



# Capstone

**Concept:** Engineering Design Process

**Objective:** Students will use the Engineering Design Process to design a solution for getting more youth interested in Tennis, with a focus on challenges and obstacles for accessible playing areas.

## Standards

### Next Generation Science Standards Connections

**MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions

**MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

**MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**MS-ETS1-3.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

### Supplies Provided

Peer Feedback Form

### Materials Needed

Pencils and Poster Board; Optional: Prototyping Materials; Technical access: PowerPoint and Video

### Video

How to sort the Court: [stemsports.com/resources/resources-tennis/](https://stemsports.com/resources/resources-tennis/)

### Maps

Tennis Maps: [stemsports.com/resources/resources-tennis/](https://stemsports.com/resources/resources-tennis/)

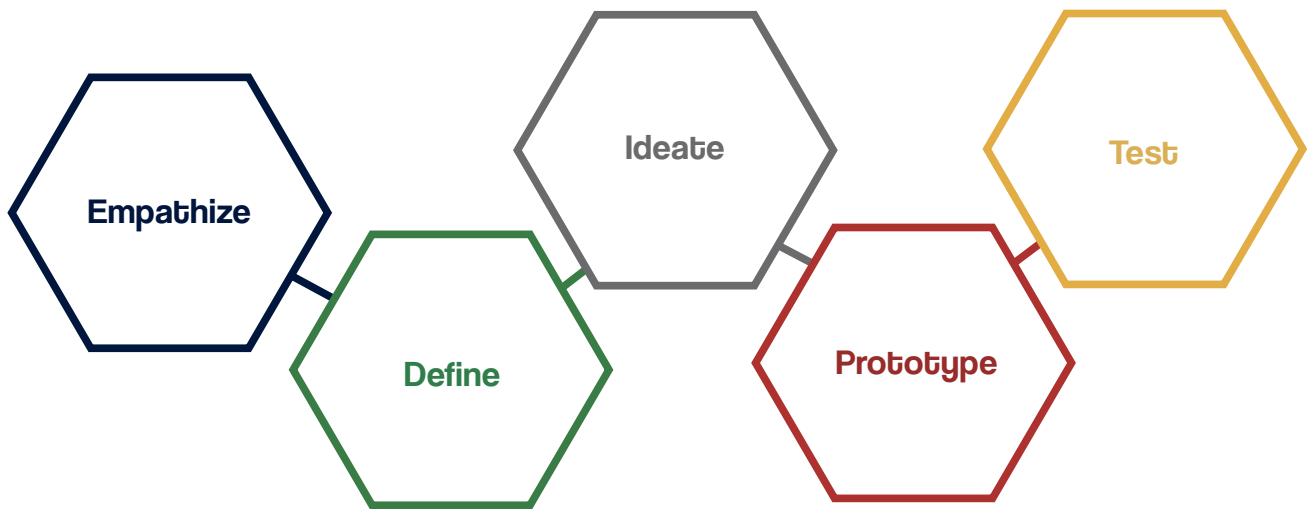
## Sequence of Lesson

**Engage:** Have students interview a friend or family member who doesn't play tennis, focusing on why they don't play tennis:

- What are the barriers?
- Why didn't they play as a child, in high school, etc?
- Do they watch it?
- Other sports?

**Explore:** Go to <https://stemsports.com/resources/resources-tennis/> and search the tennis courts in your area.

- How many are available within walking distance?
- Pick another city: How many are available within walking distance? Why do you think this is similar or different?



- Use the video on how to sort the court: [stemsports.com/resources/resources-tennis/](https://stemsports.com/resources/resources-tennis/)
- - How many of the courts are public access?
- - How many are private access?

Have students fill in the data table using Tennis Maps. Then have students calculate the percent of public and private courts in their city and several major cities.

**Explain:** Social engagement is an essential part of sports, including tennis. Using the engineering design process (EDP), explain how it can be modified to help combat social challenges. This is also referred to as “design thinking”. Likewise, the EDP steps are close to and can be used for the same purpose. Using the pie graph on “Who Plays Tennis?” on page 99, have students review the U.S. map and cities below it on page 100 to create a t-chart of similarities.

Design Challenge: How can you get more people interested in playing tennis or increase access to courts?

Explain to students that in the *Explore* section we empathize and collect data to define the challenges. Now we will review some claims and articles to define the challenges and objectives.

Explain to students the following claims that define the challenges and objectives of the design challenge:

- Tennis has been considered an “elitist” sport for many years. The main reason is because tennis was first accessed by private clubs (paid with a membership).

- Tennis enthusiasts have tried to change the face of tennis to be a sport for everyone.
- There are many more parks and recreation centers to access tennis courts throughout the U.S. today.
- In some communities, there is a need for more courts, but leaders are reluctant to build additional courts. Their claim is that tennis courts have a large footprint and don’t allow as many players as a basketball court.

*Teacher note: In addition, students can conduct research to find evidence that either supports or refutes these claims.*

**Elaborate:** Have students ideate and prototype parts of design thinking. Two options may include:

Design a court that could be built in a small park with multiple uses: <https://www.versacourt.com/residential-court-design.html>

Design a marketing campaign to get more kids interested and excited about tennis.

**Evaluate:** Have students test their prototype by presenting their ideas to the class.

Students can use poster boards, PowerPoint slides, video, roleplay, prototype a tennis court, etc. Have students complete the “What works?” form for feedback on the test.

**Extend:** Based on classmates and teacher feedback, students could present their findings to the local Parks & Recreation Department and/or the local municipality/governing body.

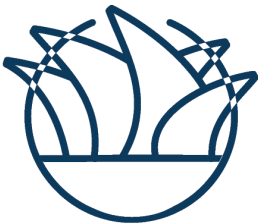
# Tennis Courts

## Across the World



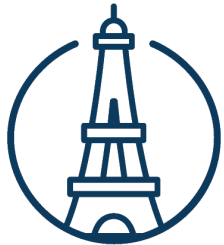
**3,000**

Number of tennis courts in London, England



**338**

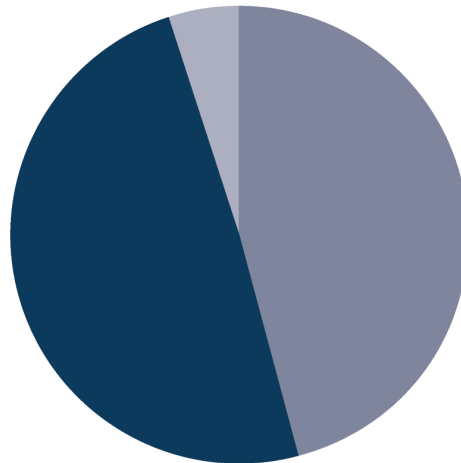
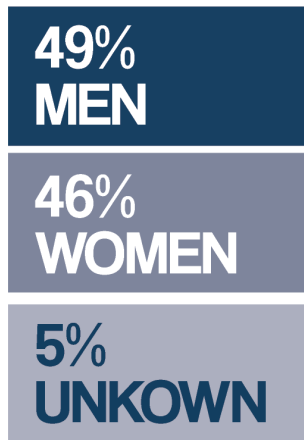
Number of tennis courts in Sydney, Australia



**142**

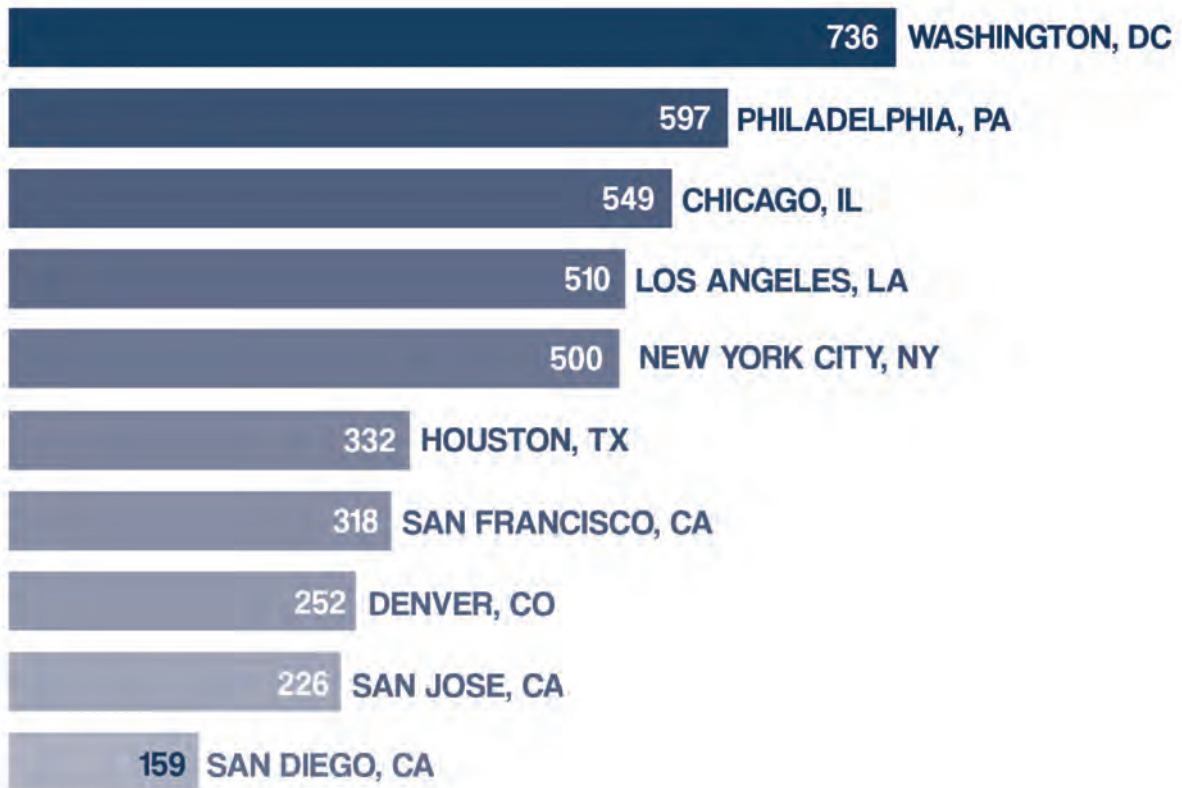
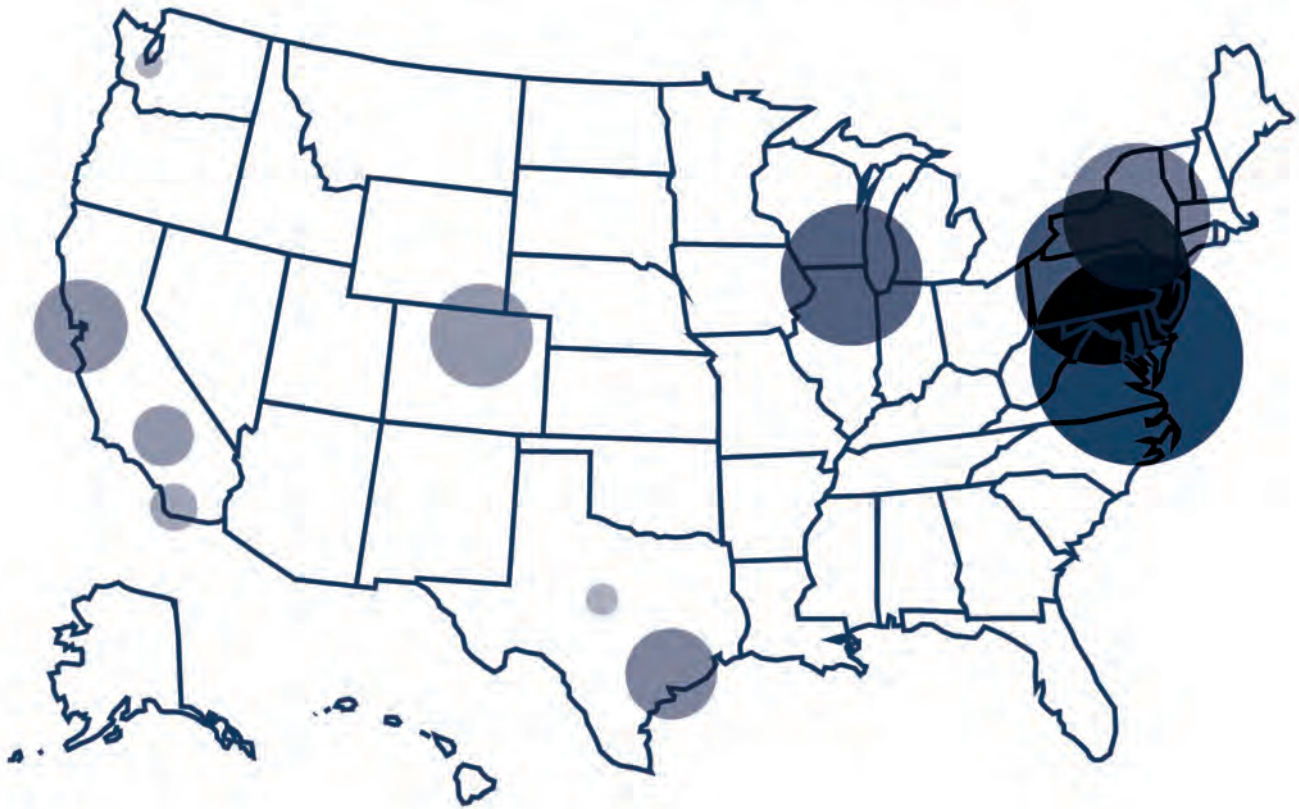
Number of tennis courts in Paris, France

### Who Plays Tennis?



The truth is... everyone can play tennis! How would you set up a tennis court in your neighborhood?

## Tennis Courts in Major US Cities



Name: \_\_\_\_\_

Class: \_\_\_\_\_

# Capstone

GRADES 6-8

## Peer Feedback Form

Group Member Names:

---

---

---

---

Select the assignment you chose:

**Design a Court**

**Create a Marketing Campaign**

1. What do you think will work best about their plan?
  
  
  
  
  
  
  
  
  
  
2. What part of the plan do you think could use improvement?
  
  
  
  
  
  
  
  
  
  
3. If you were in their group, what would you do next?

Name: \_\_\_\_\_

Class: \_\_\_\_\_

# Capstone

GRADES 6-8