

University of California, San Diego
Global TIES
ENG 100L
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Professor Jan Kleissl

K-12 STEAM EDUCATION

Final Continuity Report



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1. Overview of the Project

a. Client

The partner contact for this quarter was Tracy Roth at Tierra Bonita Elementary school in Poway, California. Tracy Roth is a fifth grade teacher and the team worked to create a lesson plan that can somewhat align with the science unit her students were learning at the time.

b. Goal

The main objective of K-12 STEAM Education is to provide students in primary and secondary education with equitable access to an NGSS-certified education plan in topics relating to science, technology, engineering, art, and mathematics with the San Diego community. There is hope for students to be empowered or inspired to pursue a future in these related topics. For this quarter and our client, students should be exposed to and enrich their understanding in topics relating to constellations and astronomy. As a project within the Global TIES program at UC San Diego, there is an emphasis in utilizing environmentally sustainable practices while also introducing or reinforcing topics of sustainability to these students.

c. General Description

K-12 STEAM education works with professional educators and administrators to curate and develop a lesson plan in the topics of science, technology, engineering, art, and mathematics for students in grades kindergarten through twelfth grade. Using a variety of methods from existing applications to non-conventional approaches from beyond the classroom standards, lesson plans are designed as an opportunity for hands-on interaction to engage students' understanding of STEAM topics, either introducing new concepts or enrich existing comprehension and allow students to pursue their curiosities within STEAM.

2. Team Structure

a. Logic and Efficiency

The team structure was decided on a voluntary basis. Each team member was free to opt for a specific role within the project that they felt suited their strengths. As there were four primary roles to choose from, there was little conflict over who would fill each role. Devin opted to become the team lead, given the opportunity to guide the team toward success. Alyssa opted to become the team liaison, given her background in previous K-12 STEAM project teams. Anna opted to become the team secretary/scribe, given her artistic expression and ability to write down ideas clearly. Finally, Jiahui opted to become the treasurer, given her sharp thinking and past experiences. Role assignments were chosen mainly on the basis of experience and

preference, therefore leading to team members receiving the role they were most comfortable with. As a result, the team dynamic was the most efficient it could be with the least resistance.

b. Subteam Descriptions

The team leader's goals were to facilitate team meetings and provide weekly check-in presentations to detail the process made for the project. The secretary of the team provided meeting notes and general idea scribing pertaining to the project during meetings and in secondary channels of communication. Managing and maintaining the budget, material acquisition, and general logistics regarding any materials required for the project were responsibilities for the treasurer. Finally, the community partner liaison helped facilitate communication with the partner organization, including arranging meetings or site visits.

c. Subteam Quarterly Goals

Goals of each subteam encompass the overarching idea of team effectiveness and efficiency in completing the project. The team leader strove to take initiative and ensure the team stayed focused and on track, aiding the secretary's objective in ensuring all team members are on the same page and up to date with all project information. For the treasurer, primary goals align with their subteam description of ensuring the team is under budget and utilizes sustainable materials or sustainable material practices for the project. Establishing consistent communication and contact with the community partner throughout the quarter was the main focus of the community partner liaison and rounded off the list of factors contributing to team success.

3. Quarterly Goals

a. Previous Quarterly Work

The winter K-12 STEAM team developed a lesson plan centered around chemistry topics using the theme of lava lamps. Chemistry topics meant to be introduced included acid-base reactions and polarity. Due to logistical issues, however, the team was not able to present to a target audience of 4th to 6th-grade students, and instead presented to an audience of TAs and two students from the quarter's ENG 100D class. The team was able to fully design and develop an interactive lesson plan with a hands-on activity that reflected the United Nations' Sustainable Development Goals and lessons in sustainability. Around 10% of the budget was used for materials.

b. Current Quarterly Work

Goals of the quarter were agreed upon within the team and documented on the team charter at the beginning of the quarter. These are 5 goals that are meant to aid in completing the main objective of the project, as well as other necessary assignments the team has to complete as a part of the Global TIES program.

The first goal aligns with the main objective of the team, to design a lesson plan for at least one school in the San Diego community that is both creative and interactive for the students. This goal remains persistent throughout the different quarters of this project, despite previous quarters being unable to work with a school. The second goal is to complete this lesson plan at least a week prior to presenting the lesson with the school. This is to ensure that the project is sufficiently complete and that any modifications can be made if necessary before the lesson presentation. Along with these two objectives is another to organize and develop a comprehensive transportation plan prior to the lesson presentation, within the same time frame as completing the lesson plan a week before. There have been cases of previous teams with transportation issues or delays that would result in tardiness and presented the team as lacking proper preparation.

As a Global TIES project, it was a goal to complete the required mid-quarter poster presentation prior to the poster presentation that all other Global TIES projects attended to detail their work. Like previous time sensitive objectives mentioned, this poster should be completed a week before the event, which for this quarter took place on Bioengineering Day during week 9 of the quarter.

The final goal established for the quarter was to present the developed lesson plan with an audience different from the student audience to collect any other feedback and information before that planned site visit. Audiences in mind primarily including the teaching assistants that oversaw the class meetings. This thought tactic in receiving critiques for the project would help exercise the iterative design process to only help improve the final product for the lesson presentation with the partner.

The following section is a direct quote that lists the quarterly goals for the project from the team charter that was drafted at the beginning of this quarter, having reviewed previous continuity reports.

1. *Develop an interactive and creative STEAM based lesson plan for a K-12 San Diego school.*
2. *Produce an interactive and creative STEAM based lesson plan one week before the visit.*
3. *Organize and develop a detailed plan for transportation at least one week before the school presentation visit.*
4. *Develop a detailed project poster one week before the mid-quarter poster presentation date.*
5. *Present a lesson plan to the teaching assistants or an audience outside of our student audience to gauge insight and feedback prior to the school site visit.”*

4. Content

a. Technical Details

Overview

For the spring quarter, our team was able to secure a collaboration with Tracy Roth's fifth grade class at Tierra Bonita elementary school. At the time of contact, the class was learning a scientific unit, "Spaceship Earth," that covers astrophysical concepts like the lunar cycle and seasonal changes. We designed our project to supplement their classroom material with additional information on constellations and their placement in Earth's sky.

The deliverables include a custom space-themed online multiplayer board game, a lesson plan that covers constellations and the Zodiac belt, and a Quizizz activity with trivia questions that correspond with information from the lesson.

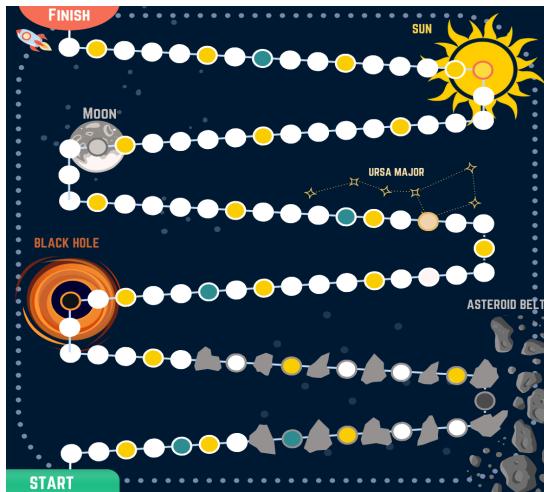
Game Features

The board game follows a play style similar to "Candyland", in the theme of space. Players act as rocket ships travelling through space, getting from start to finish. Along the way, they encounter constellations that can progress them forward (constellation cards), pass by different space-themed landmarks (info/event spaces,) and also experience random rocket events (chance cards). Players roll/spin to progress forward throughout the board, referencing information presented in the "Astronomy Around the World" lesson slides.

Additionally, due to challenges with the gameboard website being blocked by school-issued computers, we developed an online interactive quiz via Quizziz. The quiz featured content from the trivia cards that were used for the board game (20 in total).

Lesson Plan Content

The lesson plan centered around constellations and how they relate to us and to each other. Specific topics covered include the different hemispheres of Earth, star placements over regional skies, the significance of constellations as part of human history, and some of the most famous constellations around the world. Examples from the lesson plan can be found in the [Appendix](#).



1/20

Which constellation is known as "The hunter" and is one of the most recognizable in the night?

Leo Draco Orion Ursa Minor

Star Card

Question:
What makes it so that we can see different constellations during the year?

There exist asteroids everywhere in space, but in our solar system we have a whole 'ring' of asteroids that orbit the space between Mars and Jupiter, containing around 1.5 million asteroids!

Rocket Card

Another rocket zooms by and throws you off course!

Roll/spin even number, move forward 2 spaces.

Roll/spin odd number, move back 2 spaces.

Figure 1: Race to Space Board Game Design (top left), Quizziz activity (top right), Board Game Trivia Fact (bottom left), Board Game Trivia Question (bottom middle), Gameboard Event card (bottom right)

b. Budget

The total budget provided for this quarter was \$500. With the project needing to be completely digital for our client, we did not use any of our allotted budget this quarter. All components of our project were created digitally.

5. Reflection

Most of our quarterly goals were met, but we are not able to fully accomplish goal 3 and goal 5. We successfully developed and produced an interactive and creative STEAM-based lesson plan, delivering it to a K-12 audience and fulfilling key objectives. We also created a detailed project poster and successfully presented it during Bioengineering Day (seen in the figure below). However, due to logistical constraints and unforeseen time limitations, we fell short of meeting all the quarterly goals.

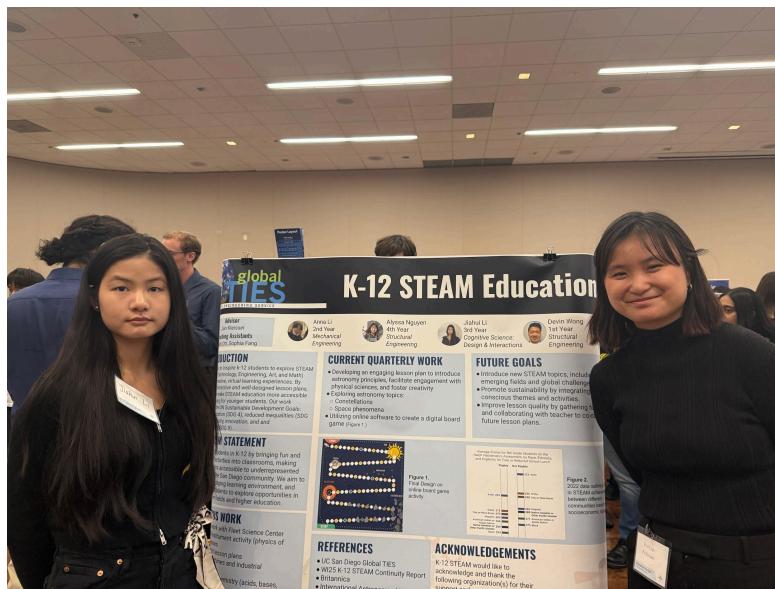


Figure 2: A few of our team members with our poster for Bioengineering Day

Our third goal was not completed as our activities were conducted entirely over Zoom due to campus policies that restrict in-person visits. As a result, we did not need to think about transportation. In addition, goal 5 was not met due to unexpected challenges that caused a shift in our plan, leaving us with limited time to present our lesson to an outside audience for feedback. However, we did manage to have our TA play and test the board game we designed, and she provided positive feedback on the content and design.

One major success was that we successfully delivered our Zoom presentation to a class of 5th graders. Although we were unable to use our board game during the session because the school system blocked the website, we quickly adapted by switching to our backup plan, which was using interactive Quizzizz. During the presentation, we observed that the students were

engaged, actively listening, and eager to participate in the trivia questions. Their enthusiasm and willingness to answer questions based on our lesson confirmed that they enjoyed and learned the content, which was very rewarding for us.

What went wrong was being unable to play the board game live with the students due to technical restrictions. However, we still presented the board game and explained how it works. Since we decided to make the board game printable, we encouraged the students to try it on their own during their free time.

a. Suggestions for Improvement

One key area for improvement is time management and contingency planning. We should build more flexibility into our project schedule to account for unexpected changes or delays. This includes setting deadlines earlier, allowing time to adjust for unforeseen issues such as scheduling conflicts, technical difficulties, or policy limitations. Additionally, we should also collect feedback and perspectives to help us identify areas for improvement and make more informed decisions during the development process.

6. Future Goals

To provide clear direction for future teams, the K-12 STEAM Education project should continue building on its mission to deliver engaging lessons that integrate science, technology, engineering, art, and mathematics for K-12 students in the San Diego area. Future teams should focus on designing lesson plans that are not only educational and interactive but also easy to implement in both virtual and in-person settings. This includes creating content that is accessible on school devices, ensuring compatibility with district system policies, and always having backup plans in case of unexpected changes.

A key improvement area is time management. Teams should aim to complete major deliverables like lesson plans, material preparation, and transportation coordination at least one week in advance. Building in extra time will allow flexibility to adapt to unexpected issues and have more time to prepare. Another goal also prioritizes feedback collection by testing lesson classmates, teaching assistants, or other outside audiences for improvement and seeing if things are working out or not. This interactive process will strengthen the quality and clarity of the lesson content.

Lastly, sustainability should remain a guiding principle, not only in the content of the lessons but also in the materials used. Teams should aim to use low-waste, reusable materials and highlight environmental responsibility in their curriculum. By maintaining these goals, future teams can ensure the continued success, impact, and growth of the K-12 STEAM Education project.

7. Inventory

a. Materials for this Quarter

Due to the online nature of this project, no physical materials were used for this project. Lesson materials were created on websites including Google Slides, Canva, Quizizz, and playingcards.io. No additions were made to the team inventory from this quarter.

b. General Team Inventory

 ENG100L K-12 STEAM Inventory

8. Appendix: Lesson Plan

Link to Google Slides Presentation:  [ENG100L - K12 STEAM Lesson Slides](#)



Astronomy around the World
UCSD Global TIES Spring 2025

What are Constellations?

Constellations are stars that are close together and make patterns

- Named after people, animals, simple shapes
 - Comes from ancient Middle Eastern, Greek, and Roman culture
- Like a connect the dots game
- Have been around for thousands of years!
- Stay in almost the same spot in the sky

<https://spaceplace.nasa.gov/constellations/en/>

The Earth's Hemispheres

Different parts of the world see different constellations as Earth orbits around the sun!

- The **equator** cuts the earth in half, long-ways in the center
- Splits Earth into **Northern Hemisphere** and **Southern Hemisphere**
 - There's also Eastern and Western!
- Continents in Northern Hemisphere:
 - North America, northern parts of South America, Europe, northern 2/3 of Africa, most of Asia
- Continents in Southern Hemisphere:
 - Most of South America, 1/3 of Africa, Australia, Antarctica, some Asian Islands

<https://education.nationalgeographic.org/resource/hemisphere/>

Circumpolar Northern Constellations

Constellations that can be visible all year in the northern hemisphere

Cassiopeia (the Queen of Ethiopia)
The North Star
Ursa Minor (the Little Bear)
Draco (The Dragon)

Figure 3: Examples from *Astronomy around the World* Lesson Plan