REMEDIATION IN SOUTH BROOKLYN INNOVATION CHALLENGE
COURSE SYLLABUS
Create Innovative Solutions to Society's Complex Challenges

Instructor: Program Lead: New York Academy of Sciences
Course Time & Format: 10 weeks; approximately 2-4 hours weekly
Format: Blended; Online
Age Level: 13 - 17 years old

NOTE TO TEACHERS

This is a sample Innovation Challenge course syllabus and rubric that has been developed for the Civics 2a. Project. Each Innovation Challenge will be adapted and modified depending on the overarching topic. The Innovation Challenge project is property of The New York Academy of Sciences' Junior Academy.

COURSE DESCRIPTION & OBJECTIVES

Innovation Challenges are an introduction to foundational concepts of design thinking with an emphasis on developing and testing new solutions to society's greatest challenges. The Junior Academy Innovation Challenges require students to work in self-selected, distributed teams, requiring cross-cultural communication, dynamic problem solving, deep critical thinking related to society, leadership and project management skills.

Students must first identify their project team and then work together with a mentor to apply design thinking processes to approach the real-world problems of an innovation challenge with the Junior Academy. While each student must identify their own role within the team, together they will learn how to identify and map out a real problem and ways to build and test solutions quickly through an iterative, scientific approach. This course requires extensive student collaboration and regular engagement through The Academy's Junior Academy and its online platform, Launchpad.

THE CHALLENGE

With an eye to reducing and eliminating the challenges posed by climate change, New York City is committed to creating a fully renewable electricity grid by 2040. As the city struggles with limited space and resources for over 8 million inhabitants, offshore wind has become an increasingly viable option. However, issues such as noise contamination, pollutant runoffs, urban heat effects

and more can pose challenges to people and their environment. This is a challenge to design solutions that remediate the building of offshore wind renewable energy infrastructure in New York City through the lens of STEM and the community, focusing on land and water preparation.

Student Challenge: At the South Brooklyn Marine Terminal in Sunset Park, there are areas on land and in the water that call for immediate remediation to prepare for the new offshore Empire Wind complex.

Focus on **one** of the following areas and design a comprehensive solution for remediation:

- Preparation for building on land
    - Noise/traffic/actual construction/air monitoring
    - Current buildings from 1970s
    - Regrade hydraulics separator for run-off stormwater
- Preparation in the water
    - Marine traffic
        - Wind turbines and other building materials are taken in via barge or other water vessels
    - Dredging
    - Living edge/shorelines
    - Pile driving
        - Construction approach that is used to build the foundation of a new structure

Integrate the following into your solution:

- Social justice
    - A concept that asserts every person should have the same rights and opportunities, and that wealth and resources should benefit everyone - is not always integrated into remediation, making already disadvantaged communities even more vulnerable to negative impacts of climate change.
    - Think about how social justice can be included in your solution, looking at racial, urban, identity, accessibility, and/or environmental justice.
- Community co-design
    - The shared mapping of a problem, identifying shared priorities, and designing, implementing and evaluating a potential solution together with those most affected by the issue (in this Challenge, residents of Sunset Park).
- New or adapted technologies (AI, AR/VR, nanotechnology, materials, robotics),

- Processes, steps (such as detecting seafloor anomalies/seafloor mapping, underwater sea vehicles) that are preliminary to your solution.

Innovative solutions may be completely new ideas or solutions that have worked in other regions but are adapted for New York's unique needs and people. Solutions need to be tested to ensure they are effective for community needs as offshore wind infrastructure is built up in the near future.

- Consider approaching the challenge from different issues including environmental, social
- Consider how to integrate community members to be part of the solution: local leaders, community-based organizations, business owners, etc.

LEARNING OBJECTIVES

INNOVATION CHALLENGE LEARNING OBJECTIVES *At the end of this course, students will be able to:*

- Develop critical thinking and problem-solving skills through brainstorming techniques to develop ideas and design a solution to a complex problem.
- Develop their own arguments and analyze competing perspectives to a complex problem with supporting evidence.
- Develop a deeper, personal civic identity and clearly identify their role in their community.
- Develop a solution that could play a part in transforming a specific societal need regarding a larger issue that is transferable to a specific community and larger global community.
- Use data and insights of an inquiry to answer a research question using scientific terms in charts, tables, or graphs.
- Utilize a social justice lens when applicable to interpret the data and critically think about which groups are not represented around decision making.
- Effectively communicate ideas, data and insights using various forms of media.
- Effectively collaborate with team members with empathy and mutual respect, and develop an expanded perspective about how people from other countries see the world.
- Effectively communicate challenge specific variables that impact the environment, society, and economy including examples of the effect on local communities.
- Understand how to apply Design Thinking methods to understand what users need, and how to develop solutions to meet those needs.
- Learn how to actively listen, work through any disagreements, and solicit input from people in creative ways to generate new ideas.
- Learn how to test ideas and develop rapid prototypes.
- Identify corresponding careers connected to Innovation Challenge.

COURSE OUTLINE

TIME	TOPIC	ASSIGNMENTS	FORMAT
Week 1	• Getting Started w/Junior Academy • Complete Course Pre-Survey	• Join Launchpad Platform • Review Junior Academy Orientation • Attend Virtual Kick Off Week • Complete Course Pre-Survey	Individual
PHASE 1 Challenge Team Formation			
Week 2	Challenge introduction	• Complete Required Weekly Reading	Collaborative

	Background on your Challenge Finding Mentors & Experts Reaching out to experts	• Engage in Launchpad Discussions • Complete activities found in resource library on circular economy	
Week 3	Team Building • Forming Your Team • Holding a Virtual Team Building • Creating a Team Comm's Plan	• Engage in Launchpad Discussions • Hold 1st Team Meeting • Complete Required Weekly Reading • Due Milestone #1: Team Dynamics	Collaborative

PHASE 2 Research, Brainstorm & Plan

Week 4	Researching • Circular economies and textile production • Developing research questions and interviewing	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading	Individual Collaborative
Week 5	Brainstorming • Team Concept Brainstorm • Develop How Might We Ideas • Building Team Empathy	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading	Collaborative
Week 6	Design & Plan • Categorizing & Bundling Ideas • Deciding & creating your concept • Developing a user testing plan	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading • Due: Milestone #2: Design & Test Plan	Individual Collaborative

PHASE 3 Build, Test & Analyze

Week 7	Build • Creating a Prototype • Build storyboard & journey map • Identifying your variables • Rapid Prototyping	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading	Collaborative
Week 8	Test & Analyze • Conducting User Testing • Getting User Feedback • Analyzing your data Results	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading • Due: Milestone #3 Analyze Results	Collaborative

PHASE 4 Iterate & Develop Final Projects

Week 9	Iterate • Modifying your concept design based on your results • Refining & re-test your prototype	• Engage in Launchpad Discussions • Engage/Meet with your Team • Complete Required Weekly Reading	Individual Collaborative
Week 10	Develop Final Project • Creating draft of Final Project	• Due: Executive Summary • Due: FInal Team Presentation	Individual Collaborative

• Project Feedback & revision • Submitting Final Project • Complete Course Post-Survey	• Due: Personal Reflection • Complete Course Post-Survey	
New York Academy Challenge Final Project Review & Grading		

COURSE ASSIGNMENTS	% of FINAL GRADE
Milestone #1: Team Dynamics: This assignment is focused on team building and planning for how students will work together.	10%
Milestone #2: Design & Test Plan: This assignment is focused on the Team's proposed solution, hypothesis and test plan.	10%
Milestone #3: Build, Test & Analyze: This assignment is focused on building, testing and analyzing data related to your solution.	10%
Team Collaboration & Online Engagement throughout course	20%
Final Presentation, Executive Summary & Personal Reflection Final Presentation Rubric	50%
	(100%) **Final Grade**

GRADING POLICY

Late-work policy: Late work for this course will not be accepted after the due date unless previously arranged with **the Academy** for extenuating circumstances. It is important to stay up-to-date on assignments since much of the work builds on previous assignments and will impact students' ability to be effective in providing solutions for their teams' projects.

Re-grade policy: If a student thinks there has been a technical error in the grading of an assignment, they should email program administration at the Academy within one week of receiving the graded assignment, otherwise the assignment will not be regraded.

REQUIRED READING LIST

Students are expected to read and refer to a wide variety of texts throughout this course; all of which can be found in the Launchpad resource library and are organized by week below.

Week 1

Launchpad Platform, Launchpad

Junior Academy Orientation, Launchpad

Week 2

Remediation in South Brooklyn Innovation Challenge Background, Launchpad

Offshore wind 101 – NYSERDA

What is offshore wind energy? - Office of Energy Efficiency & Renewable Energy

Empire Wind: About the Project – Equinor

What Does Offshore Wind Energy Look Like Today? - Office of Energy Efficiency & Renewable Energy

Detecting seafloor anomalies – NOAA Coastwatch

What is Vibratory Pile Driving and How Does it Compare to Impact Pile Driving? - University of Rhode Island

AI Applications in Wind-Energy Systems – Rene Morkos

Machine Learning for Offshore Wind – Masoud Masoumi

8 Types of Dredging Projects – US Aqua Services

Week 3

Overview of Climate Change in New York City - NYC Department of Environmental Protection

Exposure to Climate Change – Mayor's Office of Climate & Environmental Justice

Mapping tool - Mayor's Office of Climate & Environmental Justice

What is Human Centered Design?, Video Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Design Thinking for Problem Solving, Video Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Week 4

Offshore Renewable Energy, United Nations Global Compact

Wind Energy & Environmental Impacts - University of Maryland Center for Environmental Science

As Offshore Wind Ramps Up, Scientists Flag Potential Impacts – Undark

Potential Impacts of Offshore Wind on the Marine Ecosystem and Associated Species – Congressional Research Services

What is remediation: terminology and approaches – Inogen Alliance

New York City Environmental Justice Alliance – New York City Environmental Justice Alliance

Co-Design – Engaging People with Lived Experience - Community Commons

Interviewing Experts, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Interviewing Individuals, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Interviewing Groups, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Week 5

How Might We, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Brainstorming Rules, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

How to Facilitate a Brainstorm, Stanford D School, 2020

Week 6

Bunding Ideas, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Doing a Gut Check, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Creating a Concept, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Week 7

Determine What to Prototype, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Rapid Prototyping, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Prototype to Test, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Identify a Variable, Design Kit, Innovation, Design, Engineering & Organization (IDEO)

[Storyboards & Journey Maps,](#) Design Kit, Innovation, Design, Engineering & Organization (IDEO)

Week 8

[Get Feedback](#), Design Kit, Innovation, Design, Engineering & Organization (IDEO)

[Testing with Users](#), Design Kit, Innovation, Design, Engineering & Organization (IDEO)

[Research Methods](#), Launchpad

Week 9 - Week 10

[Integrate Feedback & Iterate,](#) Design Kit, Innovation, Design, Engineering & Organization (IDEO)

[How to Create a Presentation](#), Launchpad

[How to Create Video Presentations](#), Movavi

[Presentation Guidelines](#), Launchpad