FUTURELAB+

Capstone Project

Project Educator
Management Guide

CAPSTONE PROJECT

Project Educator Mangement Guide

OVERVIEW

This project management guide will help capstone educators frame student project milestones and expectations in a given school year.

Capstone educators can use these resources to help frame the milestones of the capstone project and manage student expectations in their capstone year. This includes suggestions on how to plan out a year-long capstone project, strategies for building foundational skills that students will need and refine as they complete milestones, planning on where and how to present student work, the importance of mentorship for a capstone project, breaking the larger project into small and manageable goals, and suggestions for how the educator can help students track their progress and manage multiple projects in their class.

Management Guide Contents

1   **Scope and Sequence**
Defines milestones throughout the project that the student must meet and complete.

2   **Capstone Project Calendar**
Calendar listing milestones in order of completion for student capstone success.

3   **Student Skill Building**

- A small project that students will complete before beginning the capstone project.
- This will allow them to build and practice some of the skills that will be needed, such as critical thinking, researching a topic, problem solving, interviewing skills, and presenting information.

4   **Conception of the Capstone**
A brainstorming activity for students to help them identify educational and personal interests. Students will identify problems or questions they would like to explore through their work in the capstone project. Students will also take career and interest inventories and look at example capstones to help them narrow down and refine their goals for their capstone project.

5   **The Capstone Proposal**
A formal proposal completed by the student that outlines and lists tasks and goals for the capstone project that is submitted for the approval of the capstone educator.

6   **Research**
Students will research their topic and give a presentation to peers/ classmates and educators that gives background and introduces the problem or question that their capstone is centered around.

7   **Mentorship**
Students will search for and reach out to professionals in a career field that is related to their capstone topic and write a letter requesting mentorship throughout the duration of their capstone project.

8   **Project Management**
Students will create a calendar, timeline, or Gantt chart that gives start and end dates for project milestones. Educators will also schedule weekly check-ins with students for project updates, questions, and the opportunity to give feedback to students.

Management Guide Contents

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Milestone 1

Scope and Sequence

To guide students through this months-long capstone project, it is suggested that milestones are created for the project to help break the project into smaller achievable goals for the student. This will also allow instructors and advisors to give students feedback and guidance as they progress through their capstone.

These milestones should include:

- Skill Building Activities

- Brainstorming

- Research

- Capstone Project Proposal

- Securing a Mentor

- Defining Project Timelines and Goals

- Interviewing Stakeholders

- Project Work

- Submission of Student Journal (Portfolio)

- Community Presentation

- Reflection and Future Goals

- Implementation of the Capstone Project

Milestone 2

Capstone Project Calendar

Dates	Actions and Milstones	Student Deliverables
August	Skill Building Activity	Capstone Bootcamp Activity
September	Brainstorming	Activity—Narrowing down your passion/interest.
October	Research	Mock "TED Talk" or Pecha Kucha presentation for educators and peers.
November	Project Proposal and Approval	Capstone Project Proposal Sheet, submit for approval.
December	Securing a Mentor	Zoom meeting with mentor, educator, and student required
January	Defining Project Timelines and Goals	Students create Student Capstone Calendar, submit for approval.
February	Interviewing Stakeholders Work on Project	Students will identify stakeholders and record brief interviews. Students will document and reflect on work that is done on the project in this timeframe.
March	Continuing Work on the Project	Students will document and reflect on work that is done on the project in this timeframe.
April	Student Journal Submission	Students will turn in their student journal to the educator of record.
May	Capstone Presentation Reflection and Future Goals	Students present their capstone project to the community. Students complete a project reflection and goals sheet.

Milestone 3

Student Skill Building

Prior to beginning the capstone project, students should spend the first 3–4 weeks completing a capstone "boot camp." This will allow students to practice skills that will be needed throughout the capstone project and give the educator time to gauge where student baselines are and give feedback for future improvement.

Skills that should be practiced are:

1   **Research**
    Students should be able to do research to understand the problem they are trying to solve and how to solve it.

2   **Critical Thinking**
    Students should be able to demonstrate critical thinking skills in their capstone project.

3   **Problem Solving**
    Students should be able to demonstrate problem-solving skills in their capstone project.

4   **Communication**
    Students should be able to demonstrate communication skills in their capstone project.

5   **Presentation**
    Students should be able to develop presentation skills for their capstone project.

For the capstone bootcamp, students will choose one of the units from the Futurelab+ "Biotech in the Classroom" curriculum to focus on for this activity. They should choose a topic that interests them and in 4 weeks they should complete the following:

- Write a 2–3-page research paper that explores the topic

- Identify a problem or question that the local or global community faces related to the topic

- Contact and interview a professional or expert in a field related to the topic and discuss their career and how it relates to the topic.

- Create an infographic or record a vlog (video blog) that informs the viewer about the topic, the problem, and possible solutions

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Milestone 3
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Student Skill Building

For example, a student may choose to focus on the topic of using wearable tech to collect data on biomarkers (from the "Crowdsourcing Innovations in Biotechnology" unit of the Biomed course). They should research this topic and write an informative research paper that will give the reader an overview of the topic with proper formatting and citations as specified by the educator.

Next, in collaboration with the instructor, students can use the *Career Connect* service through Discovery Education to contact a professional in this field. They will set up and record an in-person, phone, or video (Zoom) interview with a professional and create a list of interview questions that they would like to ask. Students will complete the *Two-Way Informational Interview* student worksheets prior to and after the interview to help them prepare for and reflect on the interview.

For educators, there is also a *Two-Way Interview Prep guide* with tips and information that can help teachers guide students through the interview process.

Milestone 4

Conception of the Capstone

To begin to narrow down their ideas for their capstone, students should take some time to do an inventory of their interests, passions, and the possible career paths they might like to explore in the future.

Students will begin by completing the activity in the student journal "Getting Venny With It." In this exercise, students will complete a Venn Diagram that will require them to think about their interests and record things they like or spend time choosing to do.

In each of the circles (Academics, Extracurriculars, Passions) they will record one subject or extracurricular that they enjoy doing and one thing they feel strongly or passionate about.

Then they will try to make connections between where the circles overlap and ideas of an inquiry question or project that would combine the two. In the center where all circles overlap, they can brainstorm project ideas that would combine all

Passions

Academics   Extracurriculars
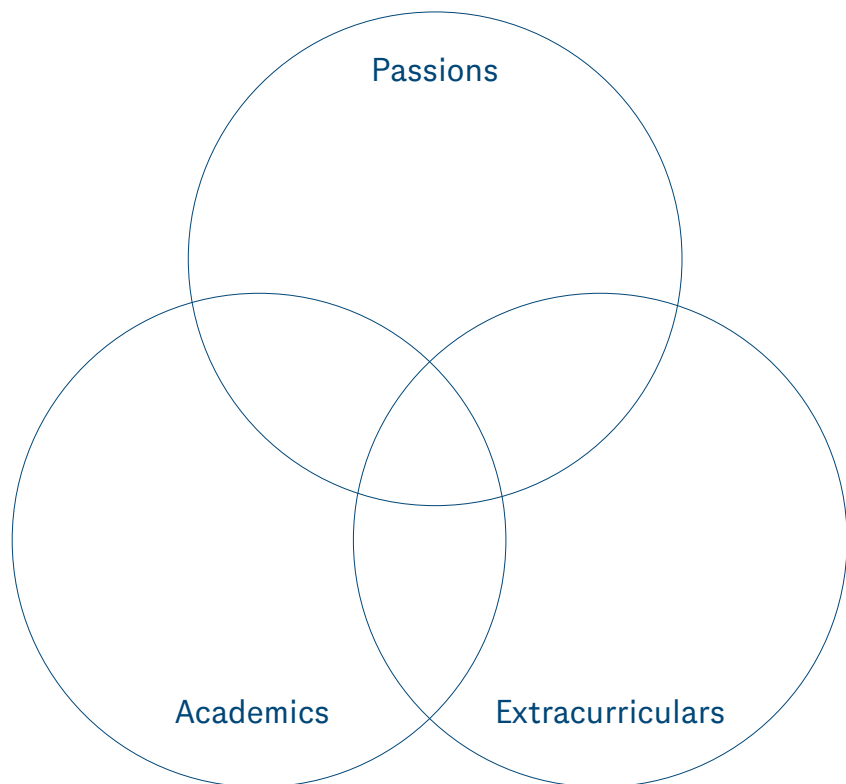
Next, students will do a career inventory that may help them to use their capstone focus to determine how they would like to structure and present their project. Students should use the *Biotech Career Finder Tool* to create a list of career pathways that they might be interested in or that could connect to their capstone topic.

Milestone 5

The Capstone Proposal

Once students have decided on what their capstone project will be, they will complete the Capstone Proposal Sheet in the student journal and submit it to the educator for approval.

Student capstone proposals will include the following in relation to their project:

1 **Title of the project:** The title should clearly and concisely summarize the project's main focus.

2 **Project Overview:** What is the main goal or objective of the project? What question or problem is being addressed?

3 **Project Description:** Describe the project in detail. List methods or approaches that will be used to achieve the objectives, along with any tools, technologies, or resources that will be involved.

4 **Project Objectives:** Outline objectives or milestones that will be accomplished in the project.

5 **Significance:** Explain why the project is significant or important. What will it contribute to a field of study or what issues will it address in the local or global community?

6 **Project Steps:** What steps will be taken to complete the project— including research, methodology, data collection, experiments, or prototyping.

7 **Timeline:** Provide a general timeline for the capstone project, identifying key milestones in the project and the time needed for each.

8 **Resources Needed:** Include a list of any potential equipment or supplies you might need for the project, as well as resources or support necessary.

9 **Potential Challenges:** List any anticipated challenges or obstacles that could be encountered and how they will be addressed.

10 **Project Summary:** Summarize the project, restating goals, and the importance of the project and why it should be approved.

Milestone 5
Continued

The Capstone Proposal
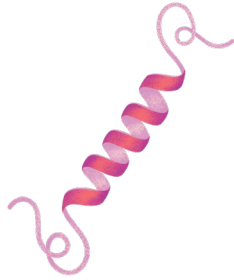
What makes a good capstone proposal?

- It is relevant and addresses a real-world problem

- It is a topic the student has demonstrated an interest in or a passion for

- It is innovative and shows creativity

- It requires research and critical thinking skills

- It is feasible—the supply needs and goals are realistic and achievable

- It will have a positive impact on local or global community

Milestone 6

Research

Students will keep detailed records of their capstone project research in their student journal.

The research section will include information about their topic—including history of the topic, background information, data, and challenges or problems in that field or area. It should also include resources used for research, such as journals, webpages, and interviews.

As a part of the research portion of their capstone, students will create a presentation for peers and advisors to introduce the topic of their capstone project and the questions they are asking or problems they are looking to solve. This will not only give students the chance to get audience feedback on their topic and capstone plan but will also allow them to practice their presentation skills before their final presentation of the capstone.

Students can choose to present their research in a variety of ways, including in the style of a TED talk or a **Pecha Kucha**.

A Pecha Kucha, from the Japanese word "chit-chat" is presented by showing a series of 20 slides that display for 20 seconds each, for a total of 6 minutes and 40 seconds. Students will choose images that align to their topic and outline them and arrange them in an order that will flow with a verbal presentation.

The final Pecha Kucha presentation is done where the slides advance automatically and without notes. This requires students to be concise and to know and practice the information they will be speaking about.

A **TED-inspired talk** to present research begins with students giving an introduction to grab the audience's attention. This can include an anecdote, idea, or relatable story that introduces the topic and why the audience should care about it.

Next students should move into the body of the talk, where they will explain their goals for the capstone project, what they intend to test, change, or improve, and why this is important. The conclusion of the talk will define key takeaways for the audience and a call to action to support the mission of the capstone project.

Images can be displayed on a screen as the presentation is given but are controlled by the speaker. There should be no notes used during the presentation in order to challenge students to be practiced, prepared, and knowledgeable on their topic and project.

Milestone 7

Mentorship

WORKING WITH A MENTOR

One of the most important pieces of a capstone project is to find and secure a mentor for the duration of the project. The mentor will be an additional support for the student who also has expertise in the area that the capstone project topic centers on.

Students and educators can use Discovery Education and Genentech resources to help them find a mentor working in a career that would be in the field of their capstone topic.

Discovery Education's *Career Connect* allows students to contact and interact with people in a wide variety of tech, science, and engineering careers via video chats. Students can use the platform with their advisor or instructor to reach out to professionals and experts at Genentech and other related industries.

Students can also reach out to potential mentors that are working in biotech industries via email, letter, or phone, including professors or educators at local universities and colleges, postdocs, or grad students in their labs, or verified professionals and experts on social media platforms.

STAKEHOLDER INTERVIEWS

In their Student Journal, students will be required to identify and interview two stakeholders for the project. These stakeholders are people, communities, businesses, or environments that are directly or indirectly impacted by their project's outcome. Stakeholders can be individuals or organizations that are actively involved in the project, or whose interests may be positively or negatively affected by the project's outcome. Stakeholder feedback can be used to drive or revise the project and can be used in the final capstone presentation.

Milestone 8

Project Management

One of the most important pieces for educators that are facilitating a capstone project is to scaffold the project. Scaffolding—dividing the project into smaller pieces with specific timelines and due dates—will help students from becoming overwhelmed, procrastinating, and will also give the educator the opportunity to monitor the student's progress in real time.

- It is suggested that the educator set up a schedule for short and informal **weekly meetings** with all students working on capstone projects. This can be an in-person meeting or a meeting via a video chat (i.e. Zoom).

  This will allow students to get feedback often and will allow the instructor to closely monitor the student's progress, answer questions, and help guide the project as challenges and obstacles arise.

- As a part of the capstone project, students will be required to create a **Student Capstone Calendar** for their project. This will divide the project into specific milestones, arrange them in the order that they must be completed, and give time-frames and deadlines for each milestone.

  It is suggested that students use the **Gantt chart** format, which uses horizontal bars to show the project timeline and tasks that must be completed.

- Students will first define the milestones for their project and suggest timeframes that each milestone must be completed in.

- Next, they will then use those project milestones (tasks) to create a Gantt chart in their student journals on paper. They may choose to make an additional copy of the **Gantt chart** using excel or a spreadsheet program. The Gantt chart will be used by both the student and educator to track the progress of the project.

  Creating the Gantt chart digitally may be useful as milestone timeframes may have to be adjusted as students progress through the capstone project.

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Milestone 8
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Project Management

Links to help students learn about and create Gantt charts:

- *What is a Gantt chart? What is it Used For?*
- *How to draw a Gantt chart*
- *How to Make Gantt chart in Excel*

Example of a Gantt chart.

Milestone 9

Project Work

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CREATING A PRODUCT

The product of the capstone project is often referred to as a "deliverable," and can be one of the end results of a project. This could be something such as an experiment, a prototype model, a data analysis, or a tangible outcome of the capstone. The capstone deliverable is dependent on the student's project topic and goals and can be showcased and incorporated into the capstone presentation.

Milestone 10   Capstone Presentation

For the culmination of the capstone project, students will be required to create and give a presentation that shows their journey through the capstone, showcasing what they have learned and how they have identified, researched, and created solutions to a real-world problem.

Students will create a slideshow that includes visuals, tangible deliverables, and takes the audience through the timeline and milestones completed in their capstone project. This capstone presentation should ideally be given to educators, mentors, stakeholders, and community members.

It is essential that students take time to prepare and practice for the capstone presentation and that they follow the rubric provided in the student journal.

The capstone presentations should be scheduled so that groups will have 10–12 minutes for their presentation and roughly 2 minutes to answer questions.

Prior to the presentation, students should send out invitations to community members, mentors, and stakeholders requesting their presence at the capstone presentations.

Capstone presentations should ideally be scheduled at a time when those invited can attend, such as in the evening, where students in a class or cohort can take turns presenting their capstone to the audience.

Milestone 11

Reflection

As a personal reflection of the project, students will complete the reflection portion and requirements in their student journal.

This includes:

- What they have learned about the topic through the project

- What they have learned about their future career aspirations and how this project has influenced their interests and goals

- What they have learned about themselves and the skills they have acquired through the project

- Writing a thank-wyou letter or email to any mentors who helped to guide or advise them through the project

- Reflecting on how they overcame or responded to challenges or obstacles they faced in the course of the project

- Reporting what the next steps could be if they choose to continue this project