



Online Course- Based Research as a tool to inclusivity in STEM Education

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Excellence in STEM is still not very inclusive

University DROP OUTS

- 26% of Black STEM students
- 20% of LatinX STEM students
- 13% white STEM students

Riegle-Crumb, C., King, B., & Irizarry, Y. (2019)

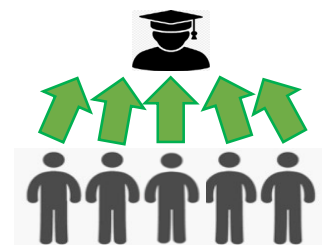


REU



Exclusive Model

CRE



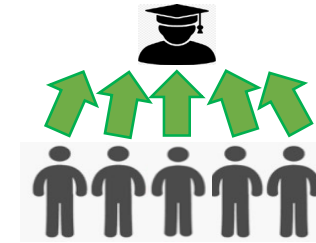
Inclusive Model



increase capacity for inclusion of all students, especially those students who belong to groups underrepresented in science.



*Transforming the Arts and Sciences curriculum to nurture inclusive excellence in STEM through *course-based research experiences* (CRE)*



No selection
no self-selection
no extra curricular time
Research ownership

CRE at LTU



Small PUI, 3500 students, 4 colleges, 15 departments, South-East Michigan



About 30 instructors from all disciplines within Art and Sciences

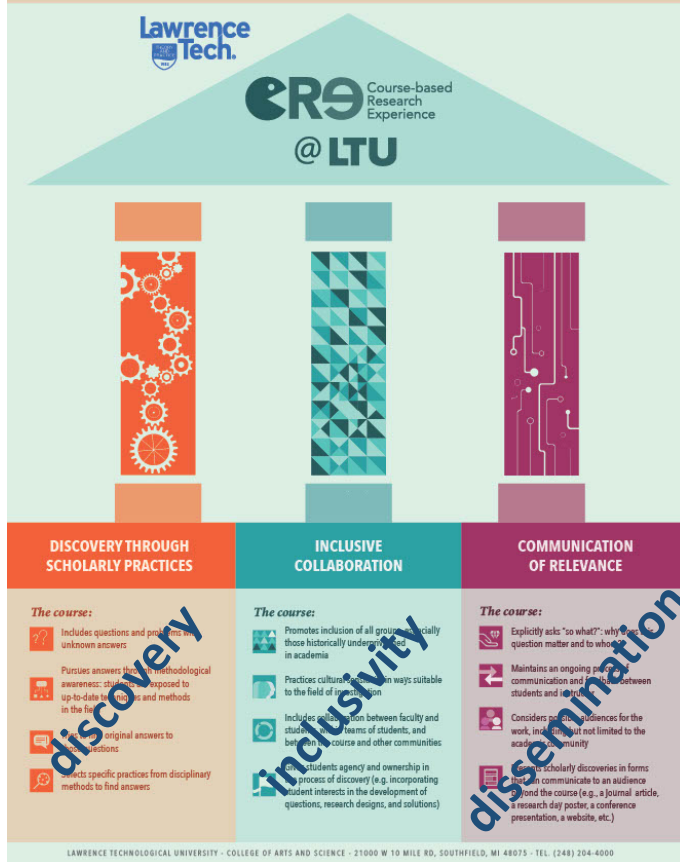
- **Scale:** more than 40 courses and 30 instructors
- **Heterogeneity:** CRE involves all the academic fields within Arts & Sciences

Principles and Logistics of CRE at LTU

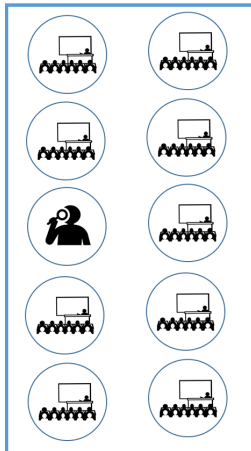
The Pillars of CRE at LTU

This infographic summarizes the insights of many years of course-based undergraduate research (CRE) at LTU. Through this process of discovery and informed by the growing body of scholarly literature on CRE, we have identified three key components of a CRE course.

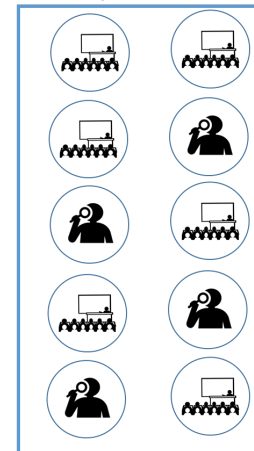
All course-based research courses at LTU include the following three pillars, contextualized and implemented according to their specific disciplines.



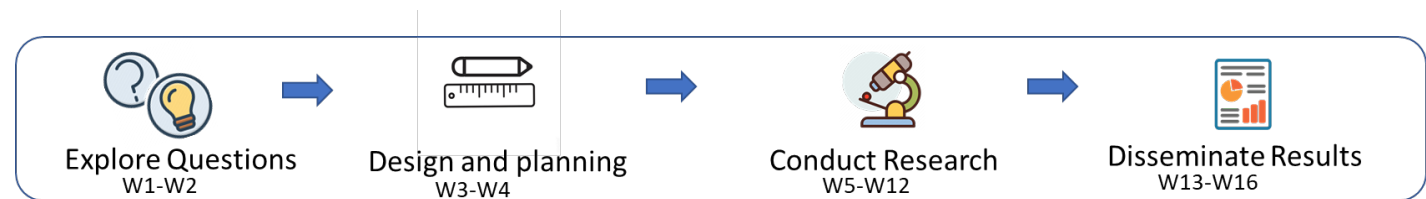
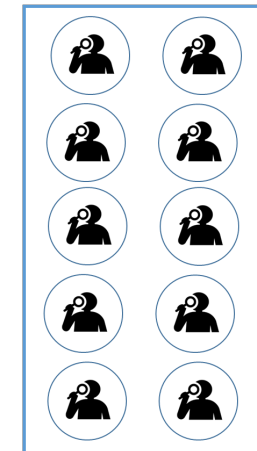
Single session CRE



Multiple sessions CRE

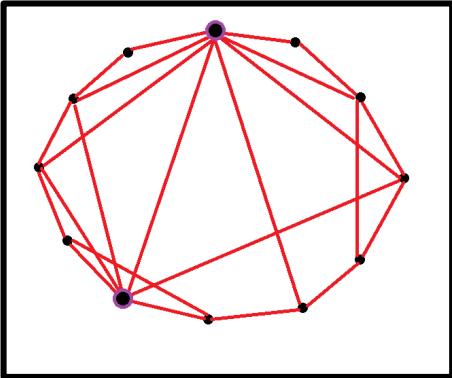


Entire Class CRE

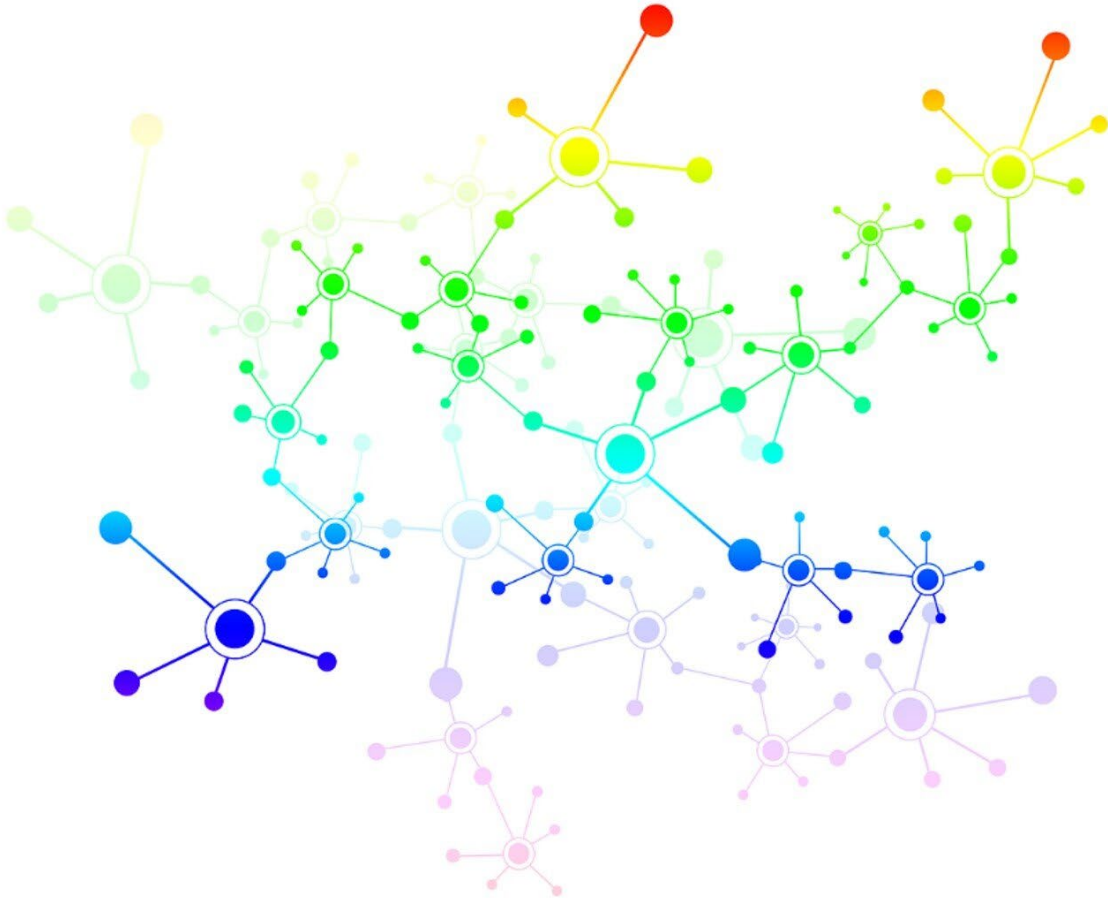


CRE Virtual Spaces as Inclusive Spaces

CRE in Physical Space



CRE in Virtual Space



- More Data
- More People
- More Diversity
- More Resources
- More Collaboration

Democratize Neuroscience Education via Open Data and Cloud Technology.

Neuroscience data [in]accessibility

- fMRI data acquisition = between \$300 and \$1,000 an hour
- Data are usually used only once
- Most colleges do not have access to imaging facilities at all
- Data acquisition is limited to faculty and grad students



brainlife.io

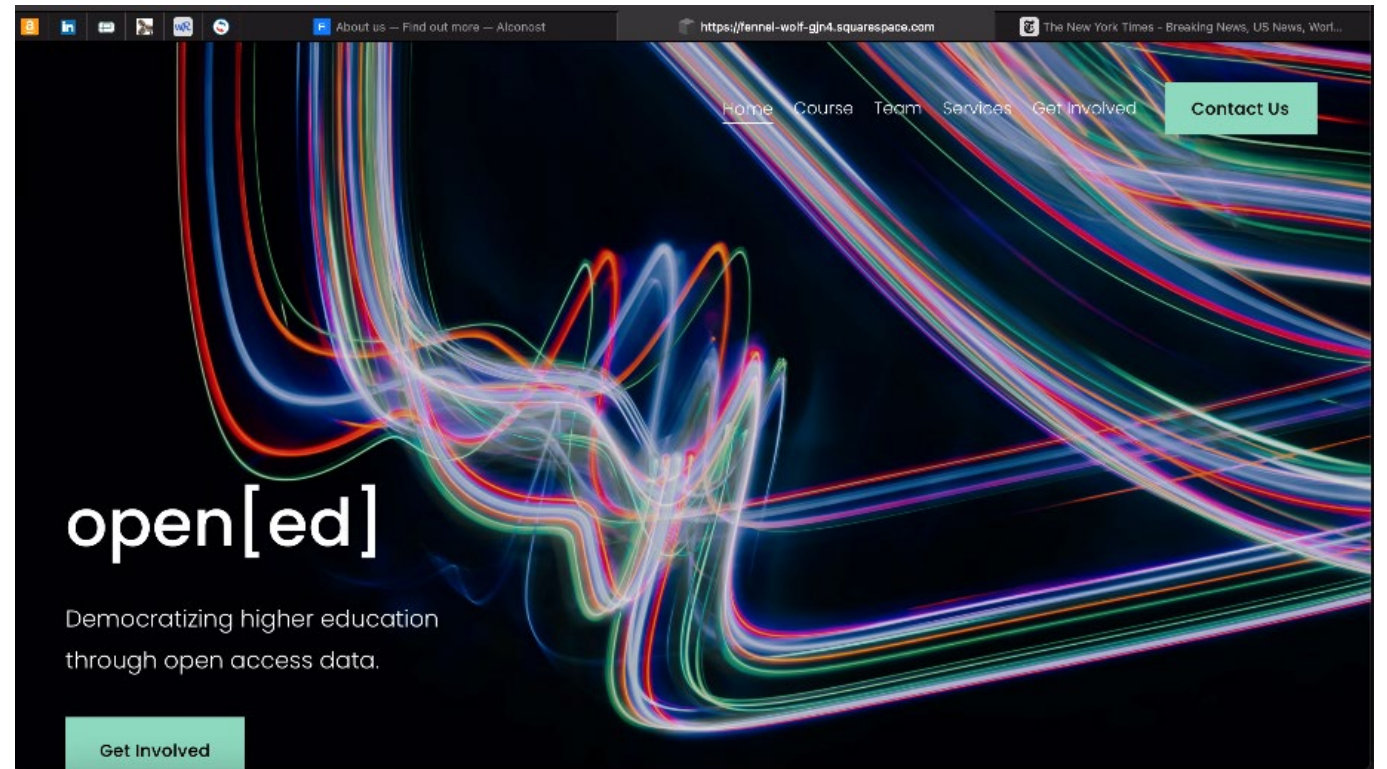
Cloud Computing
Online repository
Big Data analysis
Data Mining
Co-teaching (even multi-institutional)

Integrating CRE and BrainLife.io







Community
Development and
Engagement Project

- CRE courses at LTU
- CRE course at partner MSIs
- Instructor training and outreach
- Collaborative proposal-development activities.



Spring 2021 – Behavioral Neuroscience

	App Name	Function
	HCP ACPC Alignment	Aligns a T1 weighted image using the anatomical landmarks of the anterior and posterior commissure
	FreeSurfer	Segments the T1w anatomical data into functionally different parts of the brain.
	Multi-Atlas Transfer Tool	Maps the anatomy of a subject's brain to a template then subdivides the brain into known brain areas.
	fMRIprep	Preprocesses the functional activations (fMRI) to reduce artifacts.
	fMRI to Connectivity Matrices	The fMRI to connectivity matrices app builds functional brain networks
	Conmat 2 Network	Converts a conmat datatype to a network datatype so it can be used in the network pipeline
	Network Visualization	Generates simple 2D static visualizations for networks

Undergraduate Research in Neuroscience via Open Data and Cloud Technology
 Charbel Appari, Aayal Bamwold, Alessia Buccini, Leah Cumberland, Camara Davidson, Rachel Davies, Jessica Lodge & Frances Orling
 College of Arts and Sciences, Laramie, Wyoming, USA

Introduction
 Introduction to the project and the goals of the research.

Results: processes and pipelines
 Results: processes and pipelines. Includes brain scan images and processing steps.

Self report of the experience
 Self report of the experience. Includes a bar chart showing student feedback.

Methods
 Methods. Includes a table of software and hardware used.

Discussion & Future Direction
 Discussion & Future Direction. Includes a summary of findings and future plans.

Acknowledgements
 Acknowledgements. Includes thanks to funding sources and mentors.

References
 References. Includes a list of cited works.

confusing helpful
 new complicated
 stimulating
 frustrating simple
 useful
interesting
 challenging practical
 educational engaging
 difficult interactive
 different

Spring 2022 – Behavioral Neuroscience

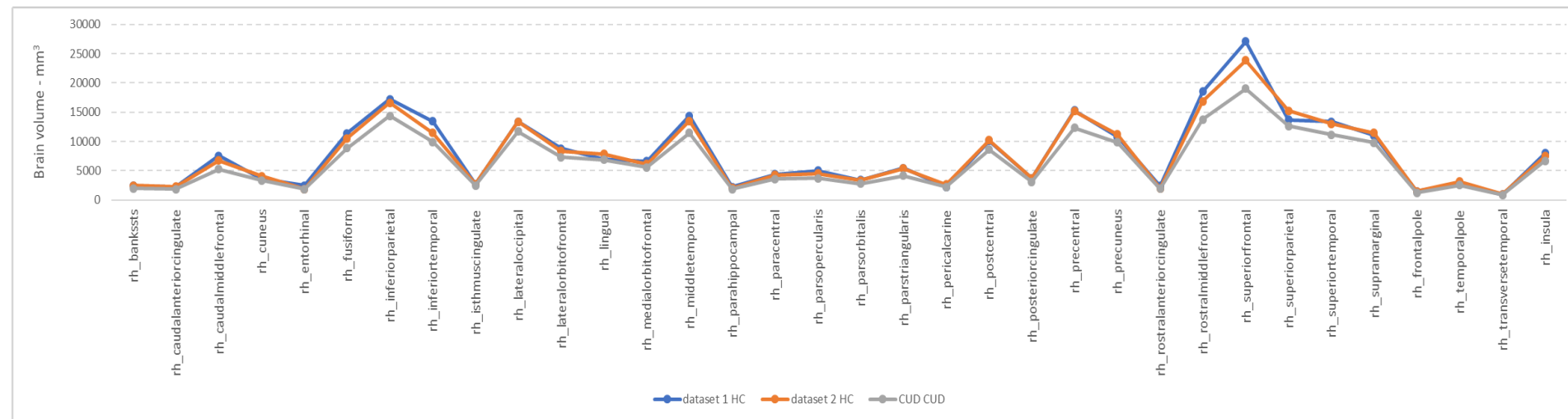
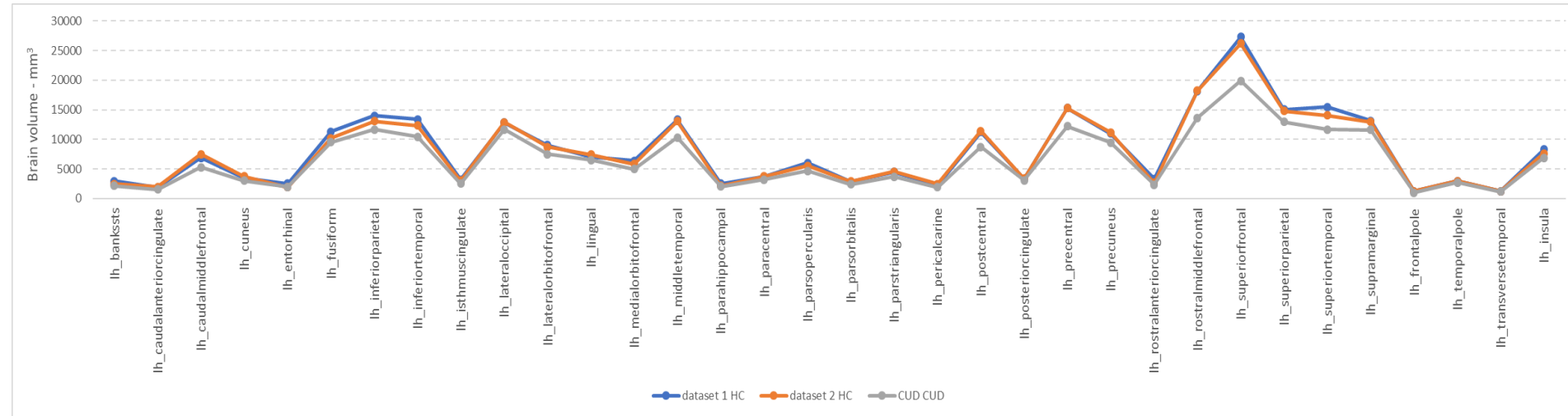
Volumetry extraction from publicly available datasets through Freesurfer

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Hypotheses about age- and disease-related morphometric brain changes

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- Introduction to anatomy and function
- Intuitive understanding
- Sense of ownership
- Team work
- Unlimited discovery playground

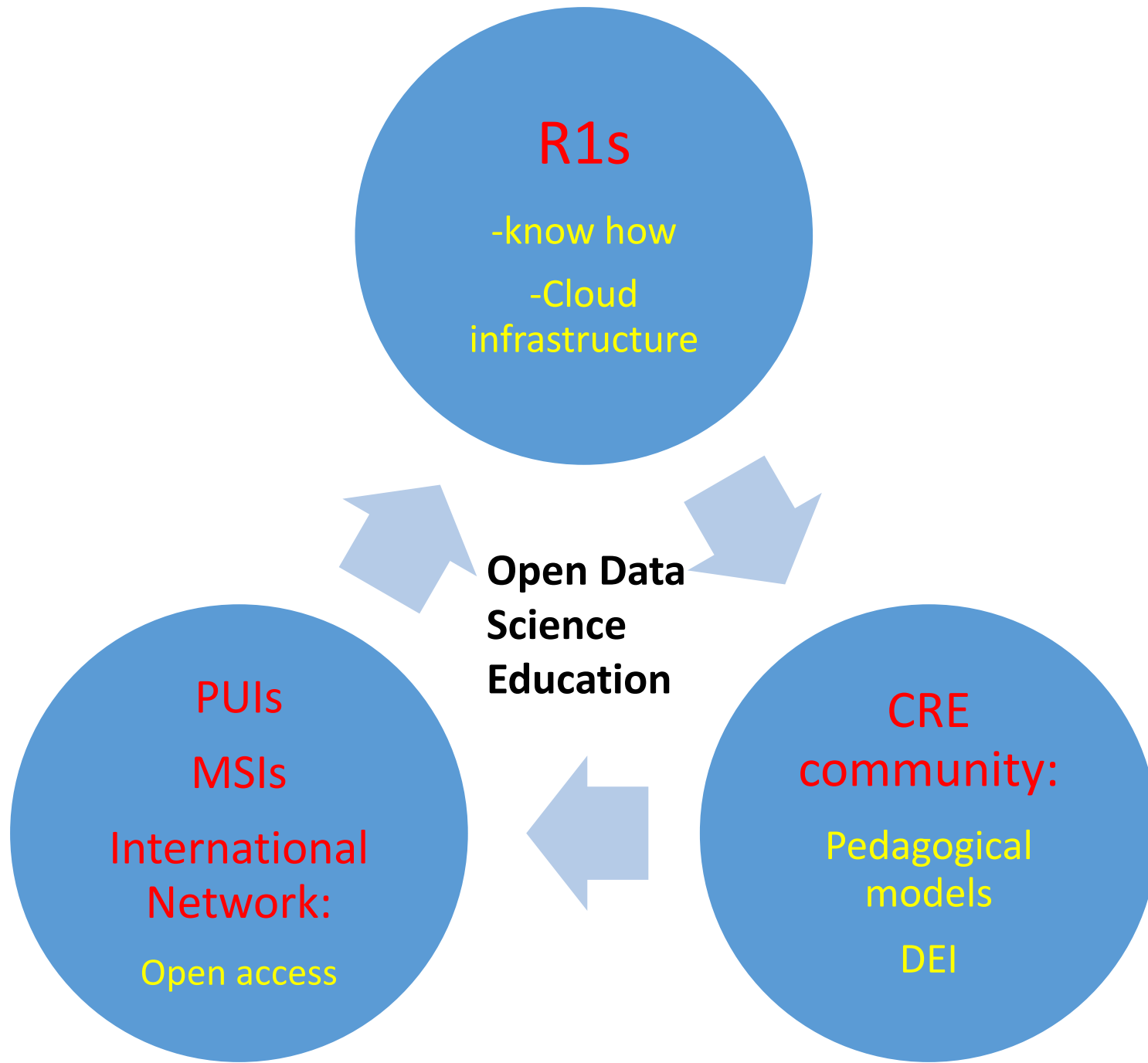


Datasets:

CUD: Garza-Villarreal et al., 2017, N=30

HC1: Wommen et al., 2022, N=10

HC2: Bakkour et al., 2019, N=10



Thanks!

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