

Capstone Project

To a Future Robot Society

Overview

This is the final assessment of this course. Building on their programming knowledge and skills developed throughout the learning journey and the scenario of time traveling to the future Robot Society, students will be invited to create an interactive computing artifact to demonstrate their imaginary narrative.

Firstly, students need to recap what they have learned and reflect on how the acquired knowledge and skills can transfer and apply to their own free creation. Students will then be instructed to detail their scenarios of the time travel narrative and decide the elements and modes for project design and delivery.

Based on their plans, students will work in pairs (in a team within 6 persons) to materialize their ideas and implement the time travel narration in the form of computing artifacts. In the final phase of the capstone, students will hold a fair to present their work and celebrate their achievements.

Objectives

By the end of class, students will be able to...

- Define and refine the assigned project scenario in response to the circumstances of software and hardware as well as time and human resource limitations;
- Operate appropriate programming scripts to transform their time travel to the future Robot Society into an interactive computing artifact;
- Work respectfully and responsibly with others to solve problems.

Materials

- mBlock
- mBot
- Capstone Project Activity Sheet
- Capstone Project Slideshow

Content Standards

Type	Indicator	Standard
ISTE	1a, 1c, 1d	Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
	3a, 3c	Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
	4b, 4c	Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
	6a, 6b, 6d	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
CSTA	1B-AP-16	Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.



Pre-lesson Checklist

- Print out and/or digitally distribute the Capstone Project Activity Sheet before the class.
 - If students will use paper versions of activity sheets, make sure all the resources are easily available for students. This can be done by providing the links on your LMS, etc., or printing the resources out for each group to utilize during the class.
 - As this learning activity encourages students to make and create their computing artifacts on their free will, instruct students to search and prepare the resources they need (e.g., external figures or sound clips from external sources) before Lesson 15.
- Make sure any necessary computer equipment is ready to go.
- Familiarize yourself with key points and notes detailed within this lesson plan and the slideshow as well as other necessary teaching materials.



Agenda (3 hours)

Time Interval	Content
(Lesson 14)	
15 minutes	Recap • This phase aims to summarize what has been learned quickly. Students need to explain the key concepts and questions in their own words.
20 minutes	Challenge – Phase I Empathize • In this phase, students need to narrate and create their animation project about an mBot meeting a robot citizen in the future Robot Society. Students need to logically place the Looks and “ask (...) and wait” Sensing blocks in sequence.
25 minutes	Challenge – Phase II Define • In this phase, students need to elaborate on their imagination and the narrative from, for example, transportation, communication, governing and living, and any other relevant aspects.
(Lesson 15)	
60 minutes	Challenge – Phase III Ideate • In this phase, students need to implement their plans and begin to construct the computing artifacts for their time travel scenarios.
	Challenge – Phase IV Prototype • In this phase, students need to implement their plans and begin to construct the computing artifacts for their time travel scenarios.
(Lesson 16)	
30 minutes	Challenge – Phase V Test • In this phase, students will continue their coursework in the previous sections. They can run and test their tentative projects and ask for help from their peers or the teacher.
25 minutes	Share • Students will play the role of a time travel agent to demonstrate and deliver their capstone projects as well as the time travel narrative.
5 minutes	Clean Up

Activities

Recap: Slides 2-10 [15 minutes]

Objectives:

- This phase aims to summarize what has been learned quickly. Students need to explain the key concepts and questions in their own words.

Procedures:

Slides 2-4

- Inform students about the agenda of this capstone project activity.
 - This lesson plan suggests that the capstone project needs three lessons to complete; however, you are welcome to divide the activities into coherent stages that suit your class and your schedule.
- In Lesson 14, students need to review what they have learned throughout this course and then plan their time travel scenarios based on their previous coursework experience.
- In Lesson 15, students will begin to design the computing artifacts. Students need to work in pairs (or groups) to implement their time travel scenarios.
- The final lesson is a flexible section to offer students more time to modify and improve their projects and share them with the class.
 - You and your class can either hold a fair to showcase everyone's work or have students to give poster presentations to explain their imaginary project ideas.
- Remind the class that they can reuse and modify their previous projects.
 - However, there should be significant evidence to prove that the capstone project is not merely a simple copy of the previous work.

Slide 6

- Have students to recall the previous lessons on their own in the first place.
 - Suggest the class that they can revive the activity sheets they have completed to see what they have achieved throughout the learning journey.
 - Students can write down the key terms or doodle a mind map to demonstrate their reflections.
- Have students recall the structure of the I/O System and the meaning of programming.
 - When reviewing the content of the I/O System, ask students to name some of the example input and output devices they know.



Slide 7

- List some of the coding blocks that students may have encountered in the previous learning activities.

Slide 8

- Review the three common control structures and algorithms: sequential algorithms, looping algorithms, and conditional algorithms.
 - Ask students to identify the three kinds of algorithms in the slide.

Slide 9

- Review the functions of variables.
 - Remind the class that there are two types of variables blocks – one is the built-in blocks such as the “answer” Sensing block; another locates in the Variables category and you need to create the blocks in the panel.

Slide 10

- Summarize the common logical operators.
 - In this course, students only need to know the three Operators blocks that can compare two values.



Challenge – Phase I Empathize: Slides 11-16

[20 minutes]

Objectives:

- In this phase, students need to narrate and create their animation project about an mBot meeting a robot citizen in the future Robot Society. Students need to logically place the Looks and “ask (...) and wait” Sensing blocks in sequence.

Procedures:**Slides 12-13**

- Have students recall the setting and plotting of this time travel story:
 - “Welcome, young time traveler! You are going to time travel to the Robot Society in the future.”*
 - “You have explored the body and mind of the citizens in the future Robot Society and learned to use their language for communication and social networking.”*
 - “You have given an account of the first meeting between mBot and the robot citizens.”*
 - “You have created a gift for your mBot delegation.”*
 - “You have created a time machine for your departure.”*
- Encourage and invite students to share their own narrative on their imaginary time travel scenario.

Slides 15-16

- Instruct students to reflect on their acquired experience through Benchmark I and Benchmark II.
 - Pose questions for discussion:
 - “What has been done for your time travel?”*
 - “What kinds of problems have you explored during the learning journey?”*
 - Show Slide 16 to ask students to report their progression.

Challenge –Phase II Define: Slides 17-20 [25 minutes]

Objectives:

- In this phase, students need to elaborate on their imagination and the narrative from, for example, transportation, communication, governing and living, and any other relevant aspects.

Procedures:

Slide 17

- Instruct students to work in pairs or groups to define what kinds of topics they would like to explore when creating the capstone project.
 - Students could elaborate on your imagination and the narrative from the aspects as follows:
 - Transportation
 - Communication
 - Governing
 - Living

Slide 18

- With regard to the transportation topic, instruct students to think of, for example:
 - "Where is the Robot Society located? (Earth? Mars? The Microworld?)"*
 - "How would you travel to the Robot Society?"*
 - "What might you meet on your way there?"*
 - "How long would you get there?"*

Slide 19

- With regard to the communication topic, instruct students to think of, for example:
 - "How would you contact the robot citizens in the Robot Society?"*
 - "How would you keep in contact with the present world from which you departed?"*

Slide 20

- With regard to the governing and living topic, instruct students to think of, for example:
 - "What is the system that makes up the rules of the Robot Society?"*
 - "Which rules are important?"*
 - "How about food?"*
 - "How about shelters?"*

Challenge – Phase III Ideate & Phase IV Prototype: Slides 21-23 [60 minutes]

Objectives:

- In this phase, students need to implement their plans and begin to construct the computing artifacts for their time travel scenarios.

Procedures:

Slide 22

- This phase is an open section for students to continue their coursework.
 - In the beginning, have students get into their specialty groups. Ask students to play the role of the robotic specialists and share their research findings.
 - Instruct students to collaborate to ideate the model of the computing artifact that accurately reflects their research insight.

Slide 23

- When students start to make the prototype, remind them that they can either use mBot as a vehicle to deliver the project or create a digital one in mBlock.

**Challenge – Phase V Test: Slides 24-25
[30 minutes]****Objectives:**

- In this phase, students will continue their coursework in the previous sections. They can run and test their tentative projects and ask for help from their peers or the teacher.

Procedures:**Slide 25**

- This phase is an open section for students to continue their coursework. It can also be used as a tutorial section for students to seek help from other classmates and their teacher.
 - Remind students to not to forget to review their goals and agenda. Ask them to see if they have accomplished their goals or not.
 - Remind students that they have time to review their programs and troubleshoot errors before presenting in front of the class.
 - Have students think of the following questions when testing and modifying their projects:
 - “What went well?”
 - “What will you do differently next time?”

**Share: Slides 26-30
[25 minutes]****Objectives:**

- Students will play the role of a time travel agent to demonstrate and deliver their capstone projects as well as the time travel narrative.

Procedures:**Slide 27**

- Instruct students to have a travel fair and pretend to be the agents to demonstrate their time travel projects in front of the class.
 - Remind students that they need to report and highlight the unique points of their projects and try to persuade others to like their work.

Slides 28-29

- Show Slides 28 and 29 to direct students to provide peer-review feedback for improvement.
 - Instruct students to use the “Exit Ticket of the Robot Society.”

Exit Ticket of the Robot Society

Name:

Date:

1. What are you most proud of about your capstone project?
2. How did you contribute to a positive partnership in this course?
3. What is one compliment that you would like to give your partner (relating to this activity, of course!)?



Slides 30-31

- Have students celebrate their accomplishment and progression in this course.
 - As an optional assignment, have students write reflective journals on their learning experience by answering the following questions:
 - *“What are you most proud of about your accomplishment during this course?”*
 - *“How did you contribute to a positive partnership and teamwork in the capstone project activity as well as other coursework?”*

Clean Up
[5 minutes]