
Integration of Research and Teaching: A Two-Way Conduit

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Department of Engineering
College of Technology and Computer Science



Tomorrow Starts Here

Scholar-Teacher Award Presentation 4/7/2011

Outline

- **Research**
- **Teaching**
- **Integration of Research and Teaching**
- **Integration of Research, Teaching, and Service**



A University Professor's Job

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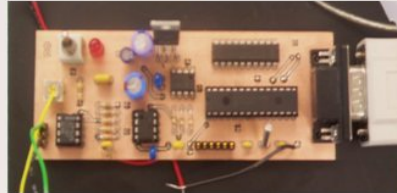
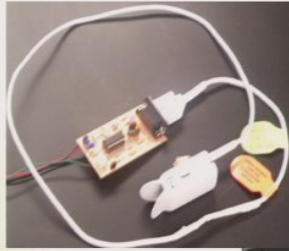
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- The Biosensors Research Laboratory



- **Tele-audiology**
 - Publications (4 journals, 2 conferences)
 - Funding (\$25,000)
- **Orthopedic injection training instrument**
 - Publications (1 journal, 1 conference)
 - Funding (\$7,500)
- **Finger plate for balance assessment**
 - Funding (~\$3,000)
- **Engineering education**
 - Publications (3 journals, >10 conferences)
 - Funding (~\$90,000)



- **ICEE 1014 – Introduction to Engineering**
- **ENGR 3014 – Circuits Analysis**
- **ENGR 3050 – Instrumentation and Controls**
- **MENG 4350 – Electromechanical Systems**

- **Currently coordinating the planning of the Electrical Engineering concentration and developing multiple concentration courses**



- **COAD 1000 – College Orientation**
- **ICEE 1012 – Engineering Graphics**
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- **ENGR 4010 – Capstone Projects I**
- **ENGR 4020 – Capstone Projects II**
- **ENGR 4501 – Prep. for Fundamentals of Eng. Exam**



- NSF CCLI/TUES Conference, Washington DC(2 days, January 2011)
- “Conducting Rigorous Research in Engineering Research” Workshop, Golden, CO (4 days, August, 2010)
- NIH SBIR/STTR Workshop, Raleigh, NC (2 days, June 2010)
- ABET Accreditation Assessment Training Workshop, Baltimore, MD (one day, February, 2007)
- MIT Leadership Skill Workshop, Boston, MA (two days, July, 2007)
- VaNTHERC “How People Learn Engineering” Workshop, Nashville, Tennessee (two days, April, 2006)



Integration of Research and Teaching

- Coherent integration of the research and education is a **two-way conduit**:



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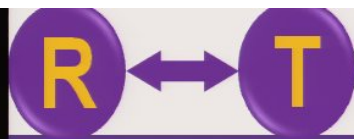
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Integration of Research and Teaching

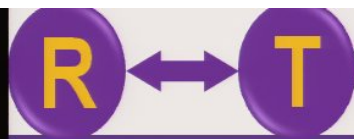
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Integration of Research and Teaching

- **Coherent integration of the research and education is a *two-way conduit*:**
 - From research to teaching
Research ideas can be migrated into classroom instruction and lead to education innovations





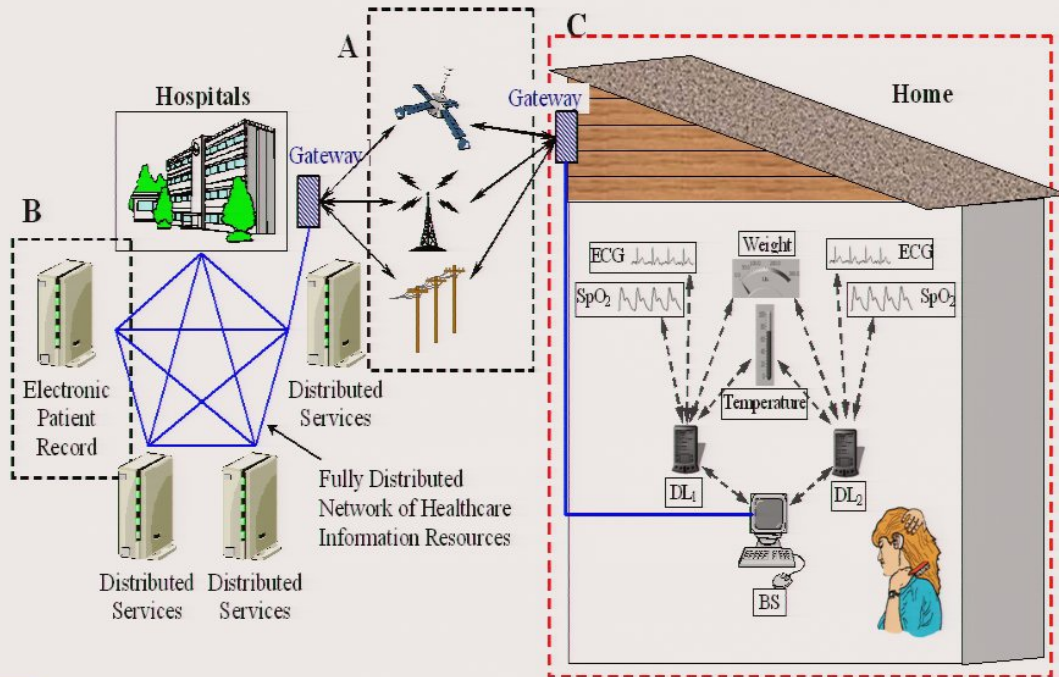
Integration of Research and Teaching

- **Coherent integration of the research and education is a **two-way conduit**:**
 - From research to teaching
Research ideas can be migrated into classroom instruction and lead to education innovations
 - From teaching to research
Curriculum/course/laboratory development and assessment work provides good research opportunities and best practices and findings might be publishable



R → T Integration of Research and Teaching

- The common theme: from anywhere anytime **healthcare** to anywhere anytime **learning**



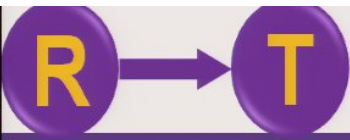
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- Philosophical Thinking: from anywhere anytime **healthcare** to anywhere anytime **learning**



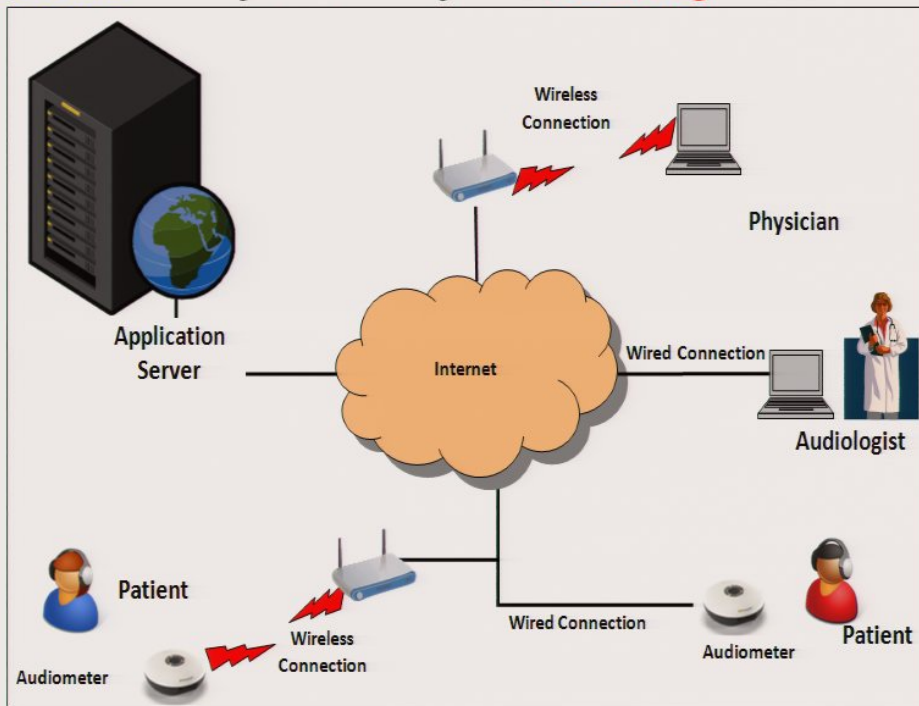
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Integration of Research and Teaching

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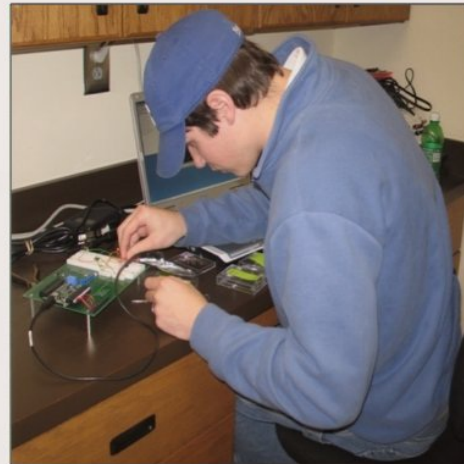
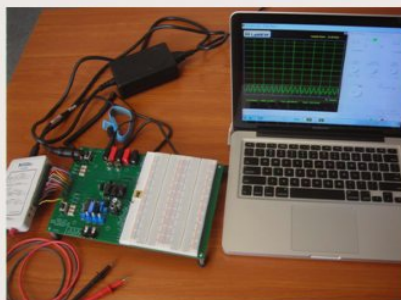
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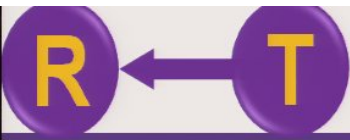
- **Ubiquitous Laboratory Learning**

- NSF sponsored project
- Develop new technology
- Develop new instruction material
- Assessment effectiveness
- Disseminate results

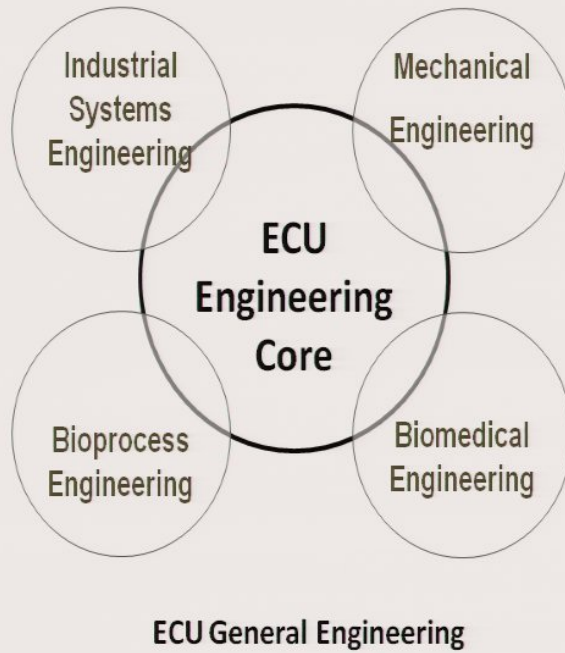


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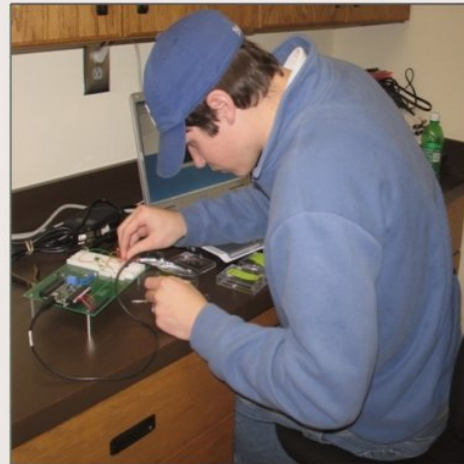
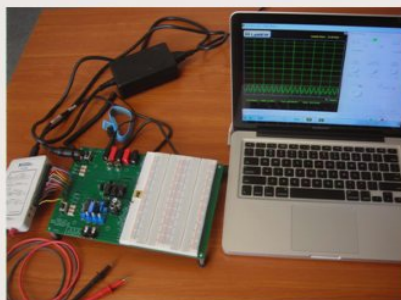
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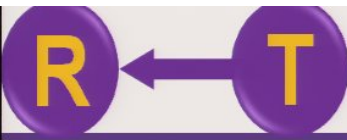
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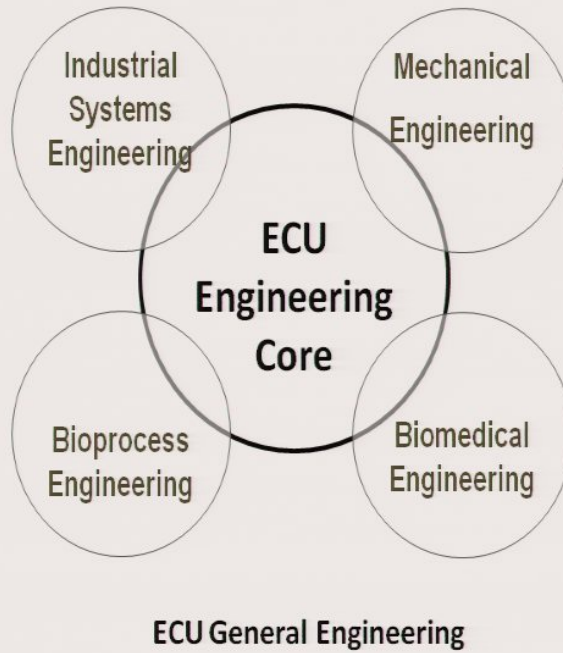


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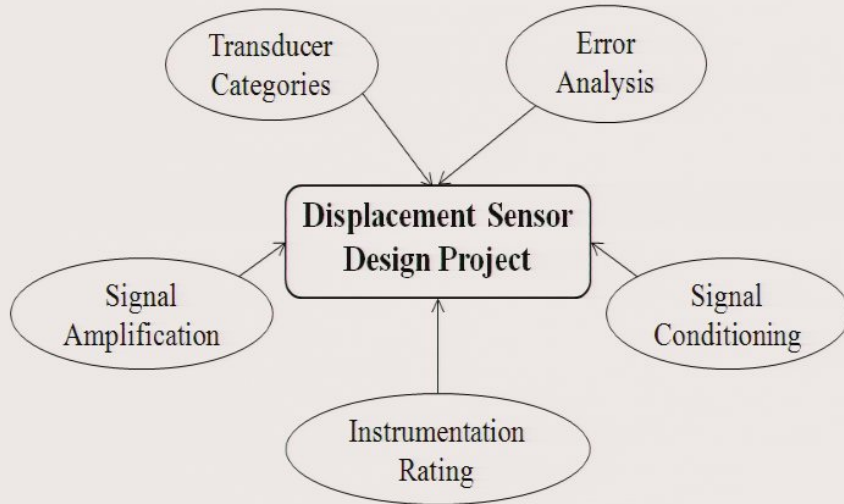
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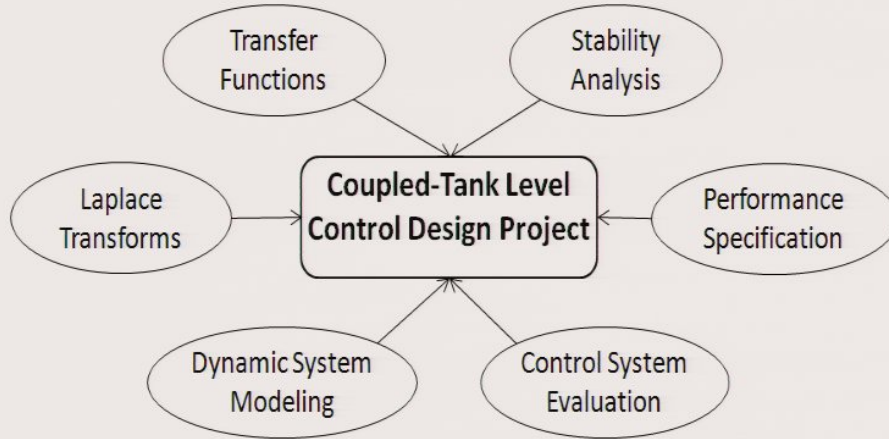
- **Project-driven Instruction Approach**



Capacitive Displacement Sensor Design Project



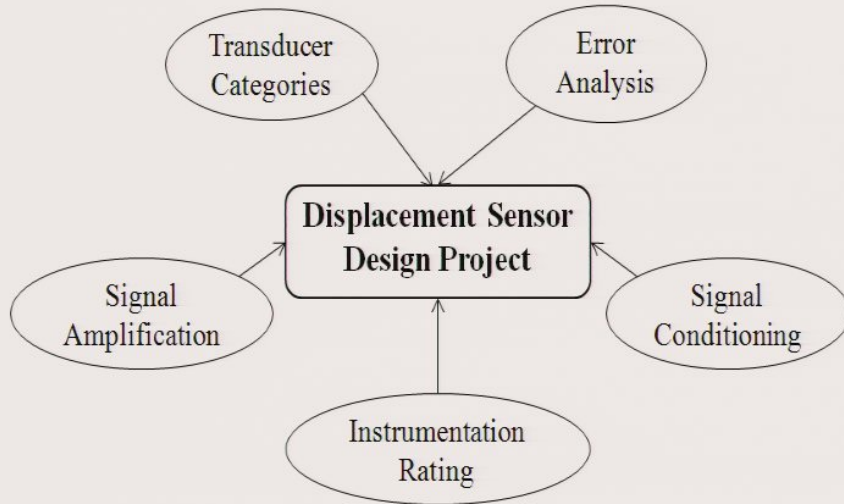
- **Project-driven Instruction Approach**



Coupled-Tank Level Control Design Project



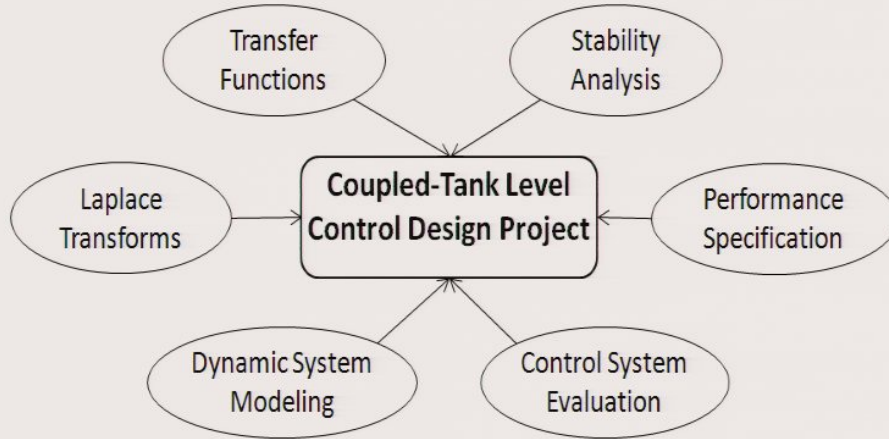
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Capacitive Displacement Sensor Design Project

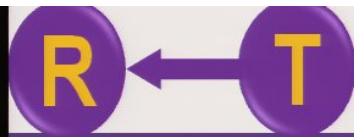


- **Project-driven Instruction Approach**



Coupled-Tank Level Control Design Project





Integration of Research and Teaching

- **Project-driven instruction Approach**
 - ENGR 3014: Four week Thermistor-based Temperature Alarm Design: universal applications of op-amps in electronic circuits.



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Integration of Research and Teaching

- **Project-driven instruction Approach**
 - ENGR 3014: Four week Thermistor-based Temperature Alarm Design: universal applications of op-amps in electronic circuits.
 - ENGR 3050: Four week Capacitive Level Sensor Design: Instrumentation concepts, LabVIEW programming skills



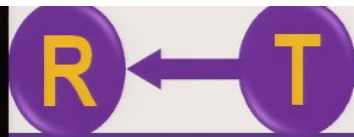
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Integration of Research and Teaching

- **Project-driven instruction Approach**

- ENGR 3014: Four week Thermistor-based Temperature Alarm Design: universal applications of op-amps in electronic circuits.
- ENGR 3050: Four week Capacitive Level Sensor Design: Instrumentation concepts, LabVIEW programming skills
- ENGR 3050: Five week Coupled-tanks Level Control Design: feedback control concepts, integrate mathematical model into real-world dynamic process
- MENG 4350: Four week DC Motor Modeling Speed Control Design: integrate control theory with dynamics, instrumentation, microcontroller programming, machinery design into the same project.



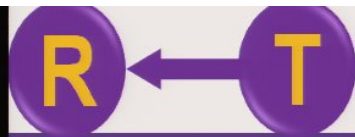


Integration of Research and Teaching

- **Project-driven instruction Approach**

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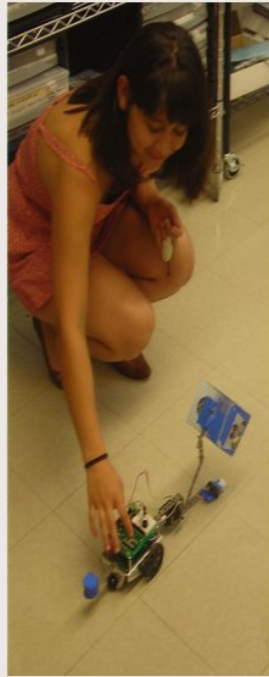
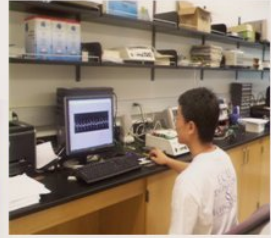
Students' Comments

- The course is laid out very well. The class is interesting. The labs are fun and educational.
- The Labs compliment the lectures.
- I enjoyed the labs for this class; I like hands-on things because I get a better understanding of the material.
- The labs were great for demonstrating theory put into practice.
- The labs apply the stuff that we learn in class.
- The course material is well laid out. We have homework that is challenging, and the tests material comes from the homework material or the lab material...
-





Students Mentoring



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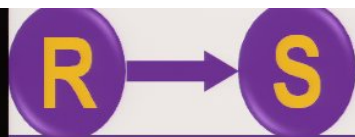
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Students' Successes

- **Yongbo Wan:** 4 journal papers, 5 conference papers
- **Xiaodong Sun:** 2 conference papers
- **Chris Eckert:** 1 journal paper, 1 conference abstract
- **Chris Eckert and Michael Cannon:** best poster presentation, 2010 ECU Research/Creative Activity Week
- **Ellen Crowell:** 1 journal paper accepted, best poster presentation, 2009 ECU Research/Creative Activity Week.
- **Jason Yang:** the Catalyst Award. Presented at the NC State Science Teachers' State Meeting

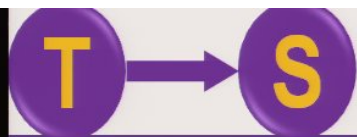




Research Revisit

- **Tele-audiology**
 - Work with Communication Sciences and Disorders
- **Orthopedic injection training instrument**
 - Work with Orthopedics East
- **Finger plate for balance assessment**
 - Work with Physical Therapy
- **Engineering education**
 - Work with Kansas State University



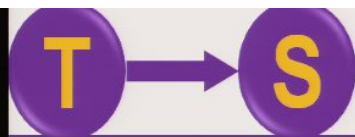


Teaching Revisit

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Summary



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ECU Mission Statement:

To **serve** as a national model for public **service**...



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