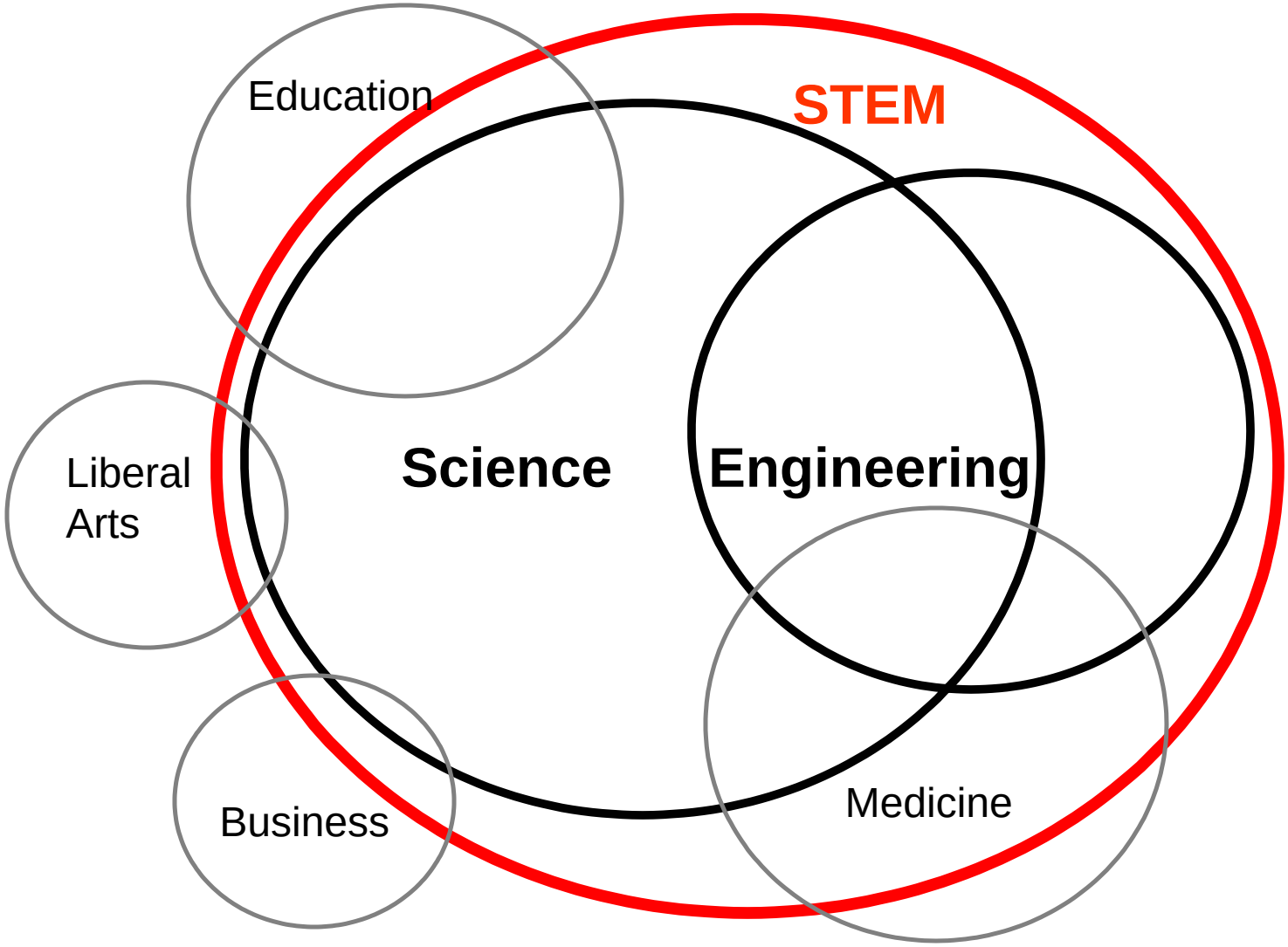
STEM in Orbit



Reverse engineering the basic sciences:

Deans of Science and Engineering working together to unplug the STEM pipeline

Rowan University

Patricia Mosto, Arts and Sciences

Dianne Dorland, Engineering

Wright State University

Michele Wheatly, Science and Math

Forouzan Golshani, Engineering

(now CSU, Long Beach)

Science and Engineering

- Divergence
- Convergence
  - LAS provides service courses for Engineering
  - Common concerns about STEM pipeline
  - Translational research
  - Joint faculty and graduate programming

Joint STEM initiatives at WSU

- Math for engineering applications
- Reform in physics service courses
- Interdisciplinary Baccalaureate programs
  - Engineering Physics
  - Computer Science/Math with Music
- Interdisciplinary Doctoral Programming
  - Technology-based Learning with Disability
- Joint faculty
  - Sensors (Electrical Engineering/Physics)
  - Bioimaging (Biomedical Engineering/Physics)

Problem Based Discovery and Application

- Trend towards interdisciplinary clusters of faculty working in a thematic area
- Some universities are disbanding traditional academic disciplines and building research centers (e.g. ASU)
- STEM Deans need to find ways to foster transdisciplinary interactions

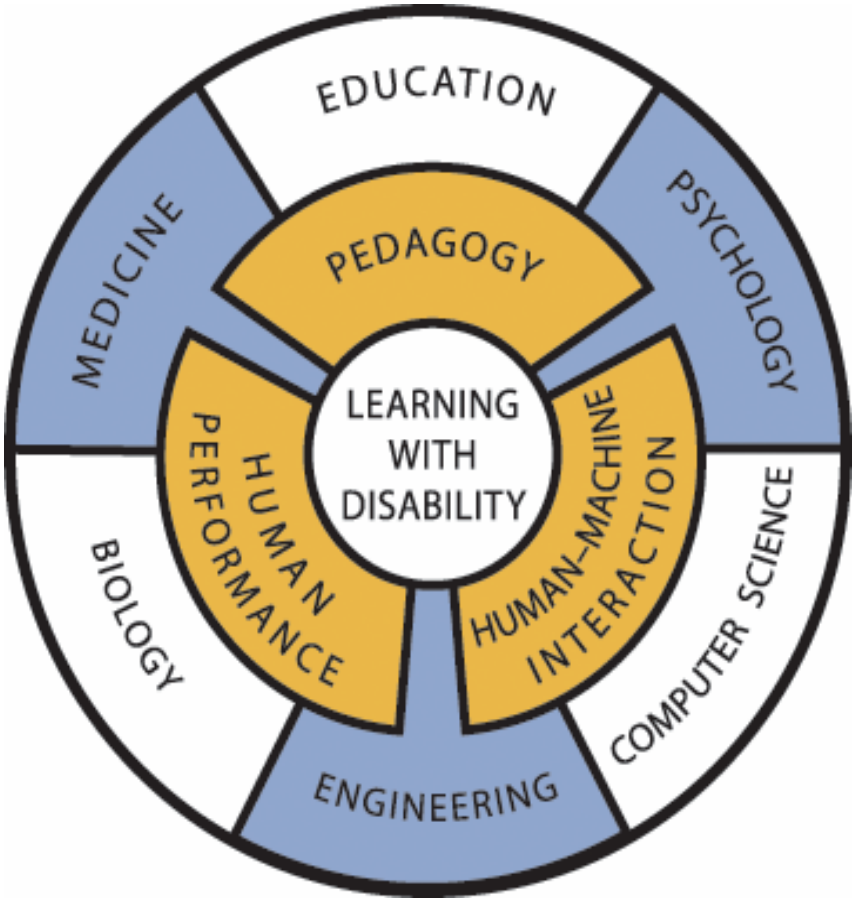
PhD concentration in Learning with Disability

- A doctoral program designed to provide a broad and comprehensive education, realistic work experiences, and opportunities for problem centered research in the area of learning with disability
- A concentration in : Biomedical Sciences; Human Factors/Industrial Organizational Psychology; Engineering; and Computer Science and Engineering
- NSF IGERT grant $3M
- Dean Forouzan Golshani (CSULB)
- Studentships $30,000 per annum

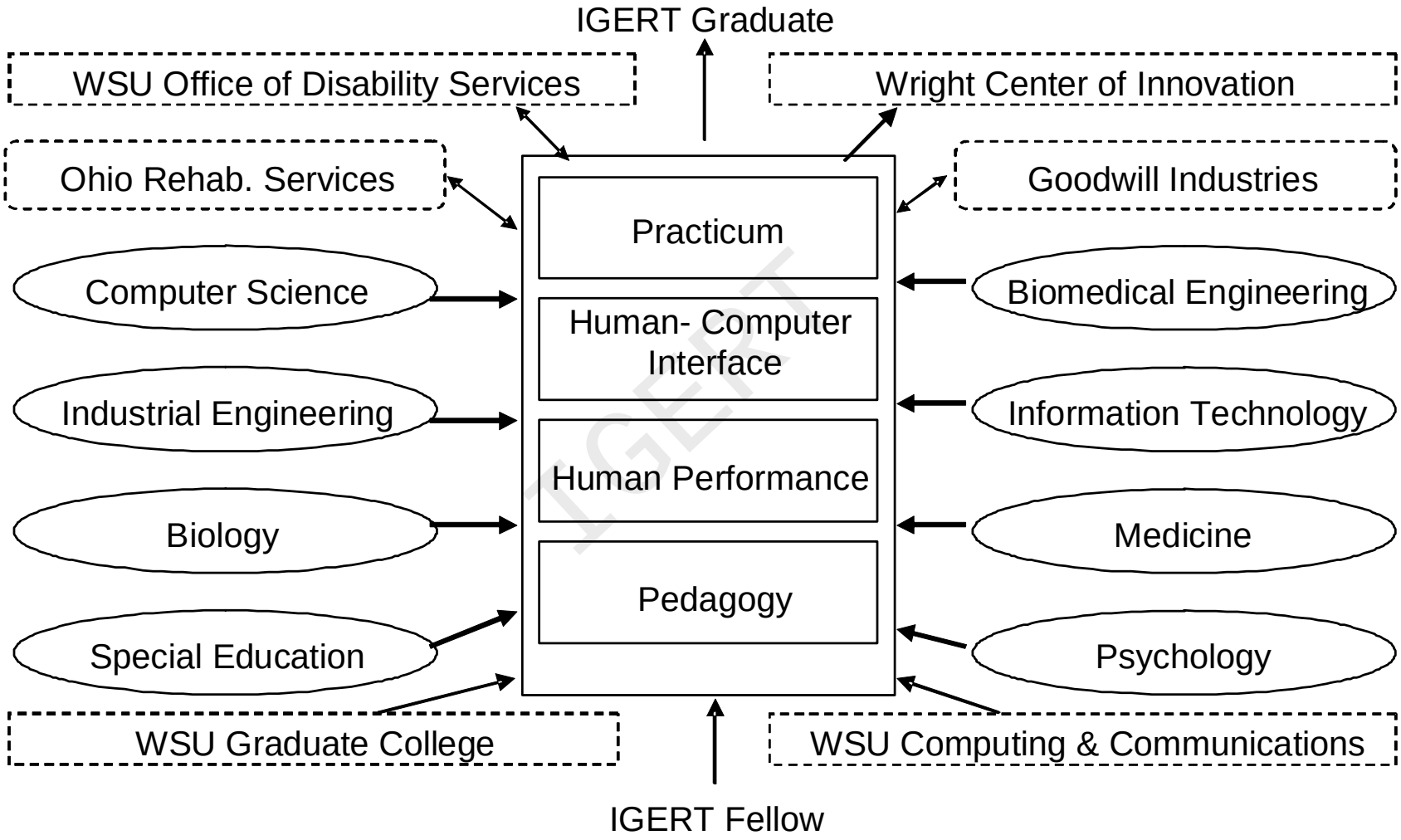
Technology based Learning with Disability

Bridging the gap between

- disability
- assistive technologies
- pedagogy of individualized learning



Unique aspects of LWD



Innovative Curriculum Model

- Not a new degree
  - A concentration within each of four PhD tracks: BMS, CSE, Eng, HF/IO
- The normal number of hours –
  coursework plus research/dissertation
- Coursework divided to:
  Normal Core + Concentration Core + Electives
- Interdisciplinary dissertation committees
- Service engagement of doctoral students
- Design studio

Specialization Coursework

Science of learning

Nature and needs of disabilities

Physiology of disability

Assistive technology

Individualized assessment, design and evaluation

Legal and ethical aspects

Multimodal interface design

Current status

- Year 4 of the 5-year grant
- Graduated 1 fellow
- About 15 fellows in progress
- In 2007 we hosted the first
  - International Conf on Learning with Disability
  - Special volume of *Disability and Rehabilitation*

What followed?

Regional Alliance in Disability,

3M NSF funded

Broadening Participation in Computing, submitted

University System of Ohio,

Center of Exc in Human Effectiveness

(proposed)

Science of Learning Center

Motor Coordination

Basic:

- Functional organization in the peripheral nervous system
- Perceptual-motor coordination
- Computational neuroscience
- Artificial life
- Dynamical systems
- Fractals

Applied:

- Regeneration and recovery in sensory motor circuits
- Human-machine systems
- Evolvable hardware control systems
- Analysis of complex time series

Lessons learned

- Working on a common goal that delivers new and prestigious resources
- Junior faculty are more receptive to working across disciplines
- Never achieved full commitment from the BioMedical Sciences PhD program
- The added demands of the concentration presented problems for some faculty and some students