

## IMPACT Profile – Technology Leadership and Innovation/Engineering Technology Teacher Education

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### Section 1 – About IMPACT and the Profiles Directory:

The mission of the [IMPACT program](#) is to improve student competency and confidence through redesign of foundational courses by using research findings on sound student-centered teaching and learning. IMPACT's team of instructional, technology, and library specialists work with Purdue professors to transform traditional lecture-based foundational courses into student-centered active learning environments. IMPACT Profiles serve as a record of this transformative process and the impact and implementation of redesigned courses.

The IMPACT Profiles Directory is a collective of faculty profiles that facilitates readers’ ability to identify best practices in course transformation processes and college teaching. Furthermore, the IMPACT Profiles Directory functions to enhance faculty’s scholarship of teaching and learning in that it creates case studies of field specific course transformation processes and outcomes that can become the basis for conference presentations and future scholarly articles, making teaching practices public and peer reviewable.

### Section 2 – Research Abstract:

This profile highlights the course redesign and transformation of a foundational first-year course in Purdue University’s College of Technology. The faculty involved in this redesign were focused primarily on accomplishing two things with the course transformation. First, faculty recognized that the initial course objectives focused on students learning general skills that are taught throughout the University – career awareness and study skills. The goal with the course redesign was for students to learn skills that are unique to the fields of study within the College and for students to experience a student-centered pragmatic approach to teaching and learning. Second, faculty wanted students to learn a holistic and

team-based approach to problem solving through the design process. Faculty have been collecting data about the impact of the varying elements of their redesign on students' learning outcomes. Although they ask multiple research questions about their redesign, the faculty focus their inquiry on the impact of collaborative learning and peer evaluation.

### **Section 3: Faculty Profile:**

Professor Mentzer is an Assistant Professor in Purdue University's Department of Technology, Leadership and Innovation within the College of Technology. He has a joint appointment within the University's College of Education with a primary role in the Teacher Education program, certifying middle and high school Engineering Technology teachers. He has been teaching for more than five years. Purdue is his first experience teaching at the college level.

Prior to joining Purdue in 2009, Professor Mentzer taught technology applications for several years at the middle and high school levels. Professor Mentzer won several teaching awards during his teaching career at the secondary level. He transformed the ways in which students were able to engage with him and his course content by bringing hundreds of thousands of grant dollars to small school districts.

### **Section 4: Course Profile:**

Professor Mentzer, along with a group of other faculty within the University's College of Technology, redesigned Tech 120: Technology and the Individual, which is a foundational introductory course. The course is now TECH 120: Design Thinking in Technology.

#### **4.1 – Where the course falls within the College of Technology degree programs**

Although students at different levels – sophomore to graduate – and from varying programs take Tech 120, it is targeted as a first-year course that meets the University's *Science, Technology, and Society* core foundational learning outcome, and is required by all students in the college regardless of their major. TECH 120 is one of three College-level core courses.

#### **4.2 – Historical data**

**Specific Learning Objectives:** Prior to the redesign, Tech 120 focused on career awareness and study skills. Two faculty taught the 3-credit traditional lecture course in sections of 120 students.

#### **4.3 – Faculty narrative about the course**

##### **What challenges exist for faculty teaching a course of this type both at and beyond Purdue?**

Professor Mentzer has been teaching this course for one year so he has not yet formally explored this question. According to Professor Mentzer, it is complicated to discuss widespread challenges across different universities because each context is different. Elements of the content he teaches in TECH 120 may be spread throughout multiple courses at other universities.

**Teaching and learning development opportunities – what did you want to enhance?** Students will take this course as an introduction to fields within the College and will hopefully say “wow,

this [course] is engaging. This is what I want to do. This [type of learning experience] is why I came to college.” Instead of forcing students to learn, Professor Mentzer wants to foster learning environments in which students ask to learn.

Additionally, Professor Mentzer recognized the content focus of TECH 120 prior to the redesign – career awareness and study skills – was not what made the College of Technology unique. “Study skills are really generic to the entire University, why are we doing it?” Faculty involved with the redesign, then, wanted to make the course more reflective of what makes the College of Technology unique, which is in part a student-centered pragmatic approach to teaching and learning.

**Course goals for engaging IMPACT:** Faculty who redesign courses through the IMPACT project have priority access to active-learning classrooms and spaces on campus. For the faculty involved with redesigning TECH 120 the primary goal for engaging IMPACT was to gain access to these spaces in order to enhance the levels of engagement and the sense of community within the course. Additionally the faculty involved with this course redesign recognized that their prior teaching structure – each professor teaching their own version of the course – would not work from a consistency perspective moving forward when considering a redesign. The faculty engaged IMPACT, then, to bring them together as a team to develop course goals and specific learning objectives.

#### **Redesigned course framework and rationale:**

Professor Mentzer implemented a hybrid course model for one of the sections. In this particular section, students are able to engage certain online course materials before class meetings, which facilitates students’ in-class group activities.

Professor Mentzer also scaled-up the course from 60 to 700 students. To support the scale-up and redesign, he introduced rubrics for streamlining and standardizing assessments. In addition to homework and varying assessments administered throughout the semester, students work in groups to produce a final project. Students earn individual and group-based grades for the final project. Professor Mentor implemented various elements of CATME, a teamwork-facilitating software that “prepares students to function effectively in teams and supports faculty as they manage their students’ team experiences.” With the use of this tool, faculty can algorithmically assign students to teams. Students can learn how to work in teams and can self and peer-evaluate in constructive ways.

#### *Course goal statements:*

The learning outcomes for the course revolve around a holistic approach to problem-solving, by first acknowledging problems that exist, then creating a structure to solve the problems, and finally, being able to effectively communicate the whole process. Approaching problem-solving this way places less focus on analysis and more on the practical side of technology, benefitting students from all majors.

### *General Learning Outcomes*

At semesters' end, students should be able to:

1. Demonstrate an ability to think holistically through design processes
2. Apply information literacy concepts in determining if real-world problems exist
3. Develop problem solving design projects
4. Communicate synthesized results to a broad audience

### *Specific Learning Objectives*

1. Identify problems within case-studies and self-directed empirical studies
2. Develop ideas by brainstorming collectively – with peers from varying technology content areas - to discuss potential solutions to problems identified within case studies and empirical studies.
3. Identify stakeholders and stakeholders' needs
4. Analyze potential solutions to determine if they match the problems
5. Investigate what has been done before to address similar problems and then examine their own solution ideas to determine how they are novel or how they build on or in addition to what others have done
6. Prototype and test solutions and collect data for making data-driven decisions
7. Develop a project plan and a team management plan
8. Create a scholarly poster to discuss the problem solving design, data, and results

## **Section 5: Research Questions**

Professor Mentzer has a number of questions related to the learning impact of this course redesign, some of which he and a research team are currently investigating. Below are some of his questions, not in a particular order.

- 1) Did students CATME/self and peer-rating scores improve from one administration to the next throughout the semester?
- 2) Were improvements and or changes in students' CATME/self and peer-rating scores different based on:
  - i. Students' classification, i.e. First-year students
  - ii. Gender
  - iii. Ethnicity, i.e. minority or majority students
  - iv. Whether students were transfer students or not
  - v. Different course instructors
- 3) Do students' self and peer ratings correlate? How is the correlation influence by
  - a. Gender
  - b. Ethnicity

- 4) Does students' individual contribution to their respective teams, measured by self and peer evaluations, correlate with students' individual grades?
- 5) Do individual grades correlate with group grades that are moderated via CATME?
- 6) Do final project scores correlate with semester grades?
- 7) Does group size make a difference?

## **Section 6: Discussion**

What does this research suggest about teaching and learning within this particular discipline?

\*\*Researchers involved with this course redesign are drafting manuscripts to discuss their research findings. Once their research is made public, this portion of the profile will be updated.\*\*