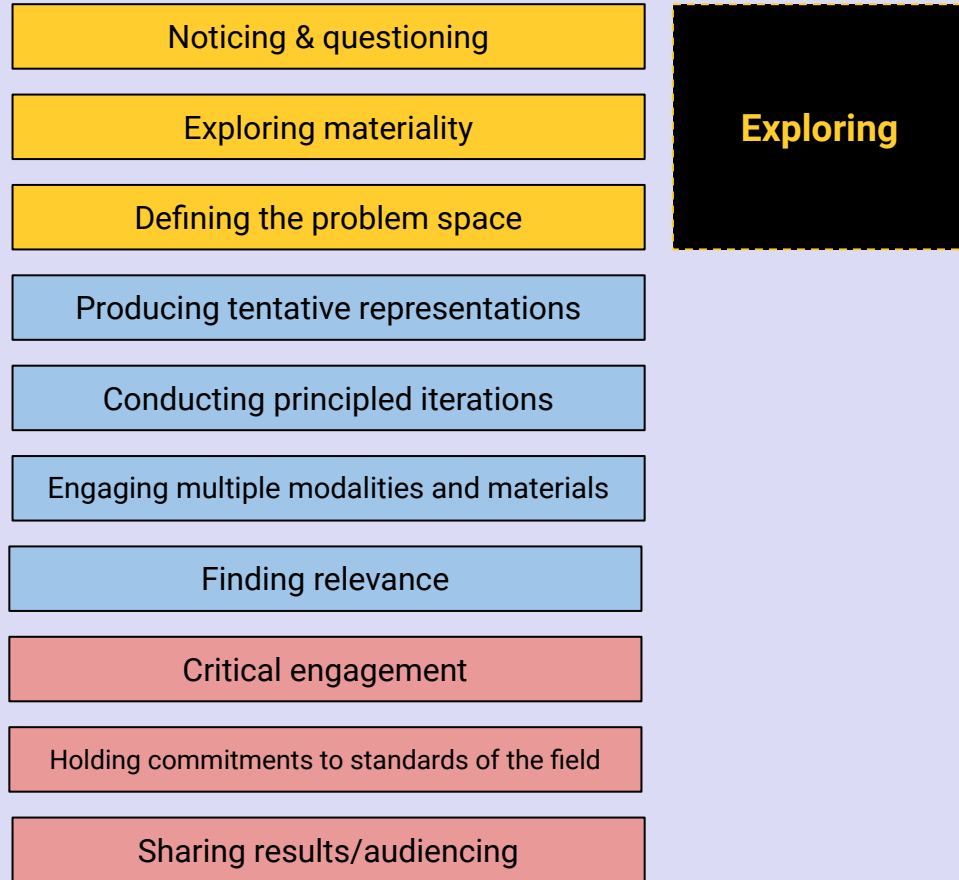
Holding commitments to standards of the field

Sharing results/audiencing

Transdisciplinary Epistemic Practices



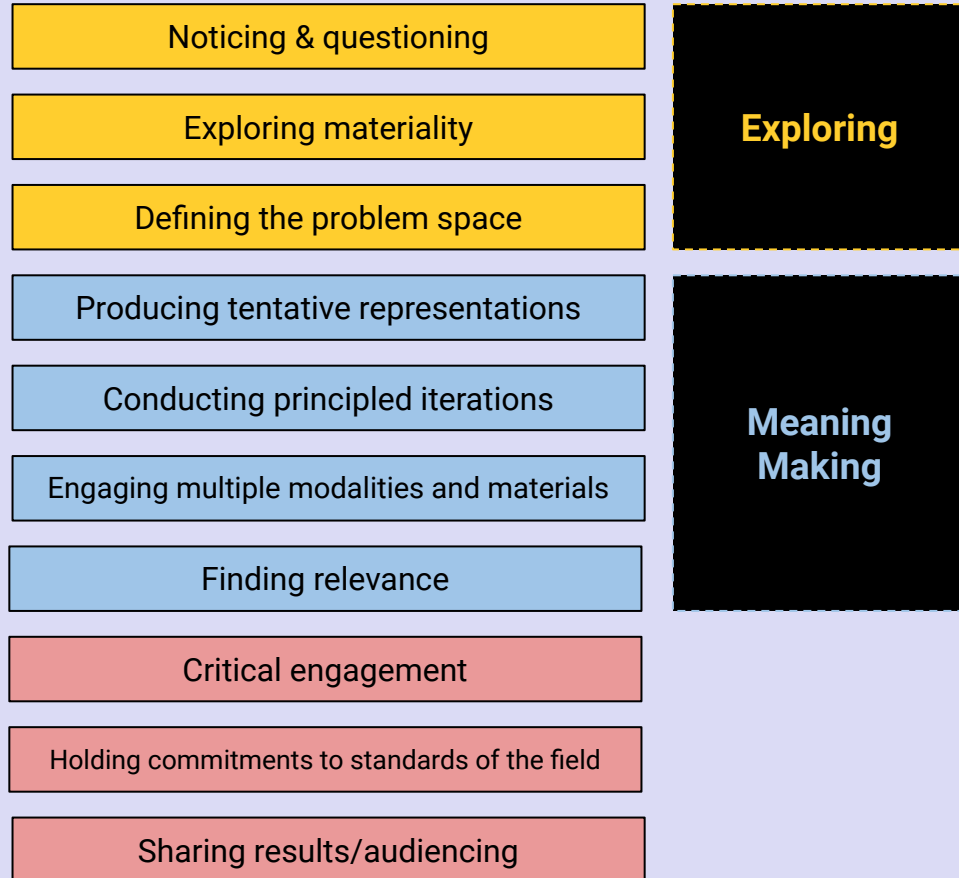
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Transdisciplinary Epistemic Practices



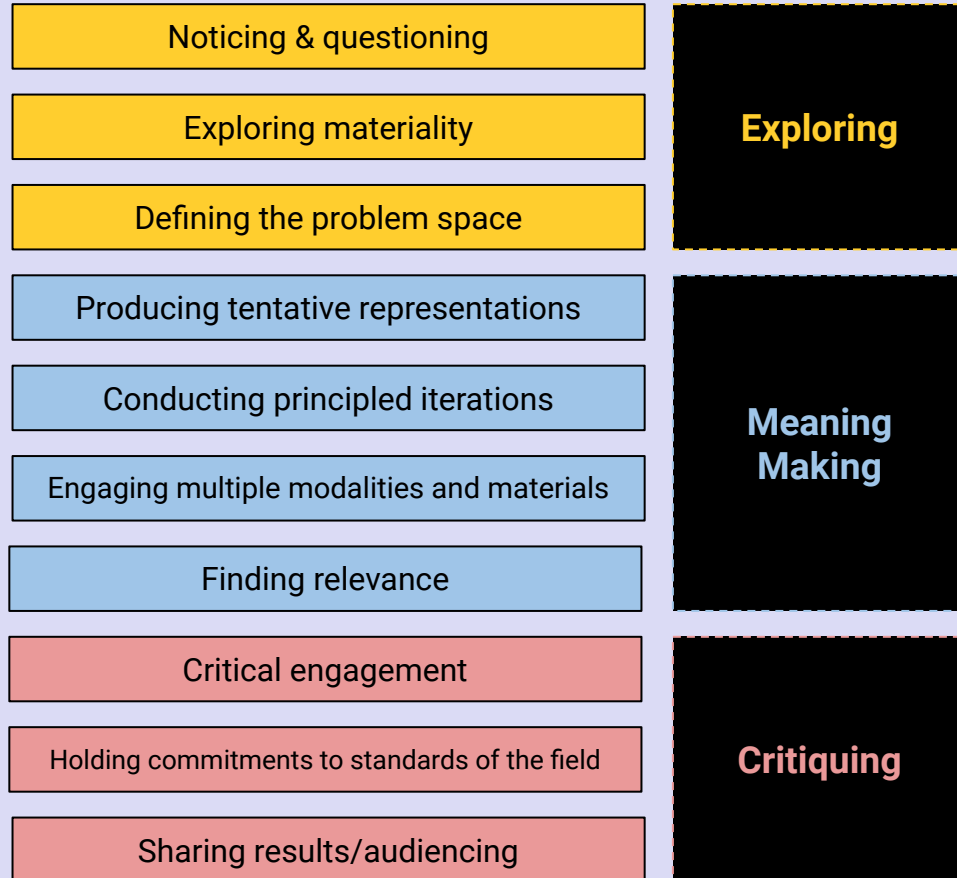
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Transdisciplinary Epistemic Practices



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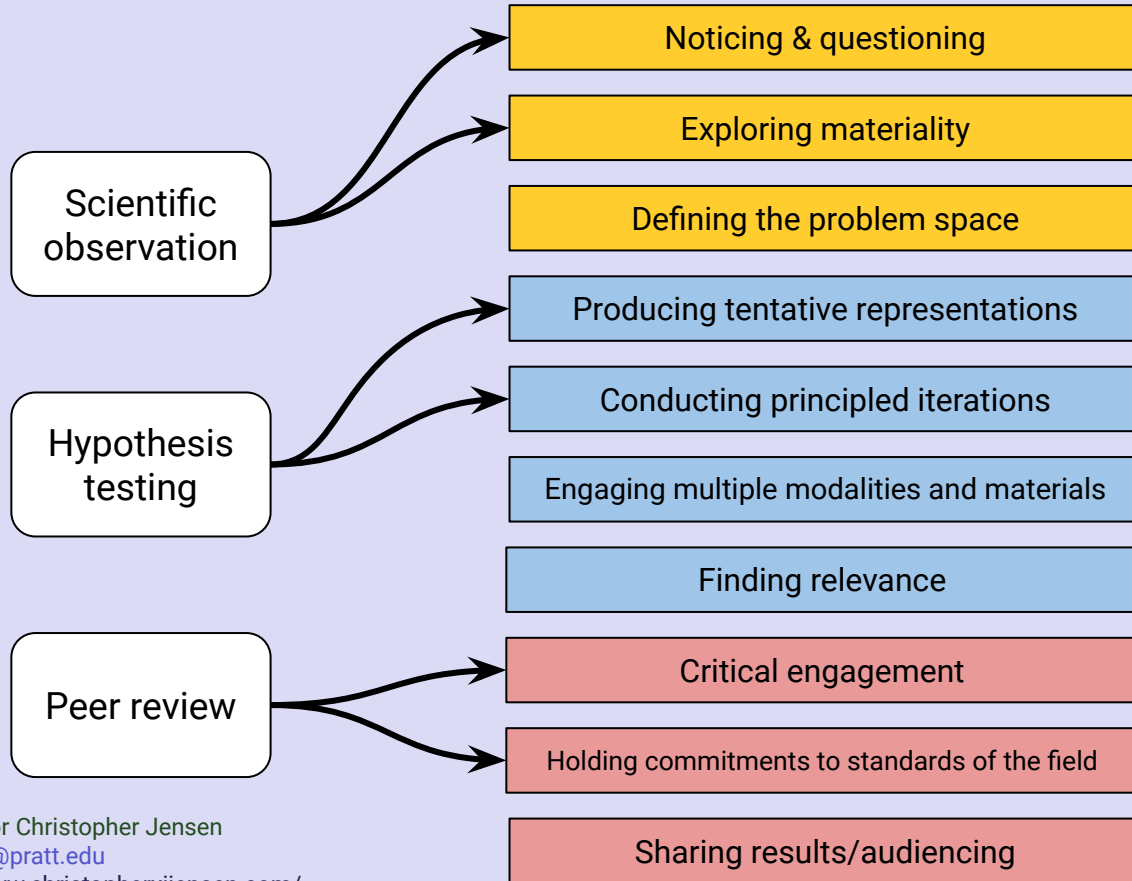


Transdisciplinary Epistemic Practices



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STEM practices

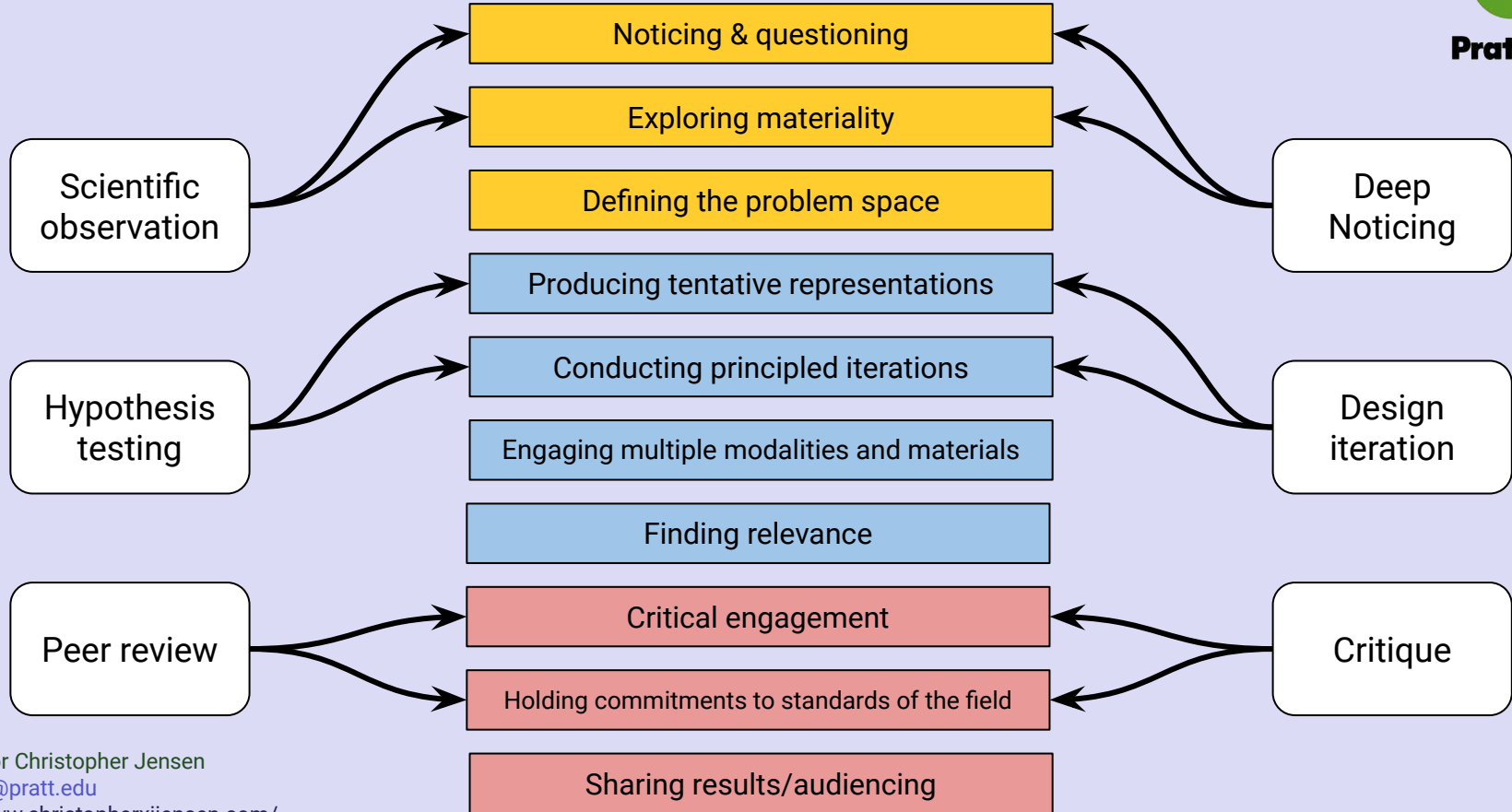


Transdisciplinary Epistemic Practices



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STEM practices



Art & Design practices

Faculty Learning Communities (FLCs) at Pratt



Pratt MSCI



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Since 2016, Pratt has been using 1-3 year FLCs to advance pedagogical exploration

Scholarship of Teaching & Learning (SoTL) at Pratt



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"Action Research"

CENTER FOR TEACHING AND LEARNING AT PRATT INSTITUTE
PRESENTS

09/22 FALL FORUM 2023 2023

Friday, September 22nd:
8:30am - 4:30pm
in the Pratt Library
and asynchronously online

TEACHING NOW

How have you and your students changed in the context of this changing world?

What might be different about your teaching practices and pedagogies?

What have you tried? What has worked and what has failed?

What did you learn from the failures? And how can we look at failures from the past to offer us answers in the now?

What kinds of opportunities have shown up in our classrooms and studios now that differ from learning experiences in the past?

How do we hold space for the trauma of the pandemic for faculty and staff along with students?

The Fall Forum gathers the Pratt Community, and communities and partners beyond the gates as co-facilitators/co-presenters. Teams and collaborators will collectively investigate:

What does it mean to be an educator in 2023? In this urgent moment, the topic for the 2023 Fall Forum centers around the theme of the 'Now.' Join Pratt colleagues for interactive dialogues, workshops, and inquisitive open sessions to collectively understand our varied experiences of the "Now."

Pratt **ctl**

FOR MORE INFORMATION
visit <https://prattctl.com/2023-fall-forum-teaching-now/>

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PEDAGOGIES OF REPARATION AND REBUILDING

2021 FALL FORUM ON TEACHING AND LEARNING

A COLLABORATION WITH PRATT CENTER FOR TEACHING & LEARNING AND PROJECT THIRD (P3), FINE ARTS: DECOLONIAL ART PEDAGOGIES

We are delighted to invite you to the 2021 Fall Forum: Pedagogies of Reparation and Rebuilding. This joint event between the Center for Teaching and Learning (CTL) and Project Third (P3), Fine Arts: Decolonial Art Pedagogies, will focus on presenting several ongoing collaborative initiatives – currently underway within Pratt – that consider repairing and rebuilding learning environments, institutional structures and social politics through the lenses of race, ethnicity, class, sexuality, gender, and disability.

Friday September 24
9am – 4:30pm EDT

Saturday September 25
10am – 12:30pm EDT

Please register in advance

SEPTEMBER 24 & 25
VIA ZOOM

Pratt

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Inquiries in Teaching Art and Design

Issue 4, Fall 2024

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Inquiries in Teaching Art and Design

Issue 3, Fall 2023

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Our Transdisciplinary Epistemic Practices FLC



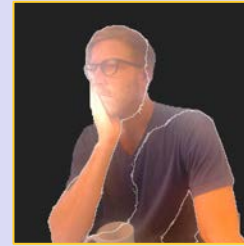
Ashley Bales
Math & Science



Leanne Bowler
Information Science



Robert Brackett
Architecture



Blake Marques
Carrington
Digital Arts



Rafael De Balanzo
Math & Science



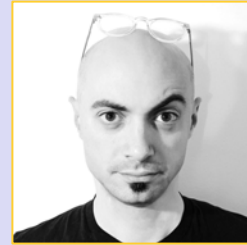
Gina Gregorio
Fashion Design



Zat Jamil
*Social Sciences &
Cultural Studies*



Jeanne Pfordresher
Industrial Design



Jonathan Scelsa
Architecture



Sophia Sobers
Digital Arts

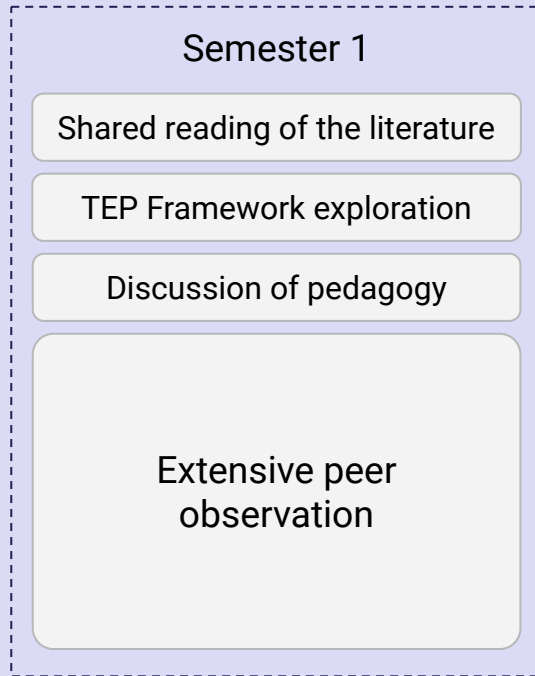


Keena Suh
Interior Design

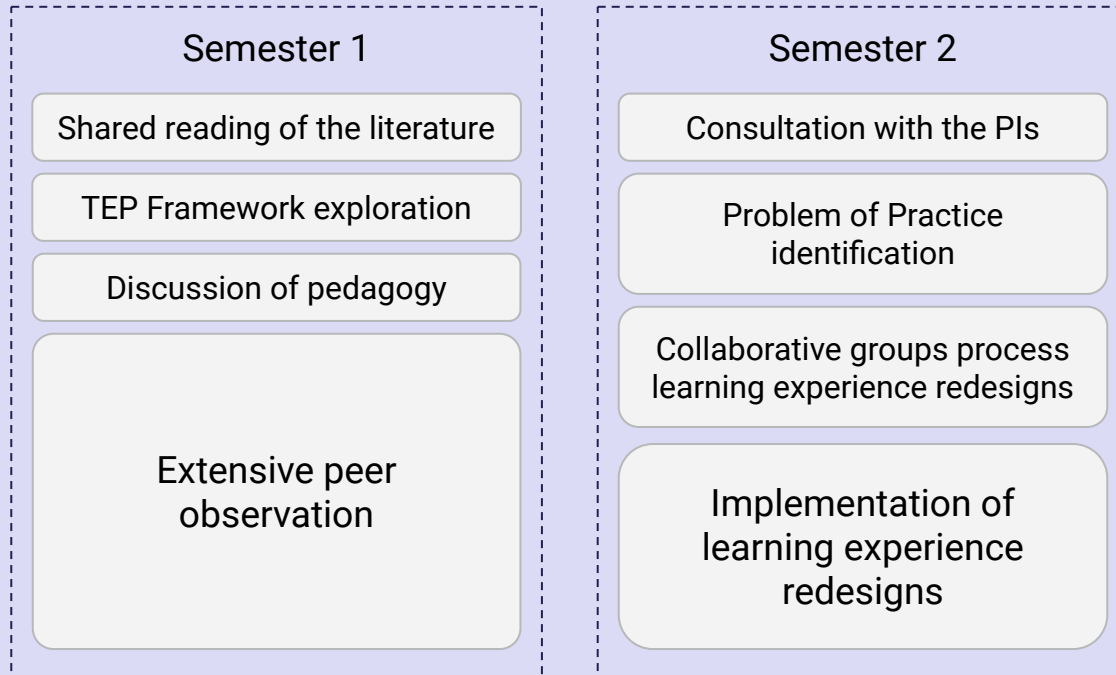
An FLC designed to explore the use of TEPs in SoTL



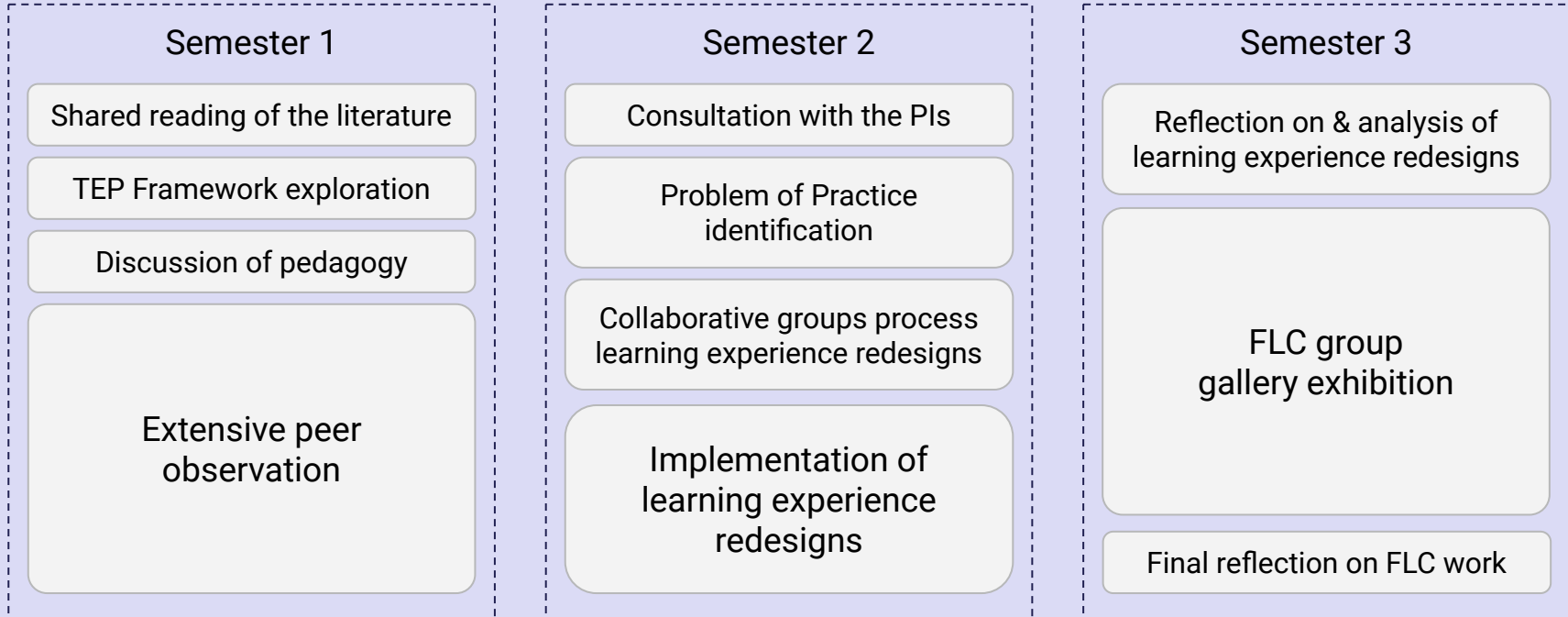
An FLC designed to explore the use of TEPs in SoTL



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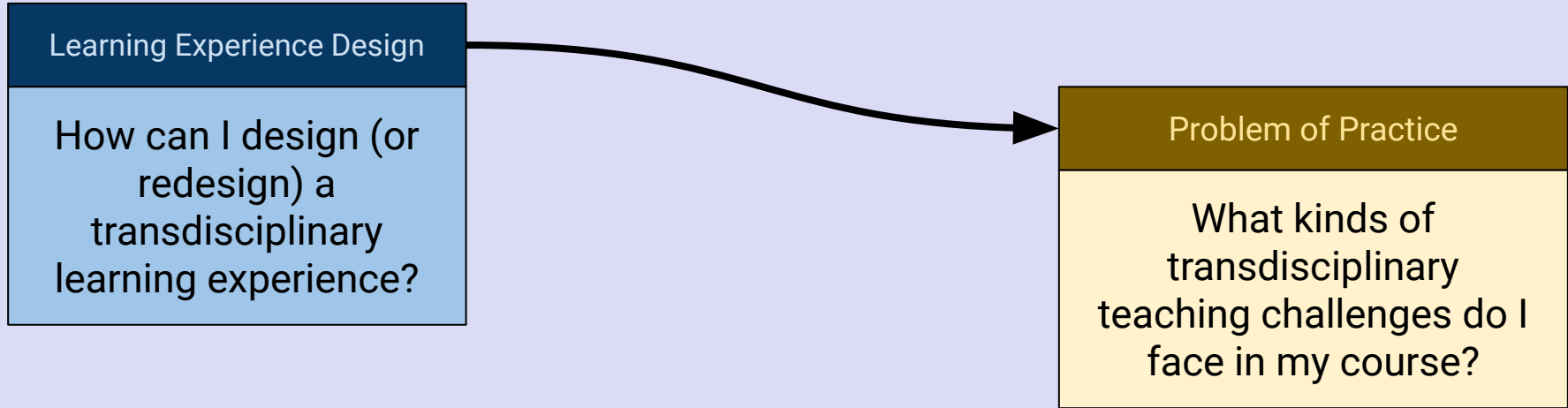


FLC projects and the TEP framework

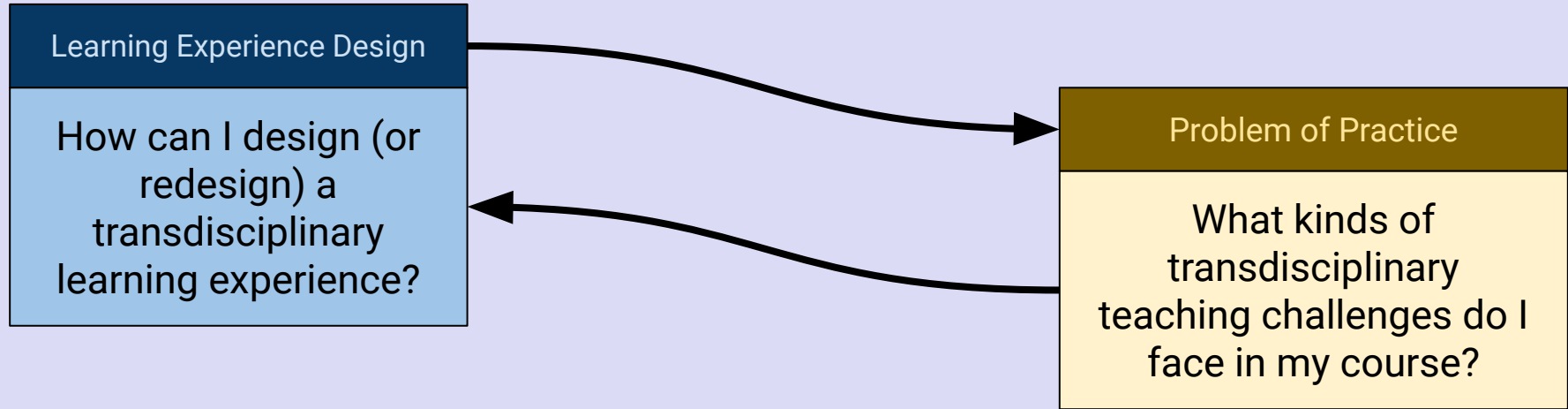
Learning Experience Design

How can I design (or redesign) a transdisciplinary learning experience?

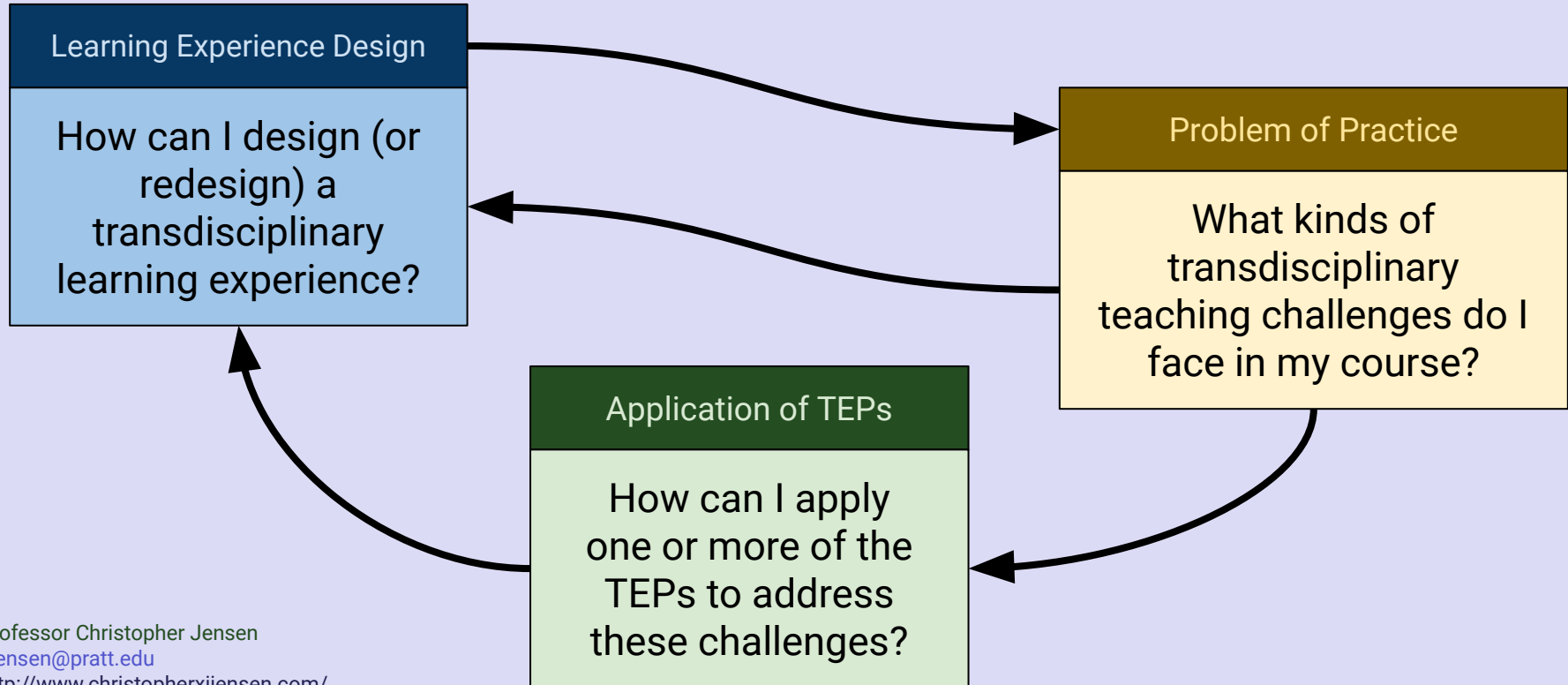
FLC projects and the TEP framework



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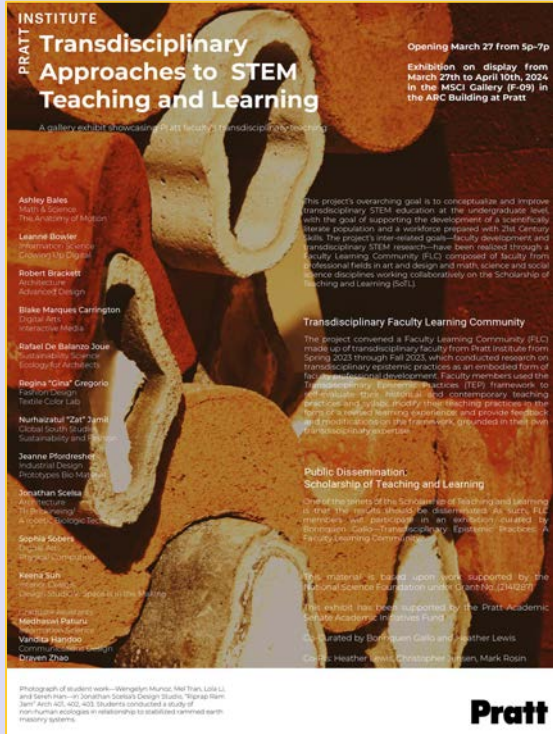




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Sharing SoTL work through a gallery exhibition

Our 11 FLC members each mapped their use of the *Transdisciplinary Epistemic Practices* onto their pedagogical inquiry projects



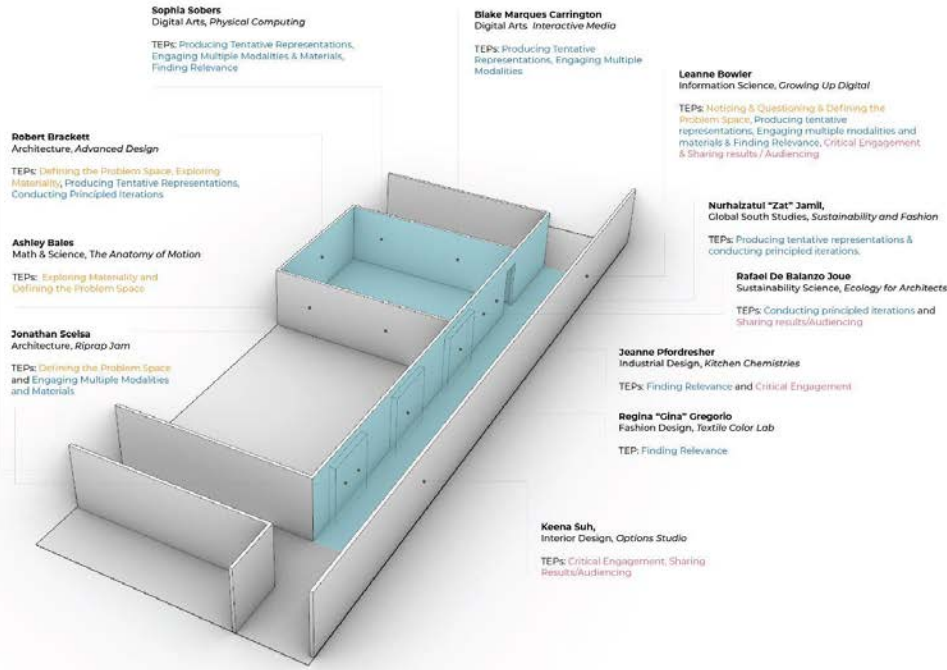
Gallery exhibition poster by Vandita Handoo

Professor Christopher Jensen
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Gallery opening photo by Chris Jensen 20

Applied Transdisciplinary Epistemic Practices: Wrestling with Problems of Practice

The eleven members of the Transdisciplinary Epistemic Practices Faculty Learning Community modified existing courses through a dynamic curriculum redesign process that integrated one or more of the following Transdisciplinary Epistemic Practices (TEPs).



MSCI Gallery (F-09), ARC Building, Pratt

This material is based upon work supported by the National Science Foundation under Grant No. (2141287).

Meaning Making

Producing tentative representations	Visualize and understand phenomena conceptually, and from there, to extrapolate to new situations
Conducting Principles Iterations	Construct and compare the results of multiple varied solutions to a task or problem, using well defined variational criteria
Engaging multiple modalities and materials	Develop capacity to engage with, and make informed connections among multiple modalities and materials
Finding Relevance	Contextualize work within the frames of social values (historical and contemporary) and personal values

Critiquing

Sharing results/ "Audencing"	Sharing findings/ work through verbal, visual, or textual discourse
Holding commitments to standards of the field	Adhering to the standards and practices of the field
Critical Engagement	Providing feedback and promoting dialogic communication based on evidence, and leveraging a diversity of perspectives

Exploring

Defining the Problem Space	Asking well formulated questions that can be addressed either empirically, non-empirically, or through a well defined combination of both
Exploring Materiality	Explore models of the world and its structure, to explain and/or inspire further inquiry
Noticing and Questioning	Careful observation and looking more closely at the world, and thereby identifying (well defined) questions that need to be explored or features that otherwise might not be seen



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Gallery schematic by Vandita Handoo



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PRATT INSTITUTE
Transdisciplinary Approaches to STEM Teaching and Learning
 Opening March 27 from 10-5p
 Exhibition on display from March 27 to April 10, 2024 in the 4th floor gallery of Pratt in the city, featuring a multi-media approach to learning and teaching.

Transdisciplinary Faculty Learning Community
 The group convened a Faculty Learning Community (FLC) to explore transdisciplinary approaches to teaching and learning. The FLC members, including faculty from Pratt's various schools, met regularly to discuss and share best practices in teaching and learning across disciplines.

Public Engagement: Significance of Teaching and Learning
 The FLC members also explored the significance of teaching and learning in the public sphere. They discussed the role of educators in shaping the future and the importance of fostering a love of learning in all students.

Faculty Members:
 Arjun Bose, David C. Johnson, Leland Brown, Robert Weaver, Blake Marlene Carlsberg, Daniel De Robertis, Joseph D. Crippen, Nathaniel "Pat" Lane, Jessica Phelan, Christopher Pappas, Jonathan S. Spector, and David S. Spector.

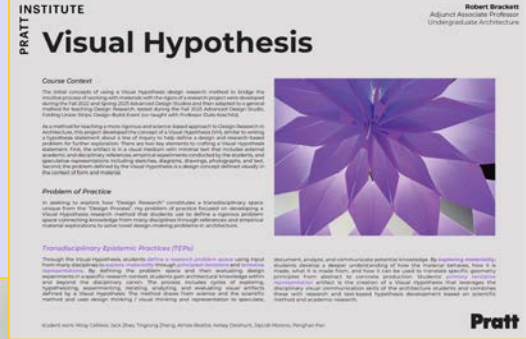
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Problem of Practice:
Developing a “visual hypothesis” research method
connecting knowledge from
many disciplines

Exploring the implementation of visual hypotheses

Exploring materiality

Defining the
problem space



INSTITUTE
PRATT **Visual Hypothesis**

Robert Brackett
Adjunct Associate Professor
Undergraduate Architecture

Course Context

The initial context of using a Visual Hypothesis design research method to bridge the architectural and engineering disciplines was developed during the Fall 2023 Advanced Design Studio. Following the Fall 2023 design studio course through and beyond the design studio.

Problem of Practice

An intention to bridge a more rigorous and systemic design approach to design research in Architecture, the project developed the concept of Visual Hypothesis, which is a research method that allows for the exploration of a problem space through a series of iterative and principled iterations. There are two key elements to defining a visual hypothesis: a problem of practice and a transdisciplinary epistemic practice (TEP). The problem of practice is a specific problem or challenge that is defined by the practice and represents a transdisciplinary, multi-disciplinary, or interdisciplinary design problem. The TEP is a method for exploring a problem space through a series of iterative and principled iterations.

Transdisciplinary Epistemic Practice (TEP)

Through the Visual Hypothesis, students derive a common problem space using digital fabrication, analysis, and computational potential knowledge. By exploring materiality, students develop a shared problem space of the visual hypothesis, which is a method to explore a problem space through a series of iterative and principled iterations. The problem of practice is a specific problem or challenge that is defined by the practice and represents a transdisciplinary, multi-disciplinary, or interdisciplinary design problem. The TEP is a method for exploring a problem space through a series of iterative and principled iterations.

Robert Brackett, Adjunct Associate Professor, Undergraduate Architecture

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Producing tentative
representations

Conducting
principled iterations

FLC member Robert Brackett

Gallery exhibition photos by Draven Zhao

Experiment with bio-polymers to
at bioplastics from renewable sources.
materials like gelatin, chitosan, agar

Problem of Practice:
**Conducting materials science
research that can lead to
actionable results in
sustainable design**

Thinking critically about what matters in materials research



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Alcohol Extract
Turmeric

Thai Tea + MISC



Finding relevance

INSTITUTE
Pratt **Kitchen Chemistries**
Jeanne Pfordresher
Assistant Professor
Industrial Design

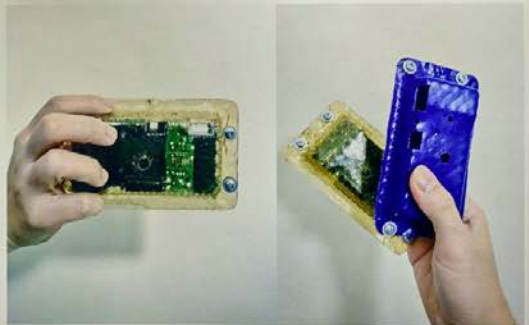
Course Content
This course will provide students with accessible, hands-on material science experiments that explore the relationship between material science and design. Students will learn how to use material science to solve design problems and how to use design to solve material science problems. The course will also explore the relationship between material science and design in the context of sustainable design.

Research Findings
Students will discover the student understanding of the subject and create an environment where they learn more critical of their research, which helps them manage the experimental process. They will learn how to use material science to solve design problems and how to use design to solve material science problems. The course will also explore the relationship between material science and design in the context of sustainable design.

Problem of Practice
The challenge of bringing a research project into a design studio is a complex one. It requires a deep understanding of the material science and design process, as well as the ability to communicate this information to a non-scientific audience. The course will explore the relationship between material science and design in the context of sustainable design.

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Critical engagement



Ben Thanat Somwong



located in Germany,
France and India

Drying

Packaging

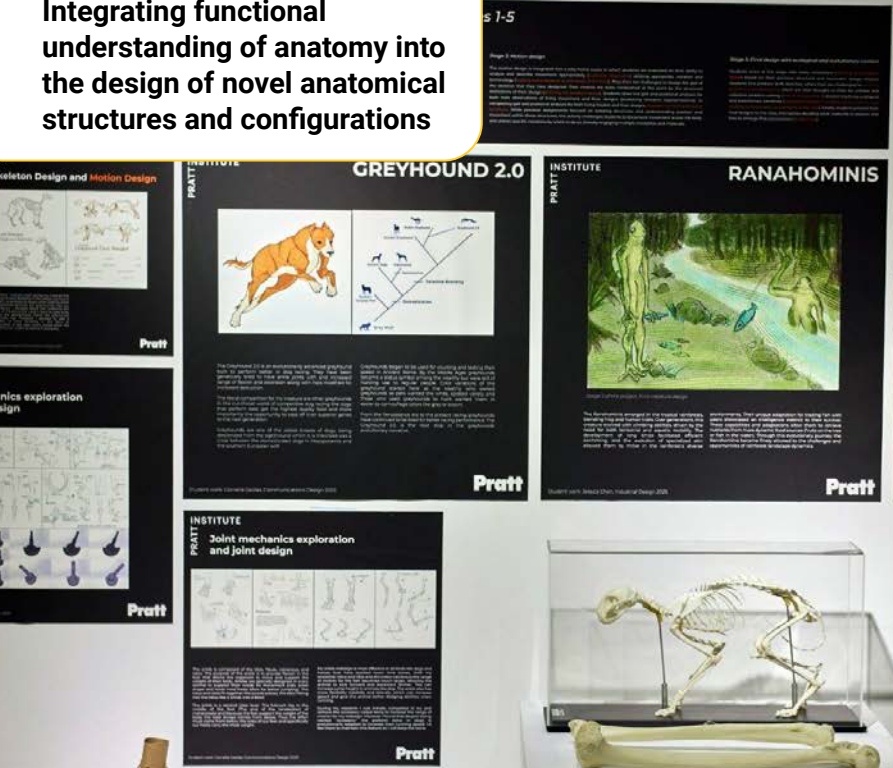
Japan as the largest
exporter of material

FLC member **Jeanne Pfordresher**

Gallery exhibition photos by Draven Zhao

Problem of Practice:
Integrating functional understanding of anatomy into the design of novel anatomical structures and configurations

Creating a believable make-believe creature



Exploring materiality



Defining the problem space



FLC member Ashley Bales

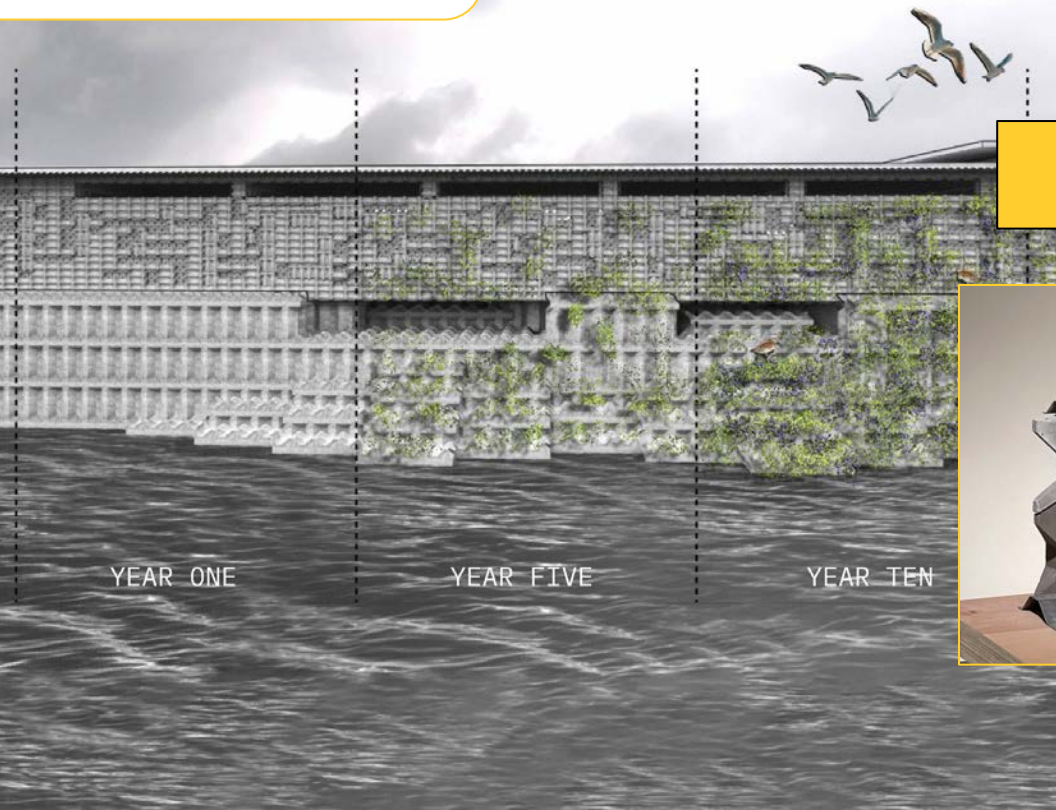
Gallery exhibition photos by Draven Zhao

Problem of Practice:
**Integrating disciplinary
research and technologies in
approaching an ecological
restoration challenge**

Geometric cast masonry for ecological restoration



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Defining the
problem space



INSTITUTE
PRATT **Riprap Ram Jam** Jonathan A. Scelsa, Associate Professor, Undergraduate Architecture

Course Context
The presentation discusses the research design from a study of the 2012 urban-scale coastal wall... (text partially obscured)

Problem of Practice
The problem of practice in this study begins here to test how systems find their own... (text partially obscured)

Research Findings: Embracing Complexity
One main finding in this analysis was defined the problem space by... (text partially obscured)

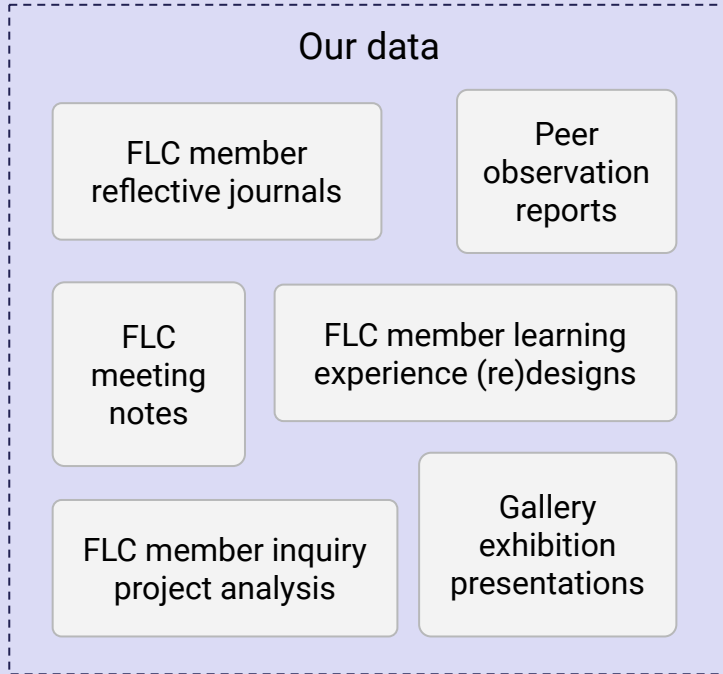
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Engaging multiple
modalities & materials

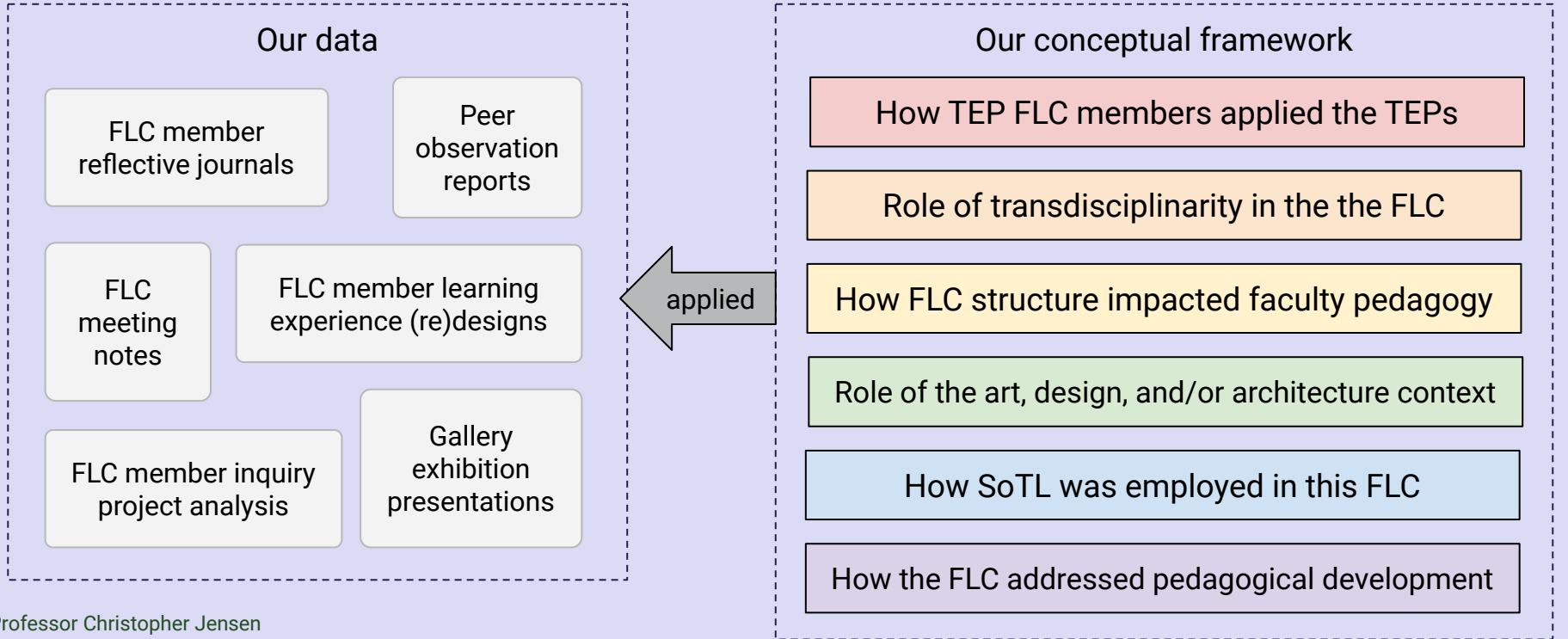
FLC member Jonathan Scelsa

Rendering and photo courtesy of Jonathan Scelsa

Qualitative analysis of our FLC data



Qualitative analysis of our FLC data



Some emerging themes in our early analysis...



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- ★ *Naming practices enables transdisciplinarity* : Having a framework that faculty can build upon enriches the transdisciplinary learning experiences faculty offer in their courses.

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- ★ *Transdisciplinary epistemic practices are not universal* : Our TEP framework appears to work well for making-based disciplines, but less well for other disciplines that might also be considered STEM-inclusive transdisciplinary.

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- ★ *Role of pairings in FLC curriculum development* : Transdisciplinary teaching is supported by working with peers from different disciplinary backgrounds, facilitating the cross-departmental collaboration that is crucial to true transdisciplinarity.

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- ★ *Role of pairings in FLC curriculum development* : Transdisciplinary teaching is supported by working with peers from different disciplinary backgrounds, facilitating the cross-departmental collaboration that is crucial to true transdisciplinarity.
- ★ *Transdisciplinary teaching is part of teaching* : Faculty striving to teach in transdisciplinary contexts must embed this work in their overall pedagogical development, which always includes disciplinary content and standards.

Principal Investigators

Mark Rosin
Heather Lewis
Chris Jensen

FLC Members

Ashley Bales
Leanne Bowler
Robert Brackett
Blake Marques Carrington
Rafael de Balanzo Joue
Regina "Gina" Gregorio
Nurhaizatul "Zat" Jamil
Jeanne Pfordresher
Jonathan Scelsa
Sophia Sobers
Keena Suh

Graduate Assistants

Medhaswi Paturu
Vandita Handoo

Guest Curator

Borinquen Gallo

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<http://www.christopherxjensen.com/>

Thanks!



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Additional support provided by the Pratt Institute Academic Senate and the Pratt School of Information

Exploring Transdisciplinary Approaches to STEM Teaching and Learning

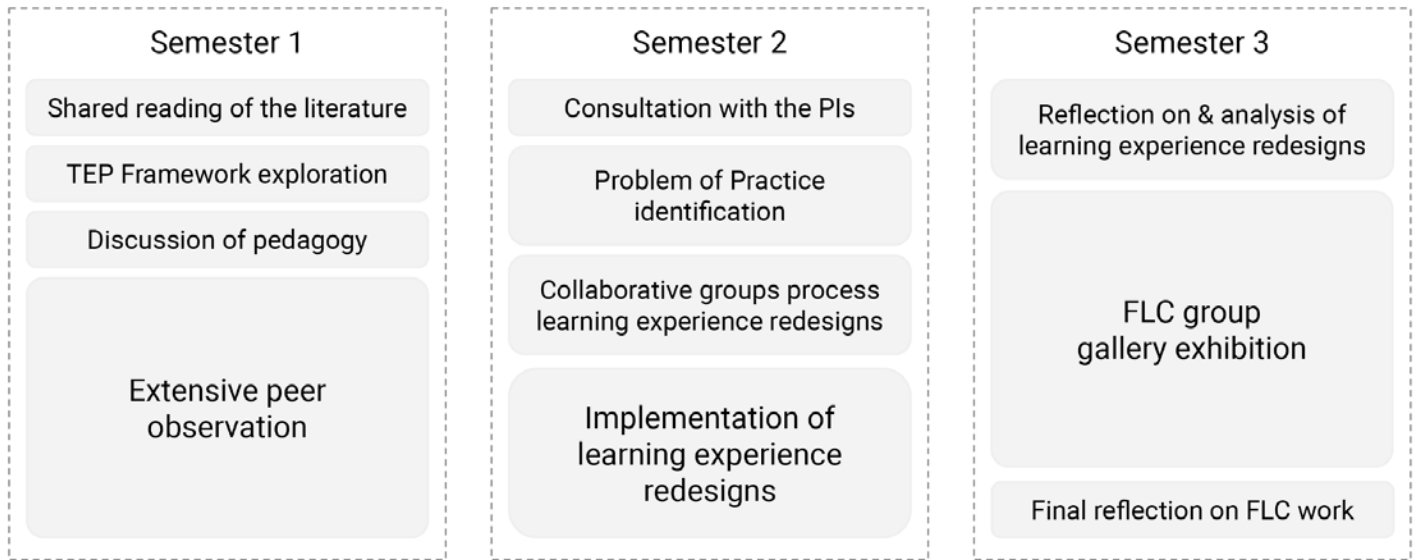
Chris Jensen, Heather Lewis, & Mark Rosin
Pratt Institute, Brooklyn, NY



Transdisciplinary Epistemic Practices (TEPs) Framework

e x p l o r i n g	Noticing & Questioning	Careful observation and looking more closely at the world, and thereby identifying (well defined) questions that need to be explored or features that otherwise might not be seen
	Exploring Materiality	Explore models of the world and its structure, to explain and/or inspire further inquiry.
	Defining the Problem Space	Asking well formulated questions that can be addressed either empirically, non-empirically, or through a well defined combination of both
m e a n i n g	Producing tentative representations	Visualize and understand phenomena conceptually, and from there, to extrapolate to new situations.
	Conducting Principled iterations	Construct and compare the results of multiple varied solutions to a task or problem, using well defined variational criteria.
m a k i n g	Engaging multiple modalities and materials	Develop capacity to engage with, and make informed connections among, multiple modalities and materials.
	Finding Relevance	Contextualize work within the frames of social values (historical and contemporary) and personal values.
c r i t i q u i n g	Critical Engagement	Providing feedback and promoting dialogic communication based on evidence, and leveraging a diversity of perspectives.
	Holding commitments to standards of the field	Adhering to the standards and practices of the field.
	Sharing results/"Audiencing"	Sharing findings/work through verbal, visual, or textual discourse.

Faculty Learning Community design



Applying the TEP Framework to a transdisciplinary problem of practice

Defining the problem space

Riprap Ram Jam

Jonathan A. Scelsa, Associate Professor, Undergraduate Architecture

Engaging multiple modalities & materials

Students considered ways in which emerging technologies could be applied.

How to use available technologies?

Students were asked to use multiple representational means to imagine how a designed space might be perceived and encountered by other species.

How to use low-impact raw materials?

Students had to reconcile material considerations with the goal of fostering biodiversity.

How to create plant/animal habitat?

Students had to reconcile human needs with the needs of other species.

How to address architectural goals?

MAKING

WEATHERING

Contact Us!

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