Crabbing Crane

How can 3D printers be utilized to design digital and physical prototypes for the development of marine products?

Suggested Equipment Skill Level

Advanced User

Equipment Skills

Tolerances
3D Design

Industrial Engineer

Career & Skillset Connections

-Analyzing and troubleshooting
-Critical Thinking
-Management (time, quality, personnel)

Project Guiding Themes

-Engineering design process
-Designing in 3D modeling software
-Designing a prototype that meets multiple constraints

Suggested Software & Materials

-3D Modeling Software
TinkerCAD, OnShape, Autodesk Fusion 360, Autodesk Inventor, Solidworks

-String/Rope/Rubber Band

Aligned VDOE CTE Course(s) and Competencies

Engineering Drawing and Design
36-Weeks

Modeling & Simulation Technology
36-Weeks

Communication Systems
36-Weeks

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Crabbing Crane

3D Printing-Advanced Skill Level

How can 3D printers be utilized to design digital and physical prototypes for the development of marine products?

Project Problem & Career Prompt

As an Industrial Engineer with expertise in marine deck crane design for fishing vessels, your mission is to collaborate with the maintenance technician, lead foreman, and chief engineer of a vessel to create a superior crane for the upcoming crabbing season. The new crane should be both stronger and lighter, capable of handling crab pots weighing over 800 pounds, while also being cost-effective.

Project Background & Resources

Understanding tolerancing
Researching and knowing different types of fasteners and how they work.

Investigative Questions

What are the types of cranes used in the maritime industry and what are they used for?
What types of environments will the crane be exposed to?

Project Criteria

-Crane must be composed of a minimum of 5 different parts and 3 types of fasteners
-Consider how the design would be improved for weathering, inclement weather, and cost
-Physical prototype must visually resemble a deck crane
-Final physical prototypes must be completed prior to project deadline

Project Constraints

-3D printer must be used for all parts except for rope/string/rubber band used for the lines
-3D printed part must be designed by your team in CAD or other 3D modeling software (cannot use prefabricated 3D model as the part to be printed)
-No constraints on prototype size.

Suggested Pacing

1-2 Days of research on crane designs and crabbing vessels	5-7 Days of sketching, 3D modeling crane parts, and 3D printing parts	3-4 Days of assembling crane, adjusting and reprint parts then final assembly

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Crabbing Crane

3D Printing

Career & Skill Set Connections

Industrial Engineer

Industrial Engineers are responsible for applying engineering theories and principles to industrial layout and manufacturing processes.

Essential Skills

*Math
*Creativity
*Project Management
*Problem Solving
*Oral and Written Communication Skills

Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree
or
Master's degree

Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

Engineering Drawing & Design

Exploring Engineering Design Foundations

Create objects using solid modeling

Producing Illustrations

Create parts of the assembly using a 3D printer

Prepare freehand technical sketches

Communication Systems

Designing Communication

Explain the design process

Produce technical drawings to scale

Exploring Digital Visualization

Generate a simple, digital 3D model

Modify a simple, digital 3D model

Modeling & Simulation Technology

Exploring Modeling & Simulation

Identify types of modeling and modeling tools

Evaluating Complex Systems

Design a 3D working model, using 3D software

Produce a physical model based on requirements from a 3D design

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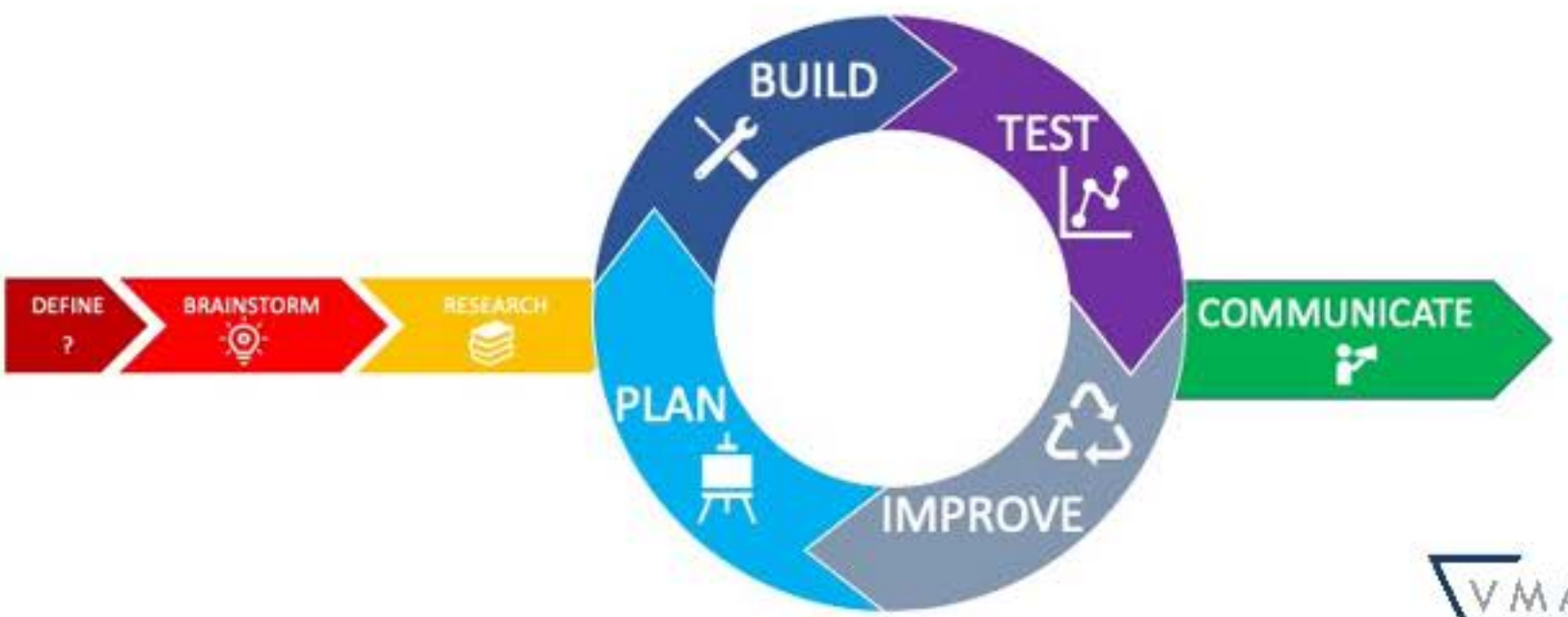
Project Management Plan

Team Member Roles

Team Goals & Timelines

Team Member Tasking

Sketches & Design Planning



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