Products exist to solve customer needs.

Marketers Understanding Engineers and Engineers Understanding Marketers: The Opportunities and Constraints of a Cross-discipline Course Using 3D Printing to Develop Marketable Innovations

Louis Reifschneider Peter Kaufman

Technology ←→Marketing

Illinois State University

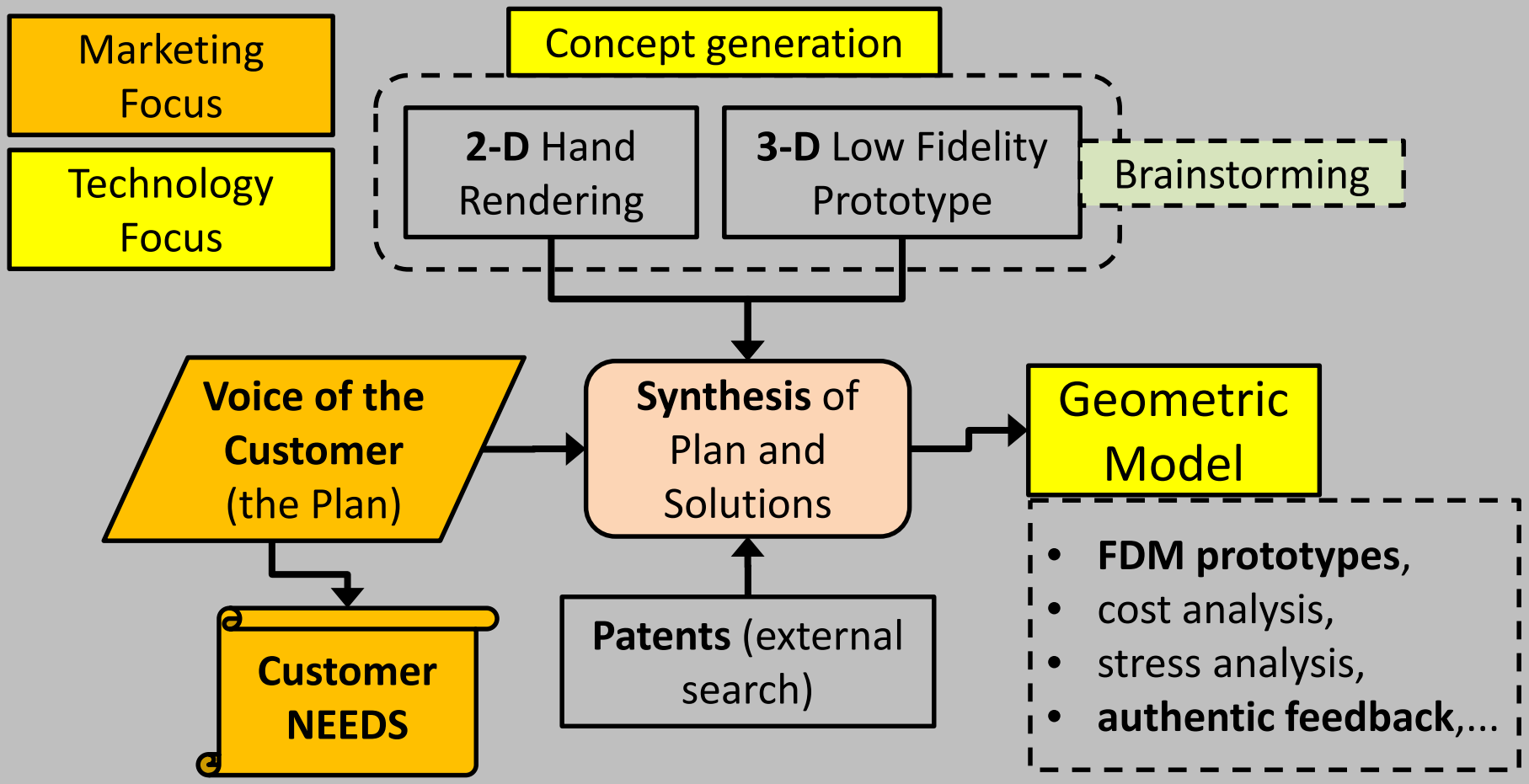
Points to take away from presentation today

1. The **geometric model** of a design **begins with the customer in mind**. **Products exist to solve customer needs.**
2. **Low-fidelity** prototyping allows all members of a design team to **communicate** their ideas **without specialized training**, CAD skill, to create geometry.
3. Fused deposition modeling creates **alpha prototypes** on **non-trivial products** within a one semester course.
4. Alpha prototype provides **authentic feedback from customers** and thus creates an **authentic design experience** for the student: one in which a product is designed, then built, and then tested by a customer.

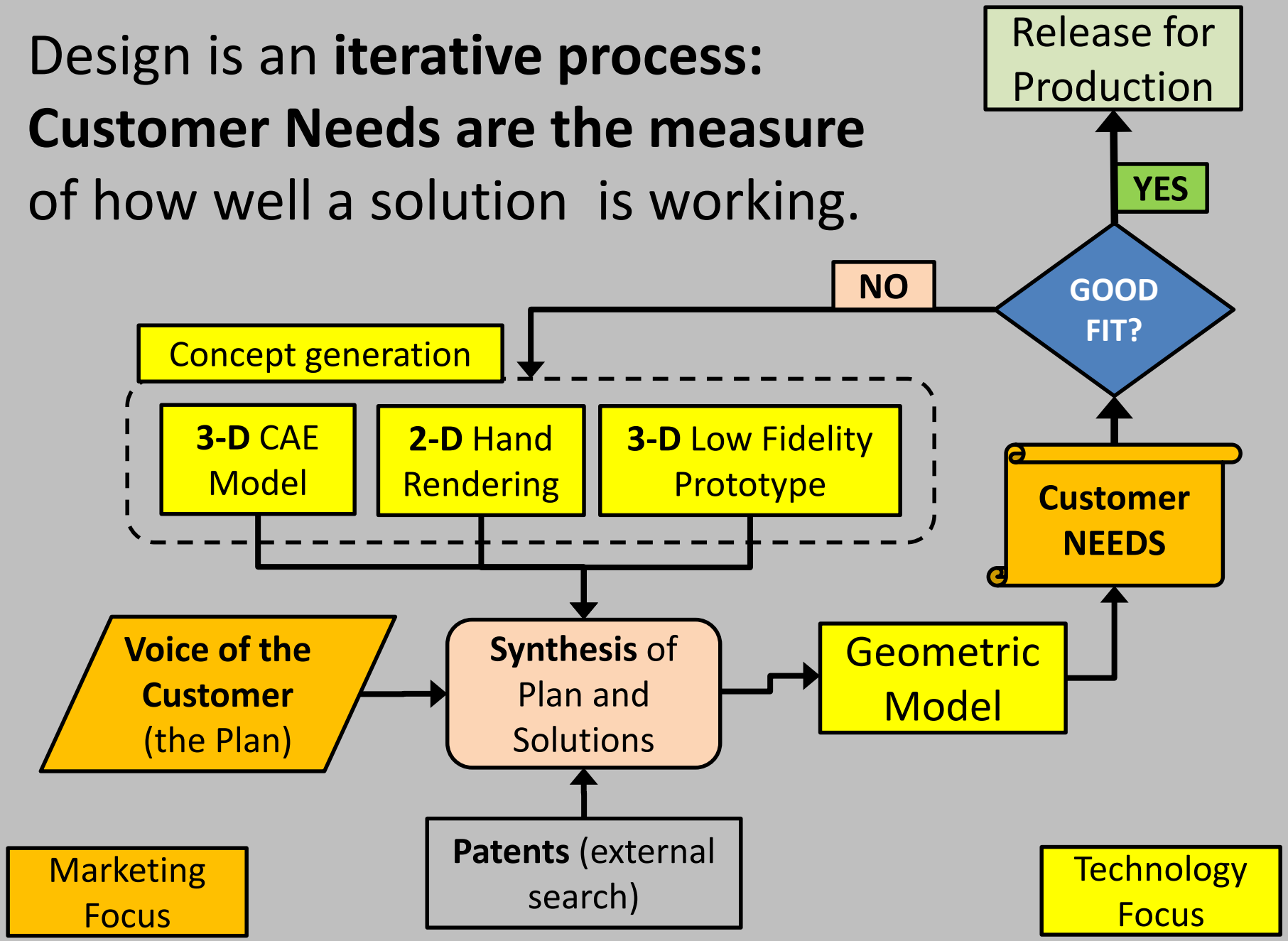
A brief history of the collaboration between Dr. R Technology and Dr. K Marketing

- 2009 Dr. R. told by TEC graduate at major company that "**having TEC students interact with students outside their program**" would be very beneficial.
- 2009 - 2011 Drs. R & K collaborate: guest speaking, their undergrad TEC and Marketing classes collaborate on short term projects.
- **Spring 2013 and 2014** New Product Design and Development (**NPDD**) course taught with **Senior TEC students and MBA Marketing students**.

New product development is a **synthetic process** where customer **needs** (marketing) **are converted into solutions** (geometric model) to meet needs.

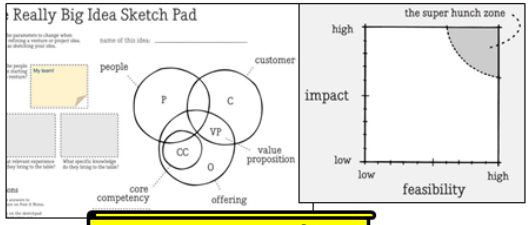


Design is an **iterative process:**
Customer Needs are the measure
of how well a solution is working.



Product Development as done in the NPDD course

THE PITCH



Market Potential?

Week 3

THE VOTE

Resumes

Each Team
- Project Manager
- Lead CAD Designer
- Lead Fabricator
- Market Researcher

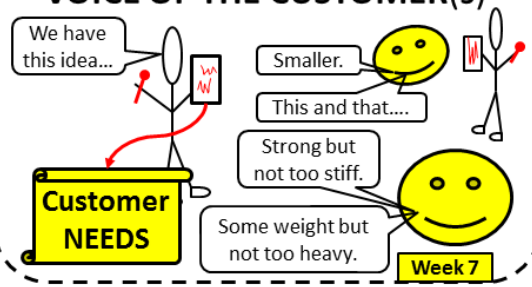
TEAM FORMATION
- Mutual Interest
- Complementary Skills

ALPHA PROTOTYPE in 10 weeks!

Week 4

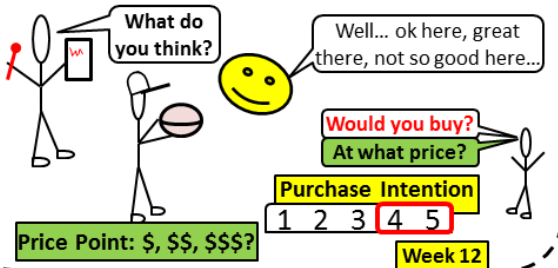
Team Mission Statement

VOICE OF THE CUSTOMER(s)



Week 7

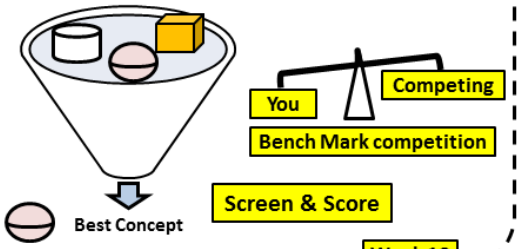
Concept Testing



Price Point: $, $$, $$$?

Week 12

Concept Selection

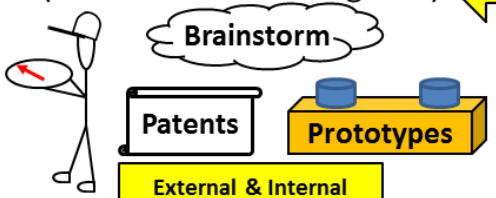


Week 10

TEC STUDENT — DESIGN REVIEW

Concept Generation

(customer needs as guide)



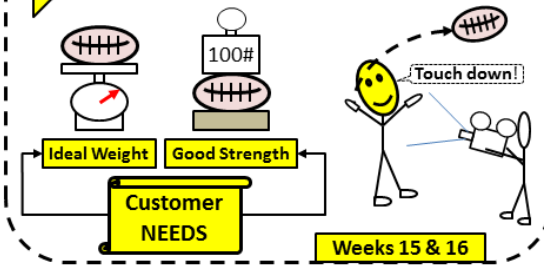
External & Internal

Week 8

the same

Prototype Testing

(customer needs as guide)



Weeks 15 & 16

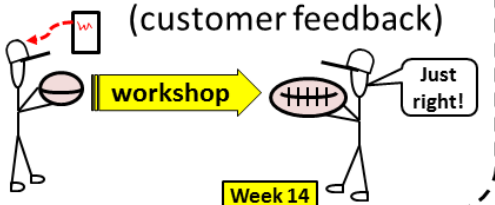
Marketing & Technology

Final Prints & Financial Model

Week 13

Finalize Alpha Prototype DUE

(customer feedback)



Week 14

10 weeks after VOTE

New Product Design and Development – THE CARTOON © LRPK 2014

Customer NEEDS

Customer Needs drive the design process: define the boundary of good and not so good solutions.

A **POSITIVE attribute** of the product that addresses a need.

Objective Measure to assess how well need is being met.

Criteria No.	Focus	Final Customer Need Statement	Weighting Factor	Metric (Measure)	Metric Description
1	Easy to carry	Easy to carry in and out of stores	30%	Dimensions and Weight	Girth (LxWxH) and Weight (lbs) of the unit
2	Size	Support the shopping materials I need	25%	Surface area	Usable surface area for storage (in^2)
3	Easy to attach	Will quickly attach to the cart	25%	Time	Seconds to attach
4	Security	Will stay attached securely during use	10%	Pounds force	Resistance to pulling of the cart (lbf)
5	Price	Will be priced economically	10%	Dollars	Price point

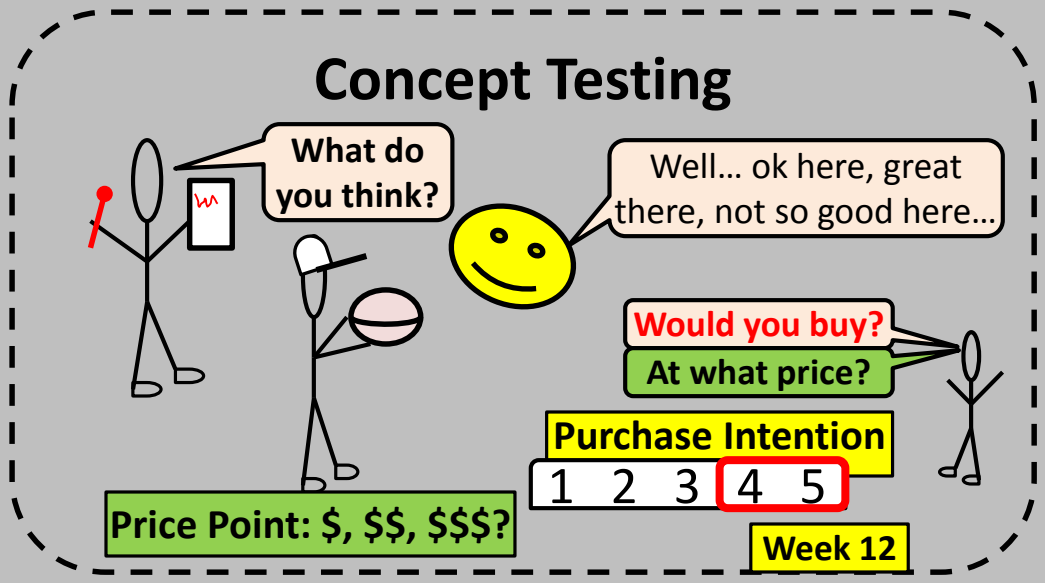
The number of NEEDS is relative few. Fewer constraints facilitate solutions.

Relative importance of need

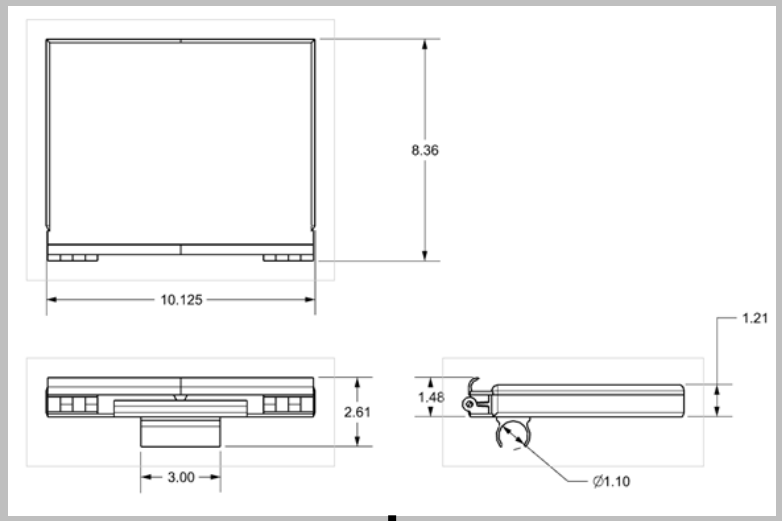
Used to score alternative designs

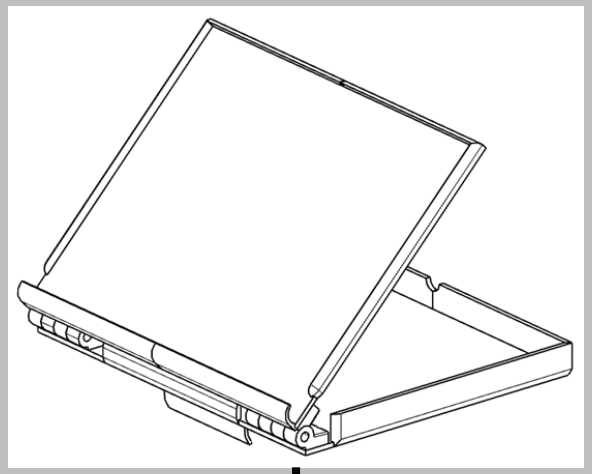
Customer Needs from representative NPDD class project: Dashboard

Low fidelity prototype made with foam core to perform concept testing with customers.



Computer-aided design of product used to create FDM and perform cost analysis.





STL files for FDM

Component data for financial model of product

Many but not all components of alpha prototype are made with fused-deposition modeling.

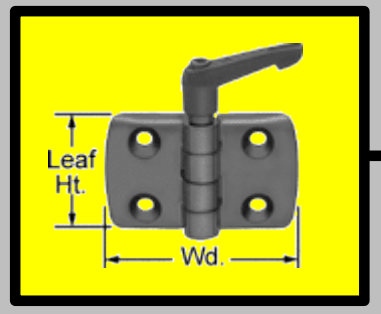
Red parts are made with Fused Deposition Modeling (FDM) (rapid prototyping).

Acrylic sheet stock used for flat areas

Lower costs materials are used when appropriate such as acrylic sheet stock.

Some part geometry was sourced from on-line vendors and incorporated into designs.

A self-locking hinge allows adjustable pitch and storage mode for product.



1. Assembly model of hinge saved from vendor site as a STEP file.
2. Edits made to integrate features of hinge into dash board design.

Dashboard product in use during prototype testing

3D models help develop products and
Product design develops innovation skill in team members.

Conclusions – important lessons learned.

- **Technology students learn** that **marketing data drives design**: products do not exist because a "constraint-based" problem was solved.
- **Marketing students gain exposure** to the **software and hardware** used for prototype development.

BOTH groups

- Learn that **products exist that meet customer needs which can be made at an economical price point,**
- **Gain experience collaborating** on a significant project **with people of diverse backgrounds**.

Acknowledgement
and follow-up question

- **Does the cross-discipline design activity develop innovation skill within team members?**
- The work Drs. Reifschneider & Kaufman have done to assess development of innovation skill while engaged in a design activity is beyond the scope of this talk.
- Research about how design develops innovation skill was conducted during the Spring 2014 offering of he NPDD course. This study was supported by the Illinois State University Scholarship of Teaching and Learning (SoTL) Small Grant Program sponsored through the Office of the Cross Chair in SoTL.

Questions?

THANK YOU