Design & Innovation Center

Direction: Vision, Strategy, Alignment

Dan O'Leary
Instructor and PhD Student
Industrial and Systems Engineering at Auburn University
dan.oleary@auburn.edu

Presented 6/23/2021

Introduction

- 2nd Career PhD student (ABD)
- Assist Dr. John Evans with Engineering Management and Product Innovation related initiatives
- Instructor, Business-Engineering-Technology Minor
- Master of Engineering Management, Spring ‘20
- Grad. Certificate, Modeling & Analytics, Spring ‘21
- 25 Year Entrepreneur, Interactive Software
- Dissertation Topic: AR and Digital Twins for Training
- BS Mechanical Engineering, Auburn 1992

AUBURN UNIVERSITY

INDUSTRIAL & SYSTEMS ENGINEERING

THOMAS WALTER CENTER for TECHNOLOGY MANAGEMENT

Agenda

- My vision for the Design and Innovation Center (makerspace)
- Alignment with Dean Roberts' vision for College of Engineering
- Strategic implementation
- Evidence of my ability to deliver

History

- 1980 Middle School Orientation
  - Vo-Tech classes
  - Shop, auto mechanics, etc.
- Parents Horrified
  - “…aren’t for college kids!”
- Tension: Knowledge vs Skills
  - Reflected academic trends
  - Response to changing workforce

Why not both?! 😩

Course Correction

- 20 Years Later – Changed World
  - Third Industrial Revolution
  - Globalization
- New Workforce Requirements
  - Theoretical and Practical
  - 21st Century Skills
- New Capabilities and Resources
  - Access to Information
  - Open Source & Rapid Prototyping

Filling the Void

- Maker Movement Emerges
  - 2001 FabLab at MIT
  - 2005 Make magazine, Dale Dougherty
  - 2006 Maker Faire, San Mateo, CA
- Widely Adopted by Education
  - Problem Solving and Critical Thinking
  - Communication and Teamwork
  - Technical Fabrication and Design Skills
  - Resiliency, Self-Efficacy, Engagement

FAB LAB

Maker Faire®

MAKERSPACE MISSION

 What? → Vision 👀

Culture, Connection, and Education

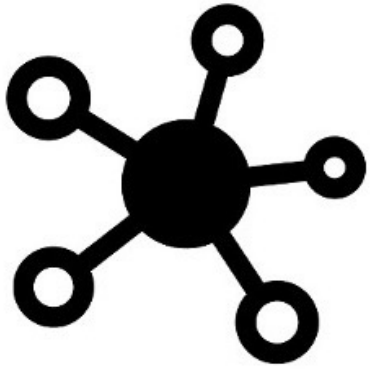
Culture

Grow and support the Maker Movement at Auburn and foster a diverse, vibrant Community of Practice as the CoE's undergraduate entry-point for Maker-related activities.

- Ensure the center is welcoming, with low barrier to early interaction
- Build a community that is encouraging and supportive
- Keep students engaged with a variety of activities and clearly defined "career progression" in the Center
- Celebrate and share success to build prestige and define group norms

Connection

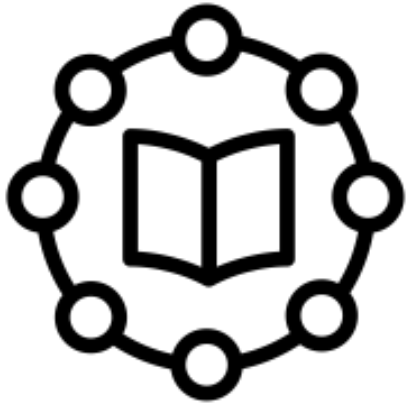
Coordinate and collaborate on Maker-related initiatives within CoE, across Auburn, and with other educational institutions and industry partners to share, improve, and amplify those efforts.



- Drive cross-discipline collaboration across Auburn's Maker eco-system
- Host related events for CoE student groups, departments, and faculty
- Contribute to the betterment of academic Makerspaces at large
- Develop mutually beneficial partnerships with industry

Education

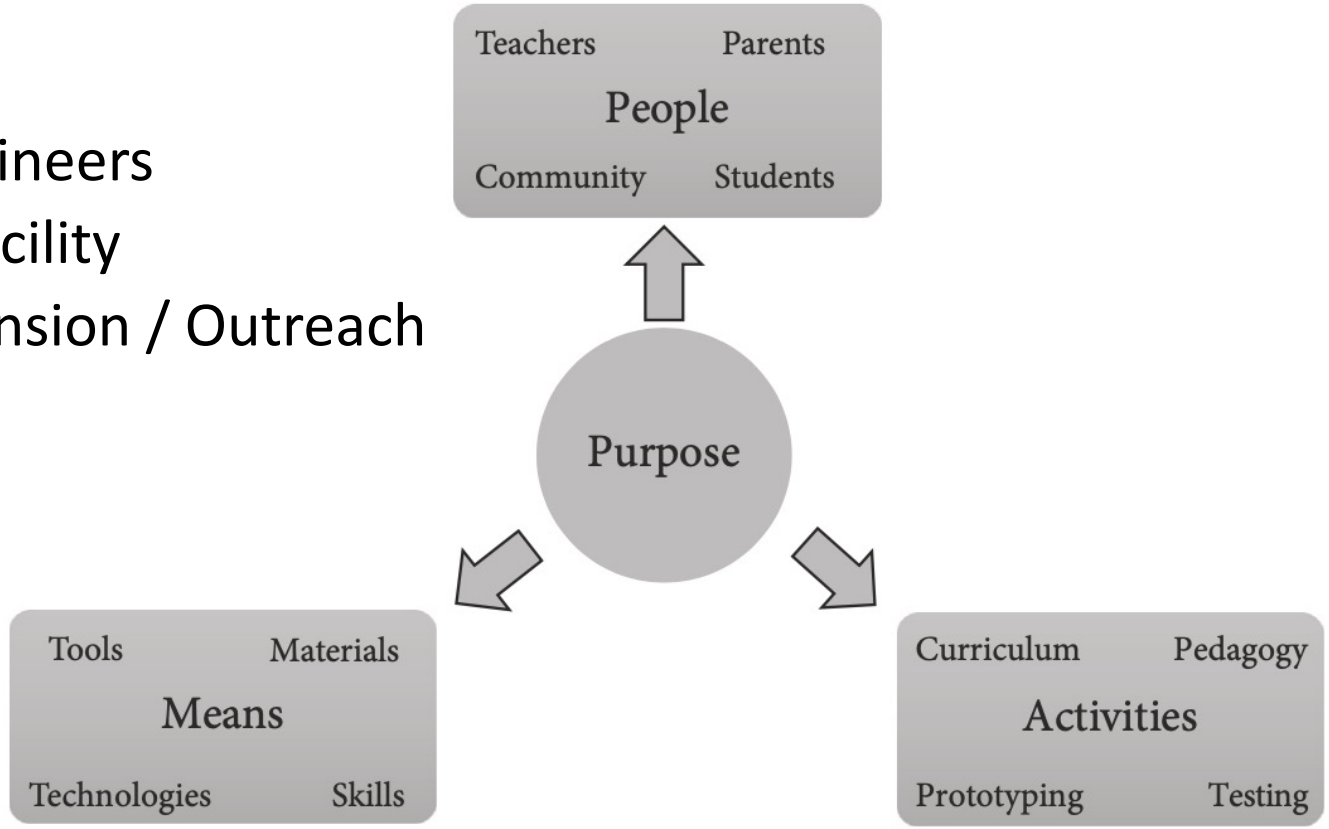
Supplement tool certifications, fabrication skills, and major coursework with other educational offerings that help to shrink inter-disciplinary gaps and teach or reinforce 21st century skills.



- Complement self-directed learning with expert just-in-time assistance
- Offer workshops and seminars that target valuable, underserved skills
- Stimulate values of curiosity, self-direction, creativity, and persistence
- Expand Scope – software, visualization, AR/VR, design, mechatronics

My Vision → Build a Shared Vision

- Aligning
  - Purpose – Outstanding Engineers
  - Means – State of the Art Facility
  - Activities – Education, Extension / Outreach
- Bias towards
  - People
  - Outcomes
- "Customer-driven"



Hira, A., & Hynes, M. M. (2018). People, Means, and Activities: A Conceptual Framework for Realizing the Educational Potential of Makerspaces. *Education Research International*, *2018*, e6923617. https://doi.org/10.1155/2018/6923617

MAKERSPACE MISSION

 Why? → Alignment ✅

Students, Research, Faculty

Alignment

- Auburn Vision & Mission Statement
  - Inspire, innovate, and transform
  - To improve lives through education, research, and service
- Dean's Vision for College of Engineering
  - Student-Centered Approach
  - Innovative Research
  - Dynamic Faculty

Vision and Mission Statement. (n.d.). Auburn University. Retrieved June 20, 2021, from http://www.auburn.edu

Student-Centered

National Leader in Engineering Education

- Based on experiential and constructivist theories of education
  - Create knowledge, meaning through new experiences, interactions
  - Student-directed and owned – teacher as facilitator, advisor
- Exactly the Makerspace approach!
  - Hands-on, project-based, with goals set and tracked by students
  - Interaction with diverse people, means, and activities
  - Supported by a community of learners; mix of students and faculty
  - No rigid hierarchy – everyone encouraged to learn, teach, create
  - Experimentation encouraged

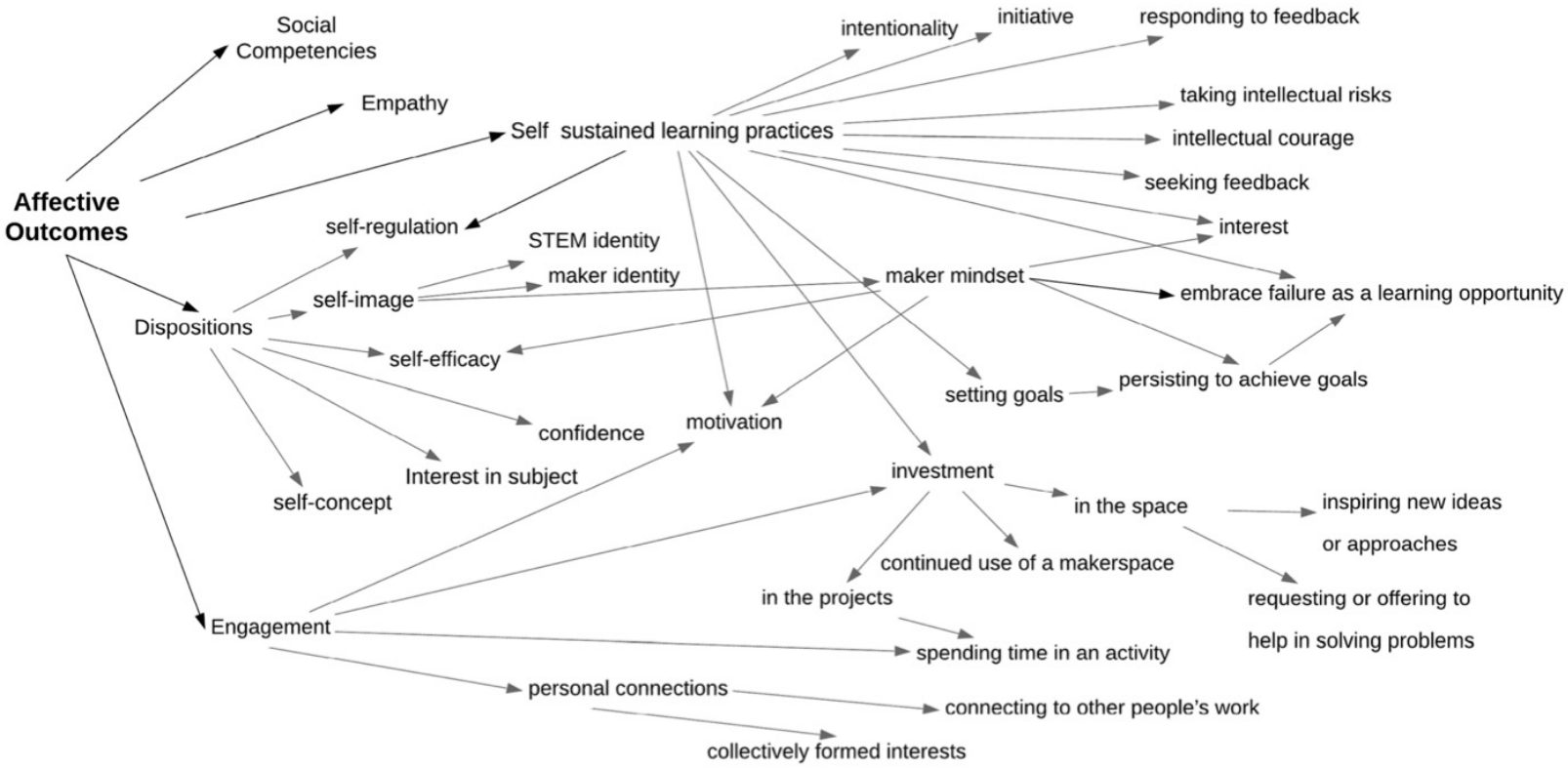
Student-Centered

National Leader in Engineering Education

Positive affective and cognitive outcomes.

Improved psychomotor skills.

Increased engagement and reduced absenteeism.

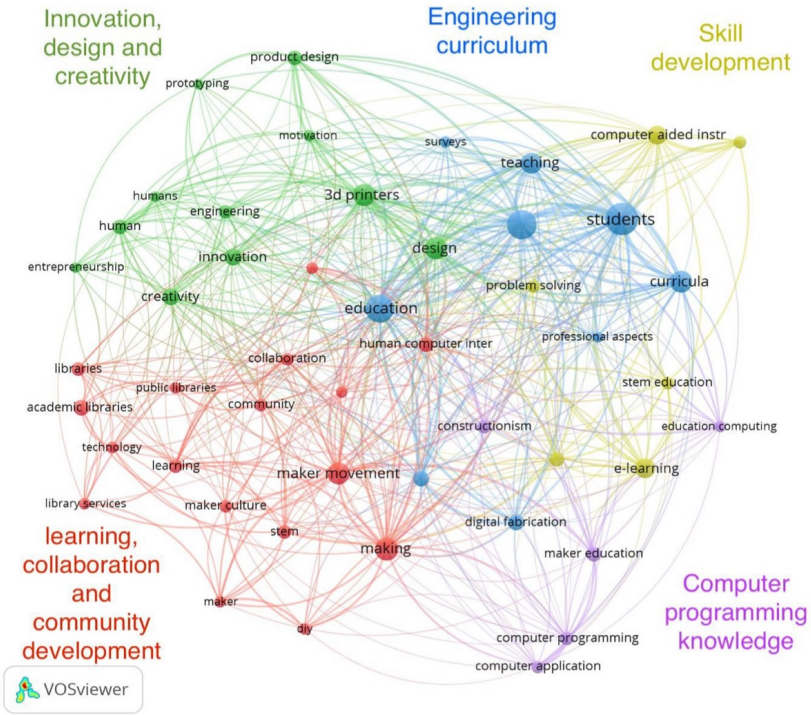


Mersand, S. (2021). The State of Makerspace Research: A Review of the Literature. *TechTrends*, *65*(2), 174–186. https://doi.org/10.1007/s11528-020-00566-5

Research

Improves Quality of Life, Economic Competitiveness

Makerspace-related research in its infancy, but accelerating
Leadership opportunity for Auburn and CoE



Sharma, G. (2021). The Makerspace Phenomenon: A Bibliometric Review of Literature (2012–2020). *International Journal of Innovation and Technology Management*, *18*(03), 2150006. https://doi.org/10.1142/S0219877021500061

Research

Improves Quality of Life, Economic Competitiveness

- Potential research areas identified include
  - Curriculum design in makerspaces
  - Engineering design methods in makerspaces
  - Instructional strategies for facilitating engineering projects
  - Assessment tools for measuring learners' engineering projects
- Design and Innovation Center as Makerspace and Research Lab
  - Quantitative studies to measure the efficacy of promised benefits
  - Longitudinal case study to report our processes and results
  - Collaborate with active research at nearby Georgia Tech and UF

Chou, P.-N. (2020). Guest Editorial: Maker Spaces in Engineering Education. *INTERNATIONAL JOURNAL OF ENGINEERING EDUCATION*, *36*(4), 1134–1135.

Dynamic Faculty

Excellence and Innovation

- Makerspace creates new opportunities for education, development, research, and outreach
  - Supports development of innovative student-centered activities
  - Allows faculty to learn new skills and participate in the community
  - Opens new lines of research related to those activities
  - Venue for service, outreach, and extension efforts
- Requires promotion of these benefits and education of some faculty
- Student outcomes will best demonstrate the value, drive interest

MAKERSPACE MISSION

 How? → Strategies 🏆

Some Goals and Tactics to Consider

Strategies

- Customer Discovery
  - **Interview students and faculty to solicit needs, build trust and empathy**
  - Better understand both problems and potential solutions
- Accessibility and Inclusion
  - Add signage directing visitors to an open, welcoming reception area
  - **Adjust / expand open hours to better match student usage patterns**
- Promotion
  - Routinely meet with CoE departments and student groups to inform and solicit input
  - Use mailing list to share Makerspace happenings and successes, encourage participation
  - **Develop a mobile demo station**
- Increase Diversity
  - **Develop cross-over programming with COSAM, CADC, and CoB**
  - Schedule and promote “open house” events where attendance is not limited to CoE
  - Build relationships with NSBE, SWE and other underrepresented groups
- Demonstrate Success
  - **Create a “Wall of Fame” to incentivize excellence, demonstrate output, share history**
  - Build an online portfolio of student work
- Learn from the Success of Others
  - **Create an Advisory Board with members from Auburn and our partners in education, industry**
  - Review the literature and popular press

Strategies

- Educational Programming
  - **Offer a 10-week boot camp for makers each summer, sponsored by industry (“Makership”)**
  - Plan an ongoing seminar series, presenters to include influential makers
- Protect and Secure
  - Coordinate with the departments of Innovation Advancement and Commercialization, Risk Management and Safety
- Build Community
  - **Identify and recruit great student Makers in High School and Community College programs**
  - Support the student and faculty staff with training and development activities
  - “Maker In Residence” program
- Host Events
  - Student groups, e.g., AuburnHacks, ACTC, Grand Challenge, TigerDev
  - **National programs, e.g. I-Corps, H4D**
  - Annual Maker Faire and Hackathon
  - Halloween Costume Contest
- Develop Industry Relationships
  - **Connect their problems with student teams; use for contests, eventually funded**
  - Solicit sponsorships from partners that recognize the value of student teams and candidates
- Communicate
  - Make effective use of Social Media to share activity in the lab
  - Create an open Slack workspace to build an online resource and community

MAKERSPACE MISSION

 Who? → Evidence 

My Credentials

My Credentials

- This position requires someone that:
  - Is a credible maker
  - Can manage and develop culture, people, organizations, and partnerships
  - Is a proven leader
  - Has experience working with Auburn students, faculty, departments, Makerspace, and CoE

My Credentials

- Maker
  - Model rockets, R/C planes and cars, race car, jeeps and ATVs, recording studio, 20-gpu crypto mining rig
- Developer
  - Co-founded and built a lasting, resilient, innovative, creative culture of up to 120 makers on 7 teams
  - Created 44+ games on 12 platforms with 20+ partners in 23 years
  - Founded a 2nd company and secured licenses with 120 partners in less than 8 years, before selling in 2021

My Credentials

- Leader
  - Led through 23 years fast-paced change in a turbulent industry, in good times (rapid expansion and royalties) and bad (death of CEO and global financial crisis)
- Educator
  - Reworked the BET first year curriculum to increase student engagement and rigor, integrated 8 Makerspace prototyping labs
  - Moved from TA to Instructor of Record, then Instructor in 3 years
  - Co-developed four different proposals for Auburn
  - Developed ISE partnerships with I-Corps, H4D, Air University, Jeff DeGraff and the Innovatrium, and 8 major universities

Closing

- CoE’s Makerspace is a state-of-the-art facility with huge potential
- Opportunity to build on that success – “lead and shape the future”
  - Support best student-centered engineering education in USA
  - Make valuable contributions to related research
  - Aid the development of outstanding faculty
- Result – outstanding graduates that make valuable things happen
  - Serve companies, industry, the world
  - Grow the reputation and prestige of AU

Thank You for Your Time and Consideration.

War Eagle