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

Franco Delogu, PhD

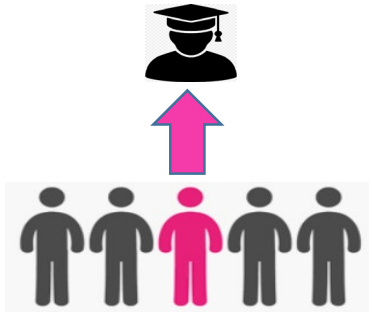
Excellence in STEM is still not very inclusive

University DROP OUTS

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

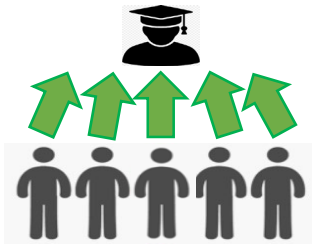
Riegle-Crumb, C., King, B., & Irizarry, Y. (2019)

REU



Exclusive Model

CRE



Inclusive Model

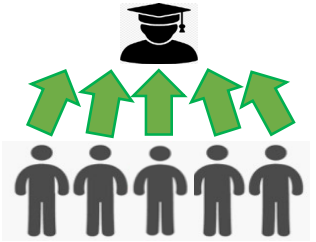
hhmi

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

LAWRENCE TECHNOLOGICAL UNIVERSITY
THEORY AND PRACTICE
1932
SOUTHFIELD, MICHIGAN

CRE Course-based Research Experience

Trasforming 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

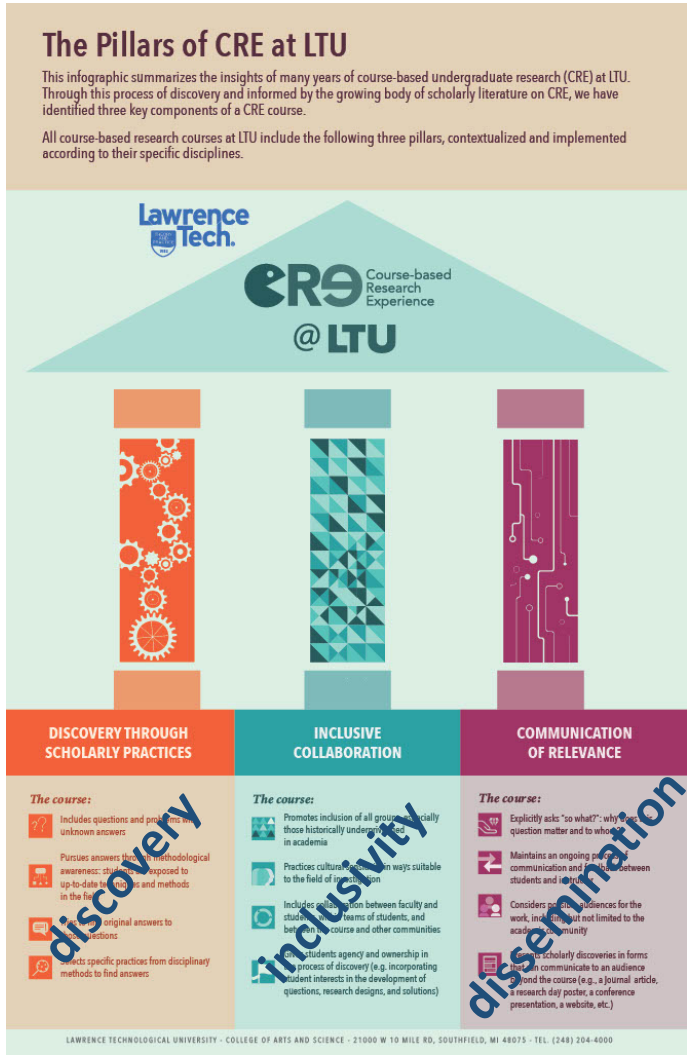
CRE at LTU

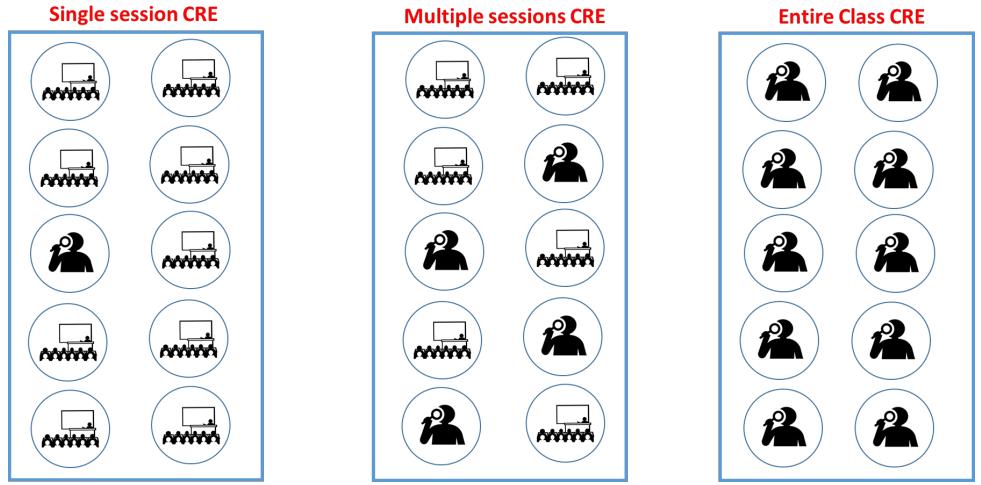
Small PUI, 3500 students, 4 colleges, 15 departments, South-East Michigan

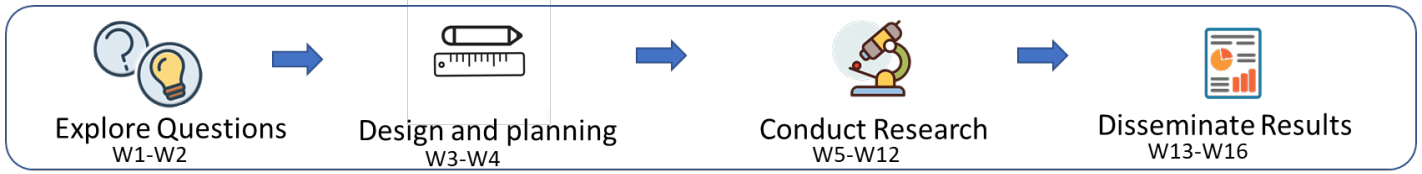
About 30 instructors from all disciplines within Art and Sciences

- **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

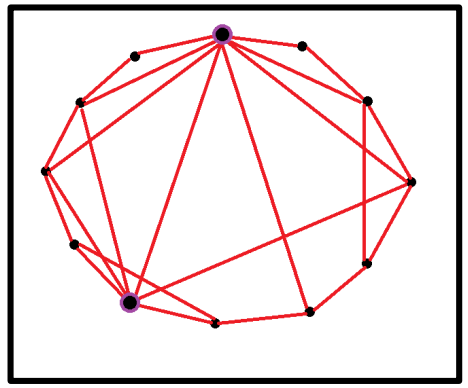




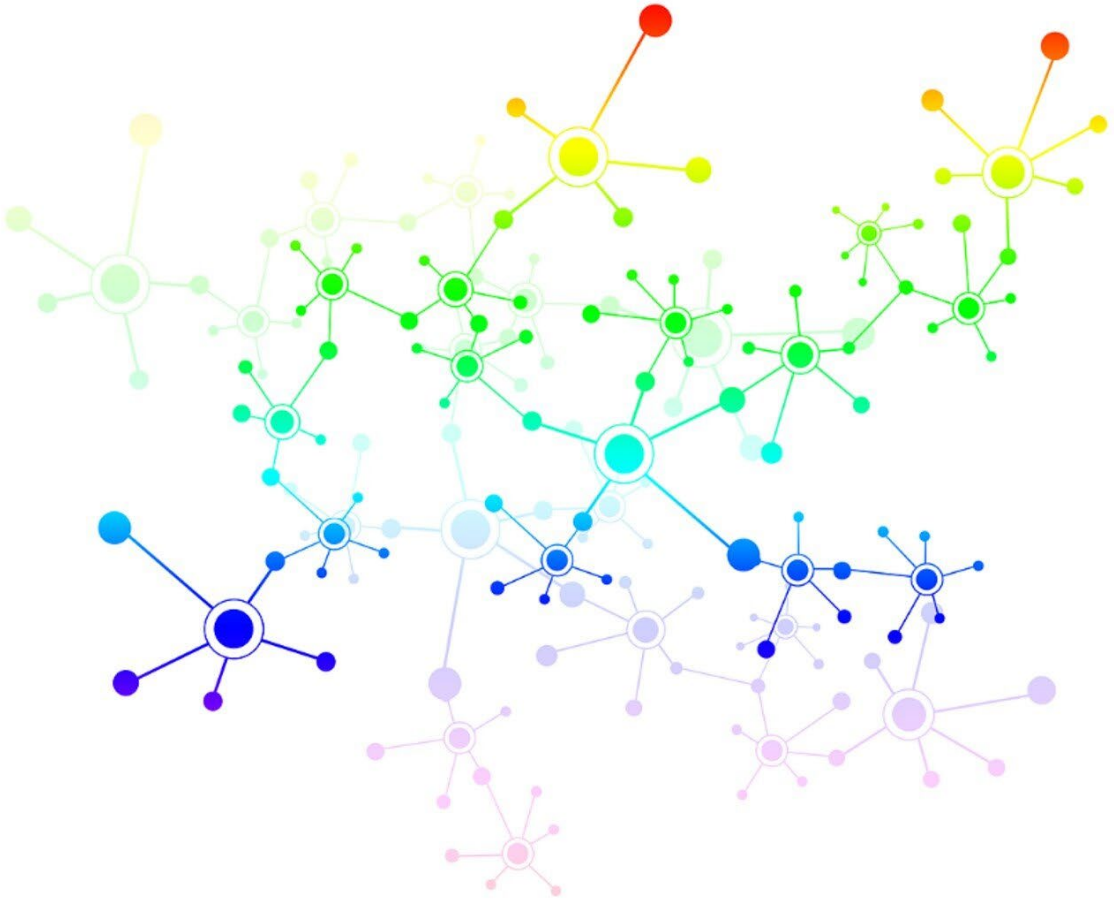


CRE Virtual Spaces as Inclusive Spaces

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

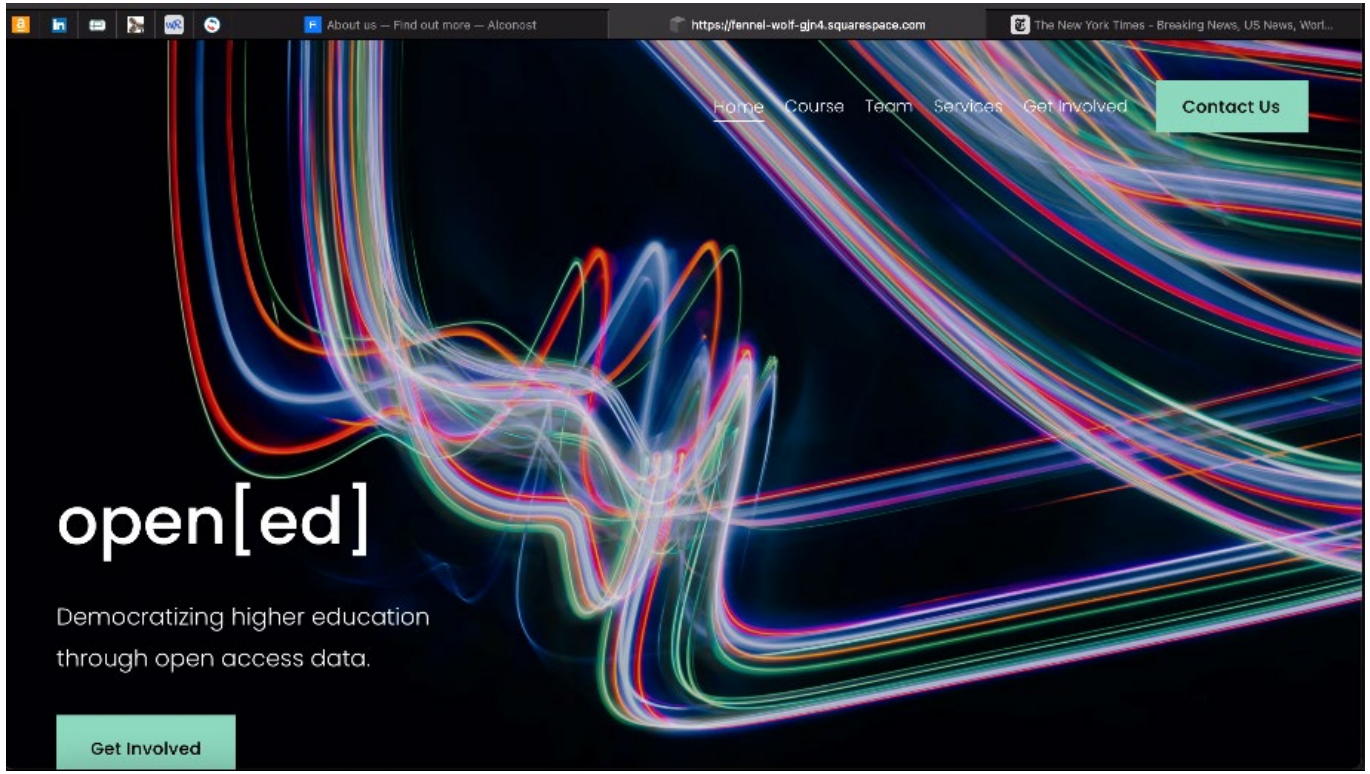
Cloud Computing
Online repository
Big Data analysis
Data Mining
Co-teaching (even multi-institutional)

Integrating CRE and BrainLife.io

MIDWEST BIG DATA HUB

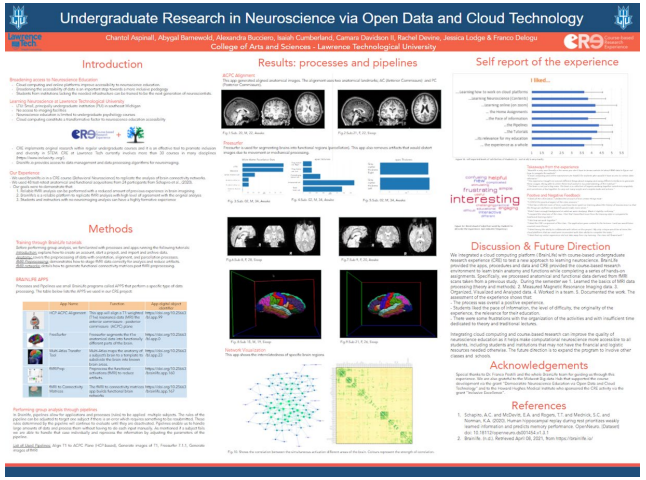
Community Development and Engagement Project

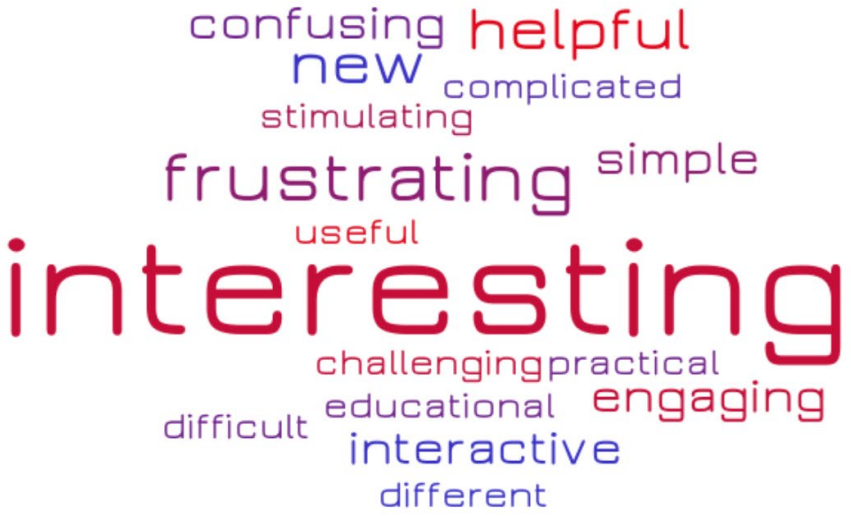
- CRE courses at LTU
- CRE course at partner MSIs
- Instructor training and outreach
- Collaborative proposal-development activities.



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 reduc 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





Spring 2022 – Behavioral Neuroscience

Volumetry extraction from publicly available datasets through Freeesurfer

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Hypotheses about age- and disease-related morphometric brain changes

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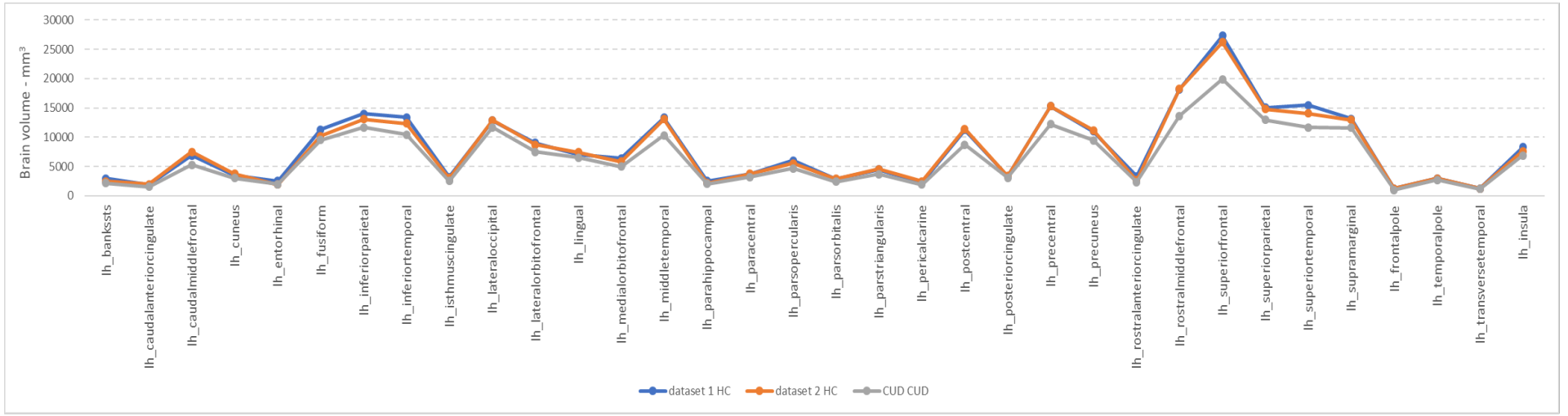
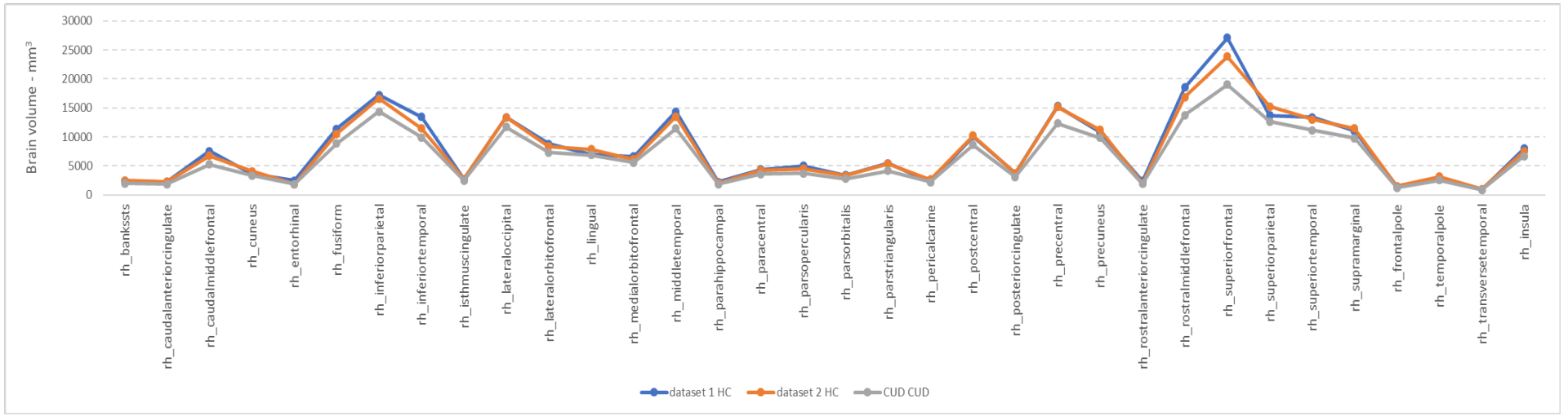
- Introduction to anatomy and function
- Intuitive understanding
- Sense of ownership
- Team work
- Unlimited discovery playground



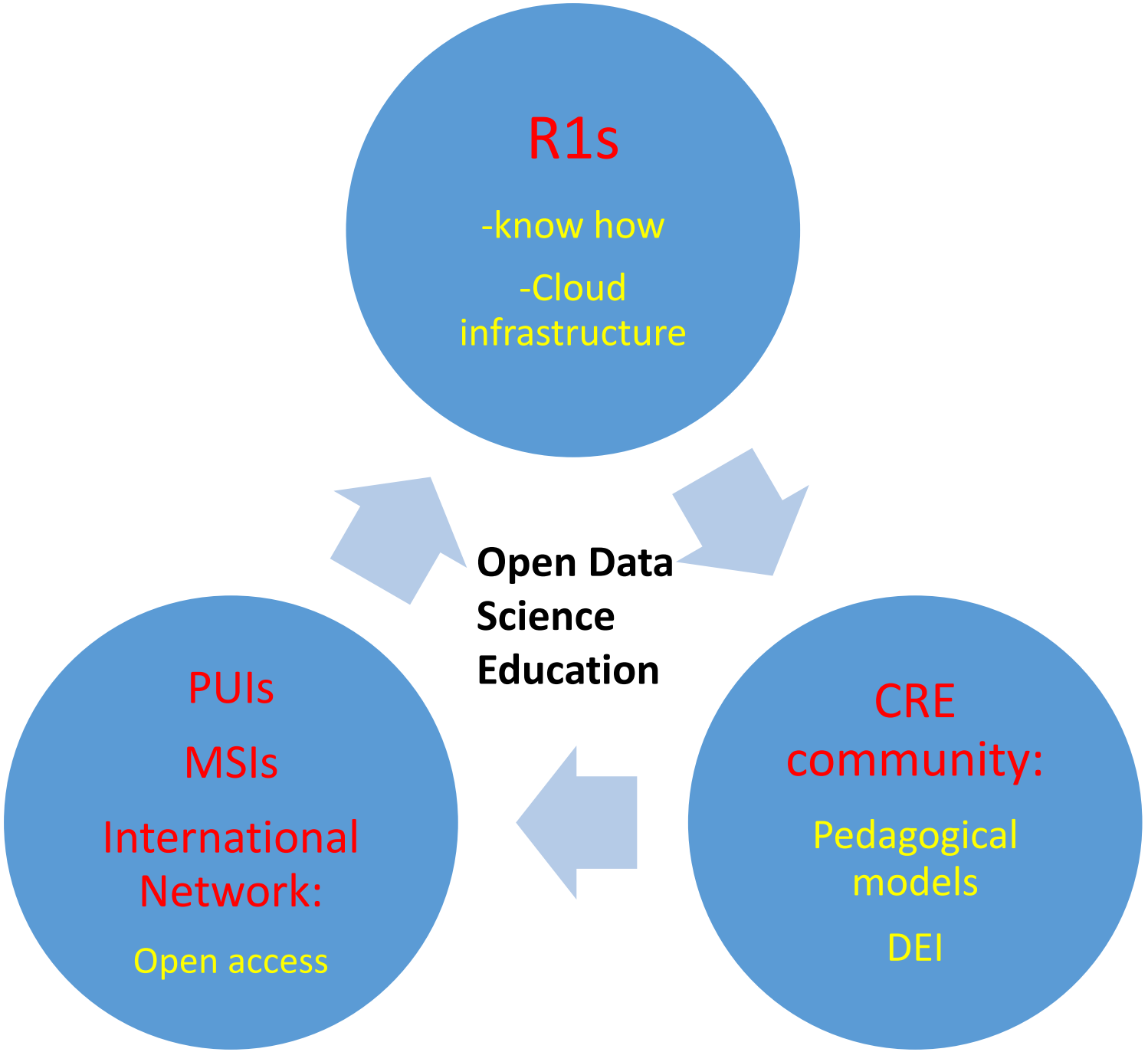


Datasets:

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

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

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


R1s
-know how
-Cloud infrastructure
Open Data Science Education
PUIs
MSIs
International Network:
Open access
CRE community:
Pedagogical models
DEI

Thanks!

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