

Exploring Intrinsically Motivated
LEARNING
by Engineering Students

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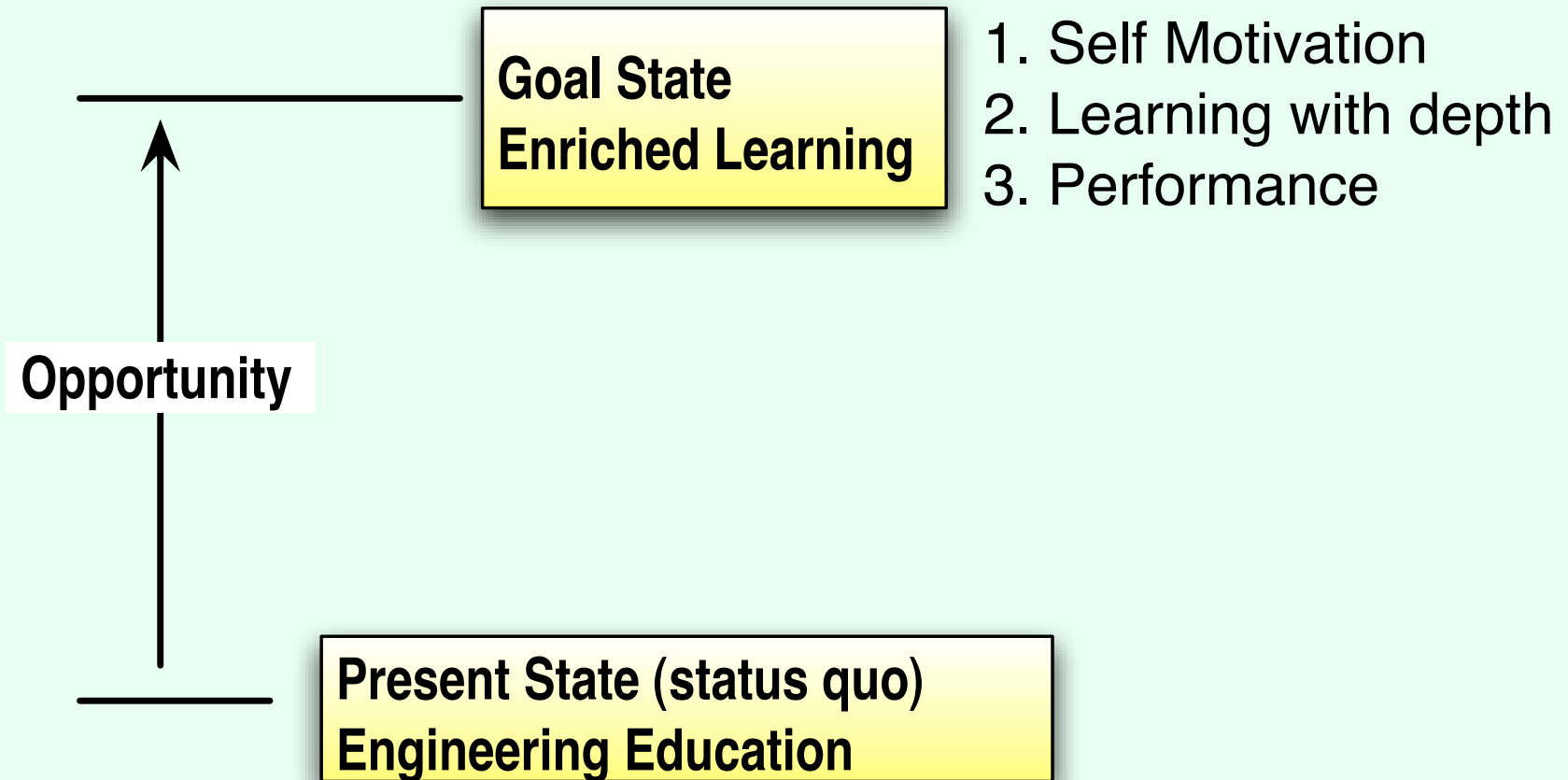
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Learning--**Goal State**

If you were magical, what traits would your students have after they complete your courses and your program? That is, what really matters? Dream big.

For now, imagine that constraints do not exist.

Vision of Enriched Learning in Engineering Education



Pursuing the Vision

- To design is to image that which does not yet exist & bring this into being
- To design is to develop a system that meets the needs of end users
- **Design Mindset**--We can design enriched learning environments. These environments empower and produce powerful learning by diverse engineering students and teachers in multiple contexts

Knowledge Informing Design

- **Requisite Knowledge**--to design an enriched learning environment, we need to understand how people learn
- **Research Literature**
 - * Wealth of information
 - * Application Issues
- **Research Need**
 - * Understand key design factors associated with how people learn
 - * Understand engineering student point of view--that is, understand how to meet the needs of the end user (customer)

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Research Question

How do engineering students engage in and describe learning when the learning is intrinsically motivated?

Grounded Theory

- **Selection:** Select GT for discovery. That is, we don't know which variables are important, what their properties are, and how they are related
- **Purpose:** Apply GT to build a theory that is built upon (grounded) in the point of view of the participants
- **Approach:** Build theory by identifying, developing and relating concepts that are the building blocks of the theory

Mindshare on Theory

- **Definition:** A theory is a set of well-developed concepts that are linked through statements of relationships such that the whole provides an integrated framework that can be used to explain or predict phenomena
- **Rationale:** A theory of learning provides a framework to design enriching learning environments

Applying Grounded Theory

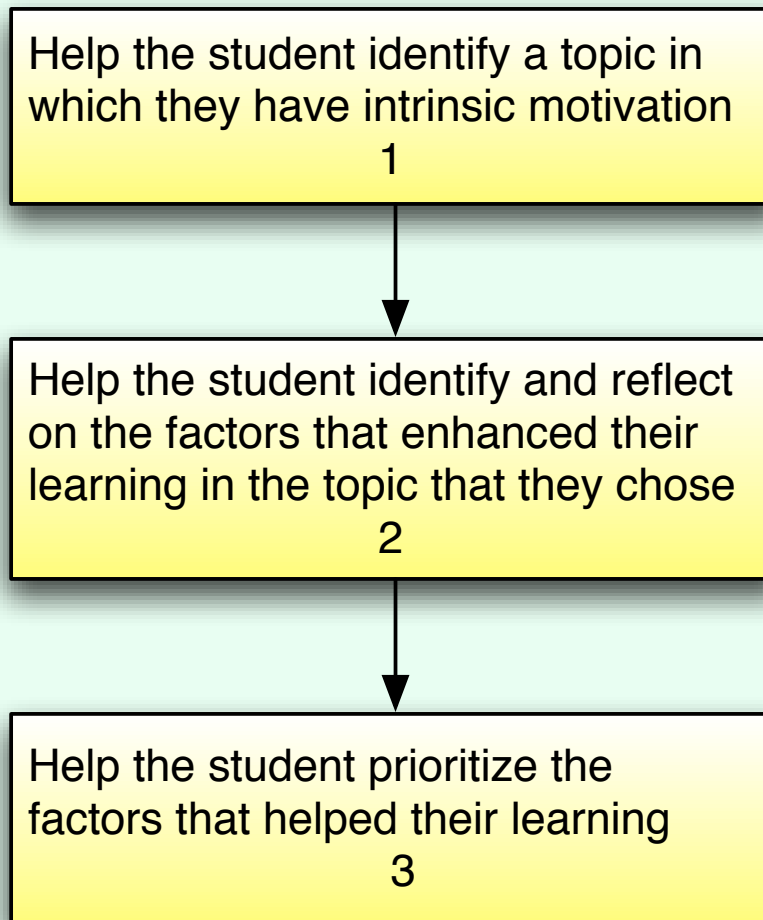
Input: RQ = *How do engineering students engage in and describe learning when the learning is intrinsically motivated?*

Methodology

1. Designed, tested, & improved an interview instrument.
2. Interviewed 8 participants & transcribed the interviews.
3. Open Coding--identified the main concepts, their properties, and the location of these property along a continuum (range).
4. Axial Coding--selected the primary concepts. Identified how the primary concepts related & linked.
5. Selective Coding--integrated and refined the theory. Presented the theory using pictures.

Output: Two diagrams that present a theory of learning from the point of view of engineering students

Methods for Semi-structured Interview

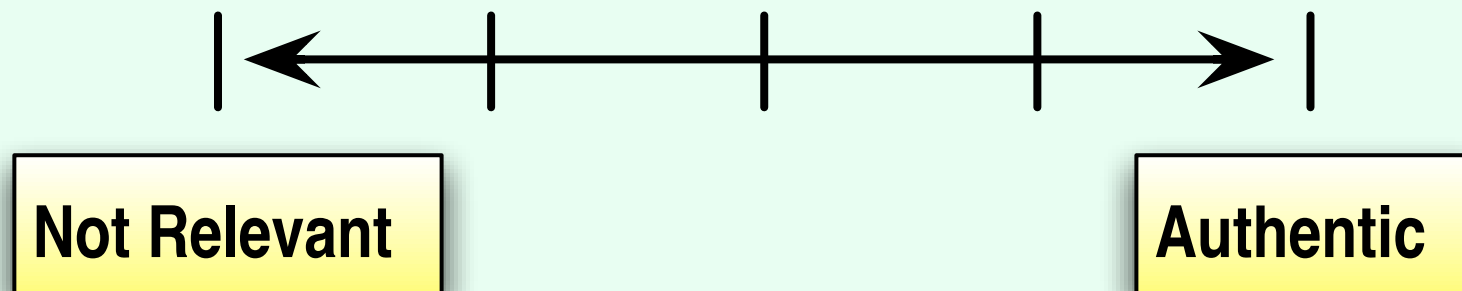


Participants

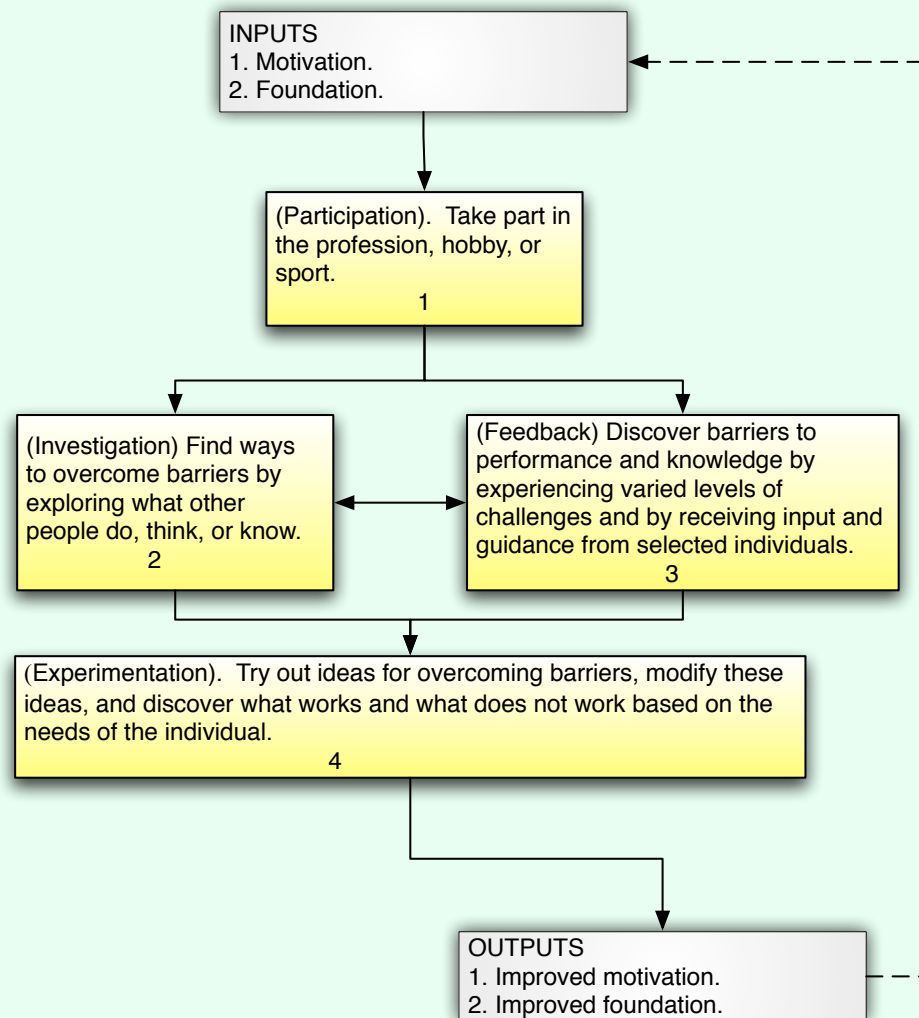
Demographic	Domain of Learning
Female-sophomore	Fixing Cars
Female-freshman	Math
Male--junior	Rock Climbing
Male-junior	Downhill skiing
Male-freshman	Leadership (Boy Scouts)
Male-sophomore	Ultimate frisbee
Male-senior	Documentation/Report Writing
Male-senior	Spiritual (Christian Lifestyle)

Engineering students engage in and describe learning through the lens of “authentic participation”

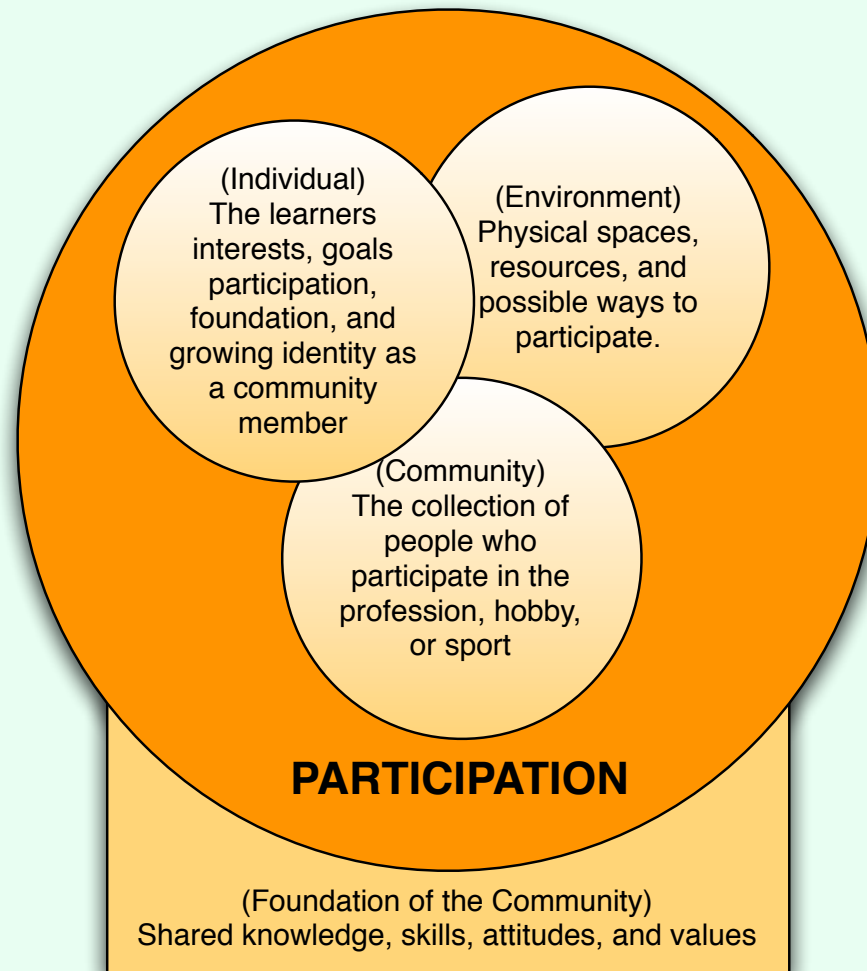
- Description. Participation involves learning the performance by doing the performance
- Dimensions. Participation spans a continuum from irrelevant to authentic



Engineering students engage in learning in a cyclic process



Engineering students engage in learning by finding a physical and social environment. Community aspects are central to learning.



Summary of Study

- **Design Mindset**--Empower learners by designing enriched learning environments
- **Knowledge**--Inform design with knowledge of how engineering students learn
- **Present RQ**--*How do engineering students engage in and describe learning when the learning is intrinsically motivated?*
- **Results**--A theory of learning grounded in the experiences of the participants in the study

Results: A framework for designing learning environments (i.e. a theory)

1. Engineering students engage in and describe learning via participation. Learning without **authentic participation** loses much of its potential value.
2. Engineering student engage in learning with a **cyclic process** comprised of foundation, participation, investigate, feedback, and experimentation.
3. Engineering students engage in learning by finding a physical and social environment. The social or **community aspect** is central to learning.