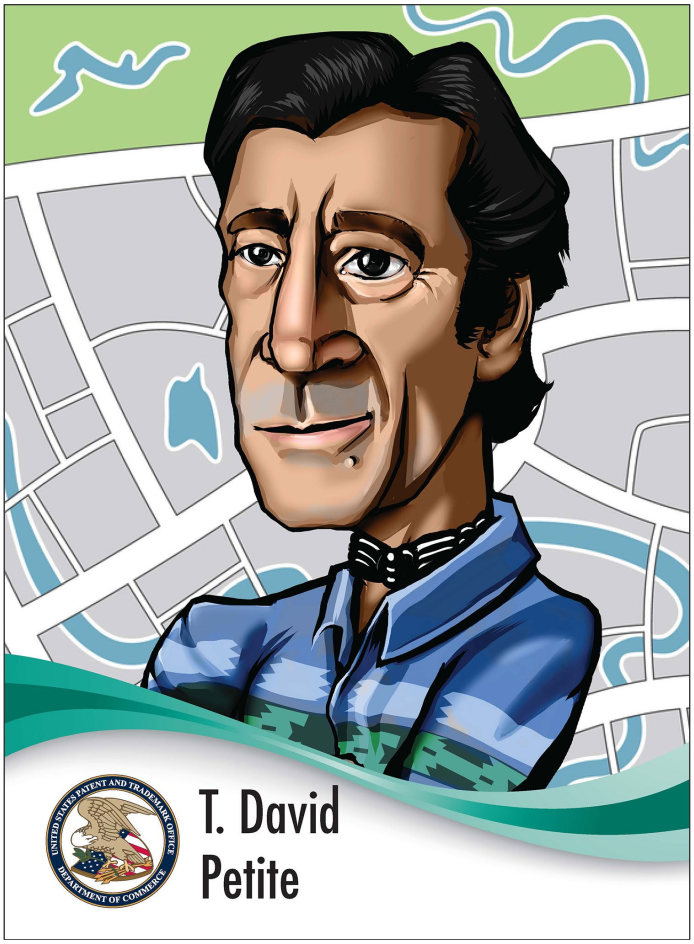


T. DAVID PETITE TRADING CARD LESSON AND ACTIVITIES

SUMMARY

T. David Petite is an inventor with over 130 patents. His transformative inventions have enabled access to wireless technology across nations worldwide. These lessons are intended for students in Grades 6-12. The activities focus on computer science, engineering and design, literacy, and community planning.

Table of Contents

T. David Petite trading card lesson plan

Student activity sheets

T. David Petite
Trading card lesson plan

Background

David Petite is a visionary and inventor whose passion for tinkering traces back to his childhood. From taking apart old radios to unraveling the mysteries of electronics, David's relentless curiosity was encouraged by his father. As one of the early creators of wireless networks and mesh technology, David has played a pivotal role in enabling seamless communication between cell phones and smart devices. He is a trailblazer in wireless technology, with an impressive portfolio of over 130 patents. Beyond his technological prowess, David proudly identifies as a member of the Fond du Lac Band of the Lake Superior Chippewa Tribe. In addition to his feats of invention, he founded the Native American Intellectual Property Enterprise Council, a nonprofit organization dedicated to supporting Native American inventors and communities nationwide. David Petite's story is not just one of innovation but also of commitment to community and the advancement of Native American talent in intellectual property.

Student activities

- A USPTO inventor trading card activity challenge: World of mesh topology with David Petite
- Network topology: Creating a drawn model of a star network (or)
- Network topology: Creating a string art model of a mesh network (or)
- Network topology: Creating a random string art model of a mesh network in a community or globally
- Tinkering with a purpose
- Timeline: David Petite’s life
- Operation Invention
- Plan and create a mesh network for your community

Grades 6-12 content and topics

Engineering, Science, Math, ELA, and Computer Science

- Computer science – network topology
- Engineering and design
- Topology and topography
- Forces, motion, and simple machines

Engage: A USPTO inventor trading card activity challenge: World of mesh topology with David Petite

Time: 30 minutes

Background

The engage section of this lesson plan will enable students to understand different network designs. Mesh network technology is a communication system with multiple interconnected devices or nodes forming a mesh-like structure. Each device (node) in a mesh network is connected to several others, allowing them to communicate and share data. David Petite's inventions developed and improved wireless mesh networks.

Students will read about different types of mesh network topology models and match a diagram with each description. They will then build a model with toothpicks and marshmallows to demonstrate nodes and transmission within the network.

Materials

- Mesh network picture cards
- Mesh network name cards
- Mesh network description cards
- Toothpicks
- Marshmallows
- Scissors
- Copy of "A USPTO inventor card activity challenge: World of mesh topology with David Petite" – one on cardstock for each group

Student activity handouts

- A USPTO inventor trading card activity challenge: World of mesh topology with David Petite

Explore: Network topology

Time: 60 minutes

Background

The explore section of this lesson plan will guide students in creating star or hierarchical mesh network models. As students create artistic models of different types of mesh networks, this hands-on experience will provide students with a better understanding of nodes and transmission throughout the network. Students will compare the features of their models and explain the benefits of mesh wireless network technology.

Materials

Creating a drawn model of a star network

- Cardstock
- Compass - if students are dividing the circle
- Pre-divided circle template – if students are not dividing the circle
- Colored pencils
- Ruler

(or) Creating a string art model of a mesh network

- Sewing needles
- Template on cardstock
- Pushpins
- Tape
- Cardboard
- Different colors of string

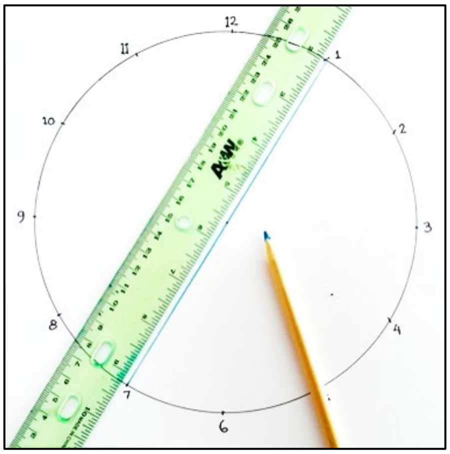
Instructions

Students have learned about the different types of wireless networks, including the mesh wireless network created by the inventor David Petite. Students will create an artistic model of a network. They can select from a drawn model of a star network, a string art model of a mesh network, or a random community or global mesh network model.

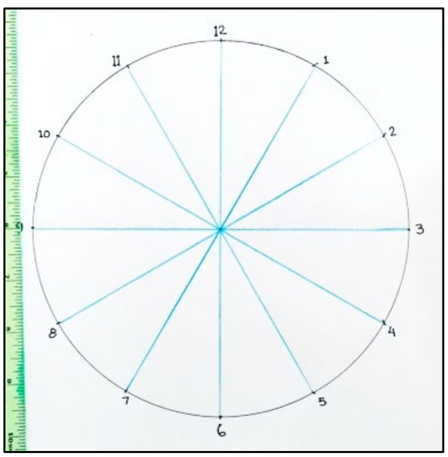
Creating a drawn model of a star network

Use the circle template (see activity sheet) for the following activity. Students will create a drawn mesh network model using the circle dot template. The template is a circle divided into 12 dots equally spaced around the circumference.

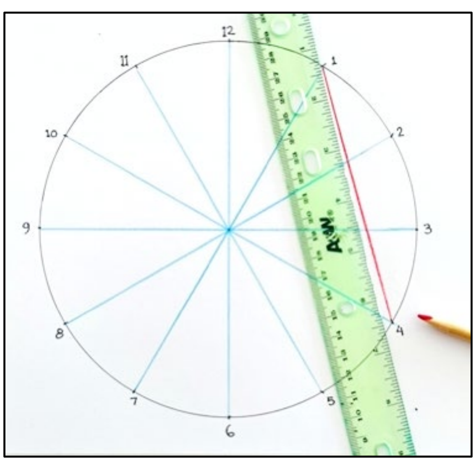
1. Use a ruler and draw a line from 1 to 7.



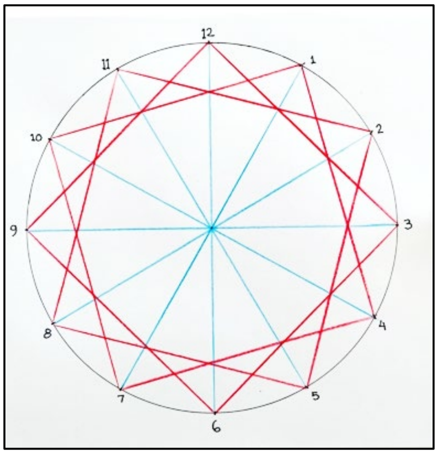
2. Using the same color selected in step 1, draw a line from 2 to 8, then 3 to 9, and continue around the entire circle.



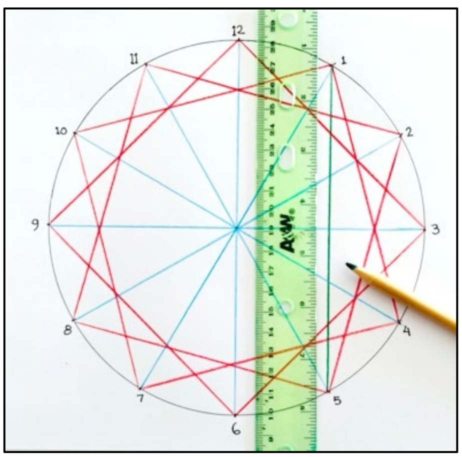
3. Select a second colored pencil. Use a ruler and draw a line from 1 to 4.



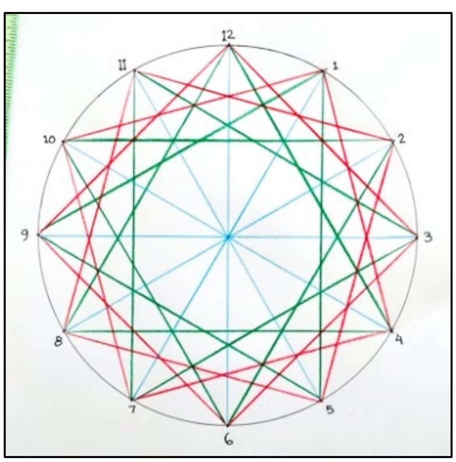
4. Using the same color selected in step 3, draw another line from 2 to 5 and 3 to 6. Continue around the entire circle.



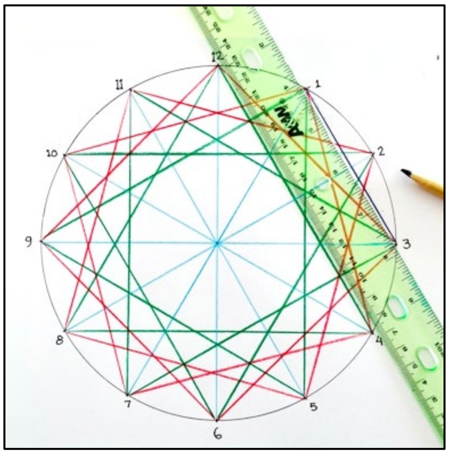
5. With a third color, use a ruler and draw a line from 1 to 5.



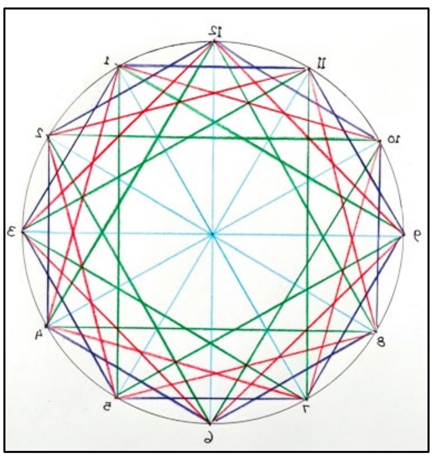
6. Using the same color selected in step 5, draw another line from 2 to 6 and 3 to 7. Continue around the entire circle.



7. Select a fourth color, use a ruler, and draw a line from 1 to 3.



8. Draw the second line from 2 to 4, then 3 to 5, and continue around the entire circle.

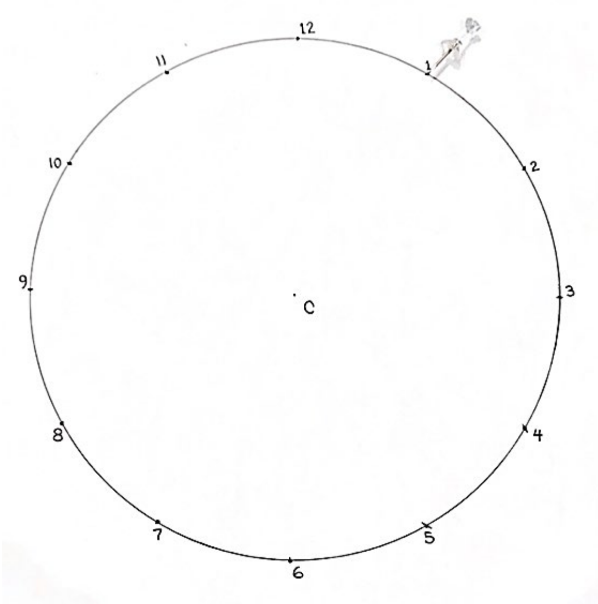


This model illustrates how a star network works. The numbers on the circle represent each node in the network; each node is typically a user or device. Every time new nodes are added to the network, it grows more robust. As more nodes are added, more connections and routes are formed through which data can travel.

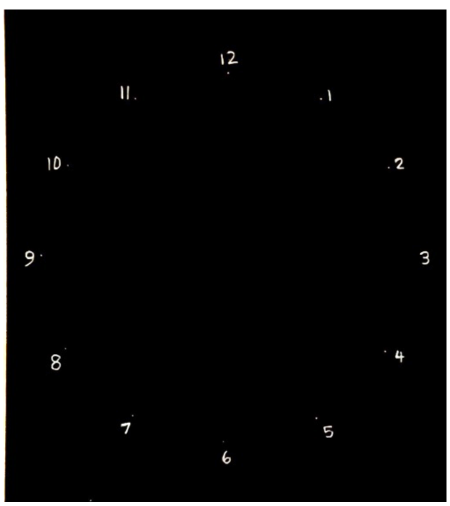
Creating a string art model of a mesh network

Students can create a string art model of a mesh network. Copy the circle template on cardstock and place it on a piece of cardboard. Pre-punch the holes with a pushpin as described below. Black cardstock and fluorescent string or colored cardstock and colored string can be used in this activity.

1. Use a push pin to punch a hole in the dot at each number around the circle's circumference. Remove the cardboard.

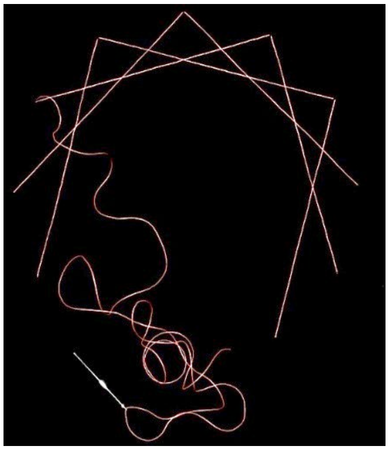


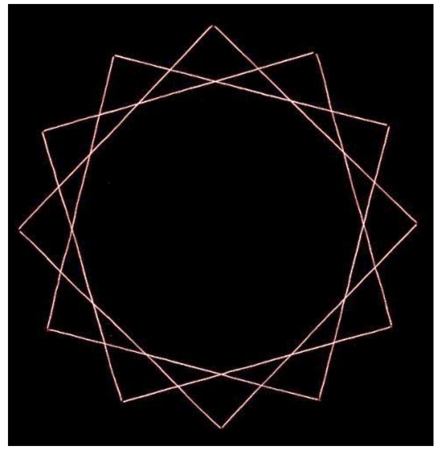
2. Write the numbers 1 – 12 on the back of the string art template, as shown below.



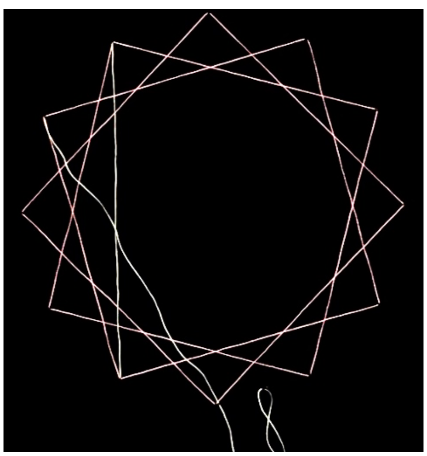
3. Use a needle and embroidery string to create a string art design. Sew through a hole from the back of the cardstock and tape the end of the string to the back of the cardstock template. Follow the guidelines below:
   a. Start from the back in hole 1 and tape the end of the string before you pull it through.
   b. On the front, sew back through hole 4 and pull the line so it's not overly tight.
   c. From back to front, go through hole 2
   d. From front to back, go through hole 5
   e. From back to front, go through hole 3
   f. From front to back, go through hole 6

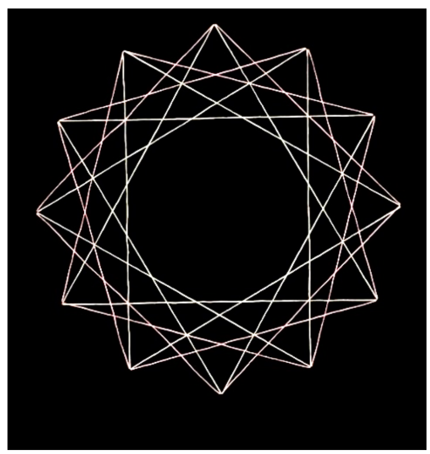
4. Continue this pattern around the circle until you get a string art model of a mesh network.



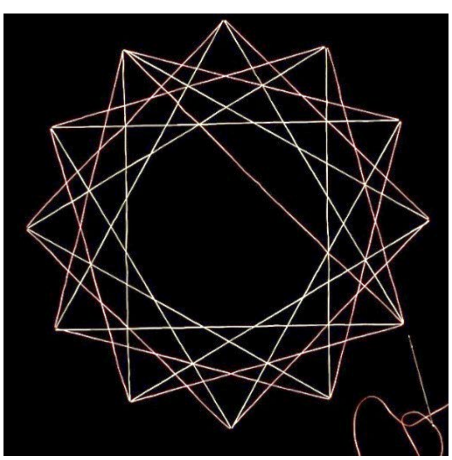


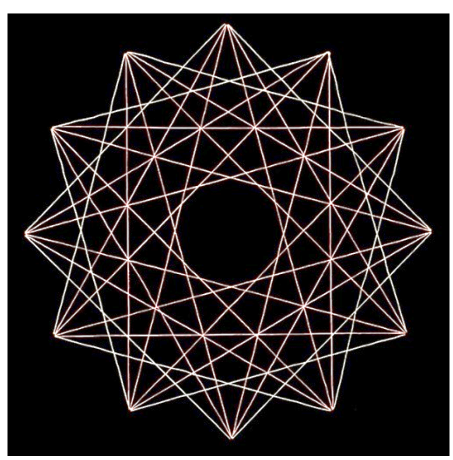
5. Using a second colored embroidery string and pattern, sew around the circle. Skip four holes by connecting 1 and 5, 2 and 6, and continue around the entire circle. The design will grow in complexity.





6. Using a third colored embroidery string and pattern, skip four holes, connecting holes 1 and 6, 2 and 7, and continue around the entire circle.

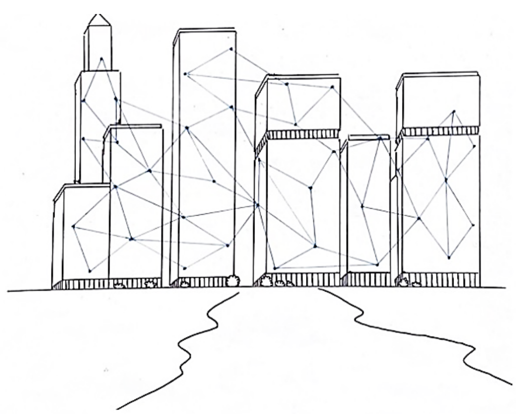




Creating a string art model of a random mesh network in a community or globally

Templates of a cityscape and a world are provided in the student activity sheets for this lesson. Copy each on cardstock and allow students to create a random mesh network on one of the images.

1. Lay the template on top of a piece of cardboard and poke holes through different buildings, countries, or land features with a push pin to represent nodes or connections. Punch holes in random locations. Students should avoid bending the cardstock.
2. Using colored embroidery string and a needle, start from the back of the card to the front so that the end of the string can be taped on the back. Sew the string from back to front and then front to back to connect the holes or nodes. This represents how internet users connect through nodes in a mesh network. The more nodes added, the greater the mesh network's complexity and the greater the number of businesses and community members it can serve.
3. When ending the string design, be sure that the string is taped down on the back of cardstock so that no tape shows on the front.



Student activity handouts

- Network topology: Creating a drawn model of a star network (or)
- Network topology: Creating a string art model of a mesh network (or)
- Network topology: Creating a random string art model of a mesh network in a community or globally
- Circle template

Explore: Tinkering with a purpose

Time: 60 minutes

Background

Tinkering with a purpose is an exploration that unlocks students' mechanical ingenuity and sharpens their problem-solving skills. In the explore section of this lesson plan, students construct a door-closing mechanism using a pulley and counterweight.

David Petite often visits classrooms, passionately advocating for instilling the inventive spirit and bringing the invention process to students. He never fails to be amazed by the depth of their thinking and the creativity of their ideas. Tinkering with a purpose is an exploration that unlocks students' mechanical ingenuity and sharpens their problem-solving skills. This hands-on innovation activity serves as a testament to the enduring truth of David Petite's mantra: "Necessity is the mother of invention."

Materials

- Dental floss
- Different size galvanized washers from quarter inch to 1.5 inch
- Shoebox
- Paper clips
- Adhesive mounting square or tape
- Needle-nose pliers
- Scissors

Instructions

Building and inventing often involves understanding forces and motion, simple machines, and mechanics. A fixed pulley changes the direction of a force, making work easier.

1. Students build a simple cardboard house out of a box. They will cut a door on one side of the box and gather the materials needed to create a pulley system that will shut the door automatically.
2. Read the story about Bocas del Torro below to your students. This is a situation that inspired an invention.

The story of Bocas del Torro, Panama:

Step into the enchanting world of Boca del Toro, Panama, where homes are not just shelter but a dance with nature. Imagine a village where the air is thick with heat, humidity, and many insects buzzing around. Homes are wrapped in a delicate embrace of netted walls, a necessity born from the unique blend of tropical challenges.

A whimsical solution to a pesky problem emerges. A ballet of pulleys and conch shells turns entering and exiting a home into a fascinating performance. As someone approaches the netted home, anticipation hangs in the air. A gentle push swings the door open, revealing the warm embrace of home. The moment they step inside and release the door, the conch shell, suspended in mid-air by a pulley system, gracefully floats down with a purpose, and the door glides shut.

The village has found a harmonious solution to the intrusion of insects – a dance of technology and tradition that keeps the tiny invaders at bay.

3. Show students the video of the door-closing apparatus using a conch shell as a counterweight: YouTube Video of a door closing
4. Teachers may provide directions to guide students in creating an automated door closer, or this activity could be implemented as an invention and engineering lesson in which students are given supplies and must invent a solution independently.
5. Ask students to videotape their solution after building an automated door closer. Students should do a gallery walk to view all the door openers and watch the videos. Below is a sample of what the project might look like.

Student activity links and handouts

- YouTube Video of a door closing
- YouTube Video of project model "Tinkering with a purpose"
- Tinkering with a purpose

Explain: Timeline activity: David Petite's life

Time: 60 minutes

Background

In the explain section of the lesson plan, students will take a deep dive into the milestones that shaped the extraordinary life of David Petite. His curiosity was ignited in childhood.

Students will craft a puzzle timeline showcasing six pivotal events that defined David Petite's remarkable journey. They will uncover the roots of his inquisitive nature, tracing back to the influences surrounding him in his early years. His father ignited the spark of curiosity within him, fostering a love for exploration.

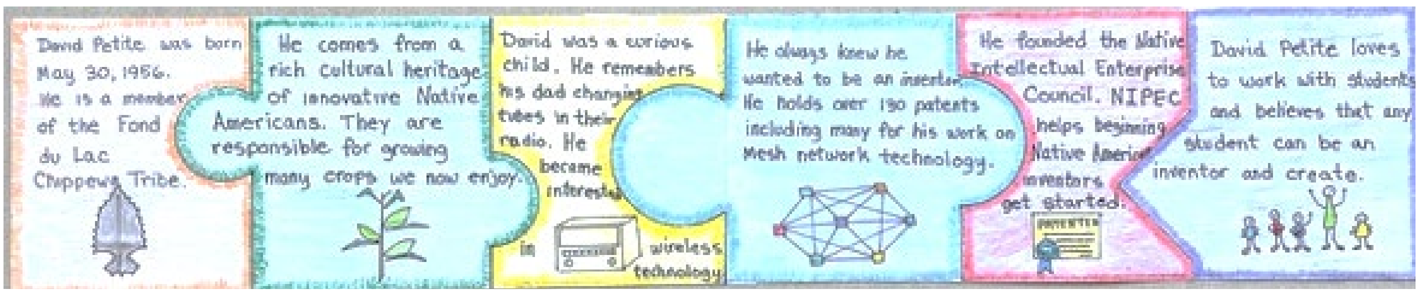
David Petite's story is woven with cultural threads connecting him to the Fond du Lac Band of the Lake Superior Chippewa Tribe. Visits to the reservation in Minnesota were pivotal to his inventive nature. Students will unravel details of his life that led to his inventive nature as they build the timeline. They'll collaborate to identify the significant milestones that mark David Petite's extraordinary technological contributions to society.

Materials (for each group of 2-3 students):

- Individual student copies of "Meet Thomas David Petite, also known as David!" handout
- Puzzle piece template, copied onto cardstock for each small group
- Scissors
- Art supplies
- Tape, glue
- Larger-sized construction paper or butcher paper

Instructions

1. Give each student a copy of the “Meet Thomas David Petite, also known as David!” handout. This can be read aloud, or students can read individually.
2. Divide students into small groups of 2 or 3. Students will collaborate in teams to share information about David Petite’s life. Each team will use 2 or 3 puzzle pieces to illustrate and describe a significant milestone or accomplishment in David Petite’s life.
3. Each puzzle piece should contain a picture and a related description, date, or event.
4. The team will assemble the timeline by taping the pieces onto large construction paper.
5. Timelines should be displayed so the class can do a gallery walk. Ask students to write down something new they learned on Post-it® notes and place them on the different timelines visited. Each team should report their observations. Sample timeline for David Petite:



Student activity handouts

- Timeline activity: David Petite’s life

Elaborate: Operation Invention

Time: 80 minutes

Background

The elaborate section of this lesson plan empowers students to engage in an invention challenge to enhance the lives of individuals or help communities solve challenges. David Petite's various inventions span medical, environmental, robotics, and engineering fields, and have improved technology access for millions of people. His inventions in wireless mesh technology, including within Wi-Fi networks in public spaces, facilitate activities such as home monitoring, weather checks, and instant communication. Now, consider conceiving an invention beneficial to yourself or others, recognizing that its impact could benefit many more.

Students will think of a human problem that they would like to solve. The student's invention should help someone else with the problem identified. If this invention helps someone else, it could also be a solution for many others.

Materials

- Operation Invention supply box for each group of students (supply suggestions are provided on a separate handout)
- Pencil and paper

Instructions

1. Have students work in pairs. They should ask their partner to identify a problem someone might encounter in daily living or doing a job. The problem could be related to where the students live or associated with a specific population, such as people with disabilities.
2. Students define the problem and research the issue.
3. They will draw their invention and label all components, describing functions. Black ink or pencil makes the drawings easier to see if scanned or copied.
4. Students create a prototype of the invention, using the materials provided, to prove the concept that it can work.
5. Students test their rapid prototype and note where modifications might be needed.
6. Based on test results, they iterate and build a revised version of their working prototype.
7. Students brand their invention by creating a trademark using the Trademark Zone on the EquIP HQ website. Groups will prepare a pitch for their invention. Students can refer to "A USPTO inventor trading card activity challenge: World of mesh topology with David Petite" and the EquIP HQ Patent Sensei interactive activity to learn about patents.
8. Students will deliver the pitch for their invention to the rest of the class, integrating their knowledge of the types of intellectual property protection that apply.

Student activity handout:

- Operation Invention

Evaluate

Time: 20 minutes

Instructions

1. Use the following questions to guide student discovery and connections to the inventions and innovations from the activities in this lesson:
   a. Why is it important to have innovation and inventions?
   b. What is the role of inventors in helping to solve challenges?
   c. What role does David Petite have in contributing to technological advances, inspiring youth, or supporting beginner indigenous inventors?
2. Research, plan, and create a mesh network for your community

Student activity handout:

- Plan and create a mesh network for your community

Vocabulary

Node
A point of connection within a data communication network.

Mesh network topology
This refers to how each device (e.g., computer, router, phone) is interconnected to every other device. It defines how networks are physically arranged.

Wireless mesh
This technology allows for data to be transmitted from nodes in the network, and the nodes can also act as a relay for other nodes to send data.

Innovate
The act of introducing new ideas or methods.

Intellectual property (IP)
Creations of the mind that may include but are not limited to inventions, written, artistic, and design works. These may be protected by acquiring a patent, trademark, copyright, or trade secret.

Patent
A grant of a property right issued to the inventor by the United States Patent and Trademark Office that confers the right to exclude others from making, using, offering for sale, or selling the invention in the United States or importing the invention into the United States for a limited period of time.

Trademark
A word, name, symbol, or device that is used in trade with goods or services to indicate the source of the goods and services and to distinguish them from the goods and services of others.

Copyright
A form of protection provided to the authors of "original works of authorship," including literary, dramatic, musical, artistic, and certain other intellectual works, both published and unpublished.

Trade secret
Information that has either actual or potential independent economic value by not being generally known, has value to others who cannot legitimately obtain the information, and is subject to reasonable efforts to maintain its secrecy. For example, the formula for the beverage Coke®.

Standards alignment

Math, Grades 3-12

Mathematical Practices
Problem Solving and Reasoning

MP.2 - Reason abstractly and quantitatively

MP.4 – Model with mathematics

Next Generation Science Standards, Grades 6-12

Science and Engineering Practices
Constructing Explanations and Designing Solutions

Disciplinary Core Ideas
Developing Possible Solutions

Crosscutting Concepts
Influence of Science, Engineering, and Technology on Society and the Natural World

MS-PS 2-5 - Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

English Language Arts Standards, Grades 3-12

WHST.6-8.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

RST.6-8.3 - Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical task.

National Core Art Standards

Program 8 - Demonstrate willingness to experiment, innovate, and take risks to pursue ideas, forms, and meanings that emerge in the process of artmaking or designing.

Computer Science Standards Grades

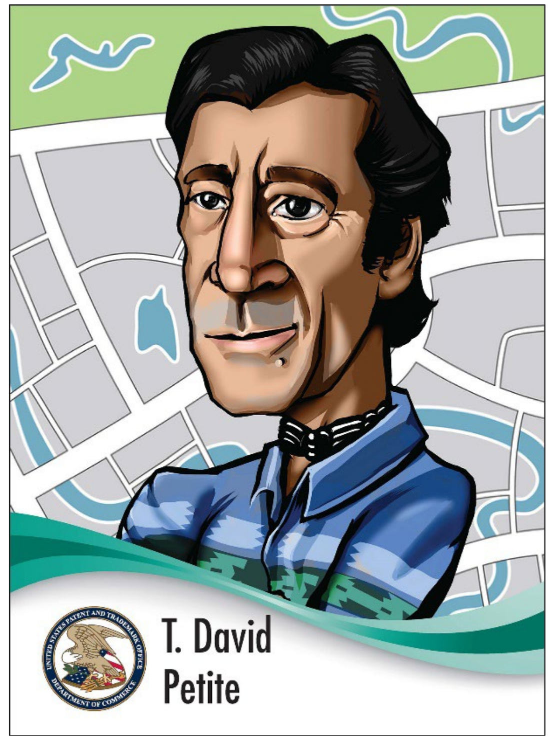
2-AP-15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs.

A USPTO inventor trading card activity challenge: World of mesh topology with David Petite

T. David Petite

Communications inventor and entrepreneur

Born: May 30, 1956; Birthplace: Atlanta, Georgia



T. David Petite is one of the early inventors of wireless mesh technologies, in which devices form a network where information hops from one device or user to another so that everyone remains connected. T. David Petite is a member of the Fond du Lac Band of the Lake Superior Chippewa Tribe and founder of the Native American Intellectual Property Enterprise Council, a nonprofit organization helping Native American inventors and communities nationwide. Petite has over 50 U.S. patents.

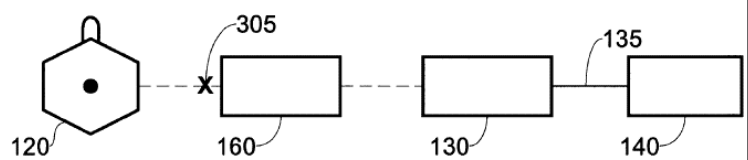
Activity

Can you identify and create models of different mesh network topologies?

Background

In this activity, you will explore how different mesh topologies determine how communication is spread through interconnected devices. You will then select one topology and build a model using marshmallows and toothpicks.

FIG. 5



Drawing from David Petite's Personalized Security System, which shows how messages are received and relayed from the transmitter to the transceiver.
U.S. Patent 5,926,103

Materials

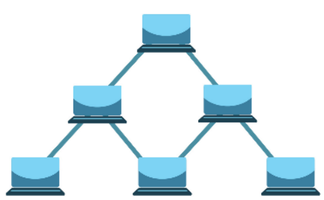
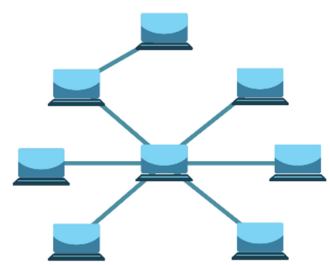
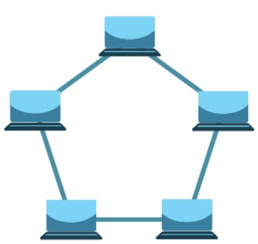
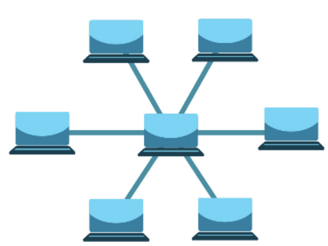
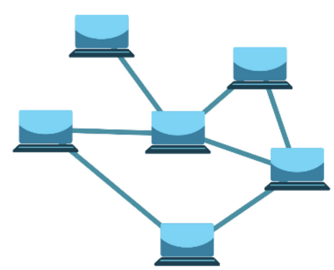
- Mesh network picture cards
- Mesh network name cards
- Mesh network description cards
- Toothpicks
- Marshmallows
- Scissors

Directions

Network topology matching activity

1. Cut out the cards. Match the name card with the correct network picture card and definition card. You should have three cards for each type of topology.

Star topology	Bus topology	Tree topology
Mesh topology	Hybrid topology	Ring topology

A network that is formed by combining designs to take advantage of strengths, minimize weaknesses and costs, and meet users' needs.	A network with nodes or users branching out from a central hub. If the central hub goes down, this can mean the failure of the entire network.	This network is robust and very redundant. It grows in complexity and reliability with each new node or user creating a new connection. The internet uses this network topography.
This network design connects the nodes in a single line, a backbone.	This network topology arranges the nodes in a circle. There is no signal weakness with each additional user.	This network design is hierarchal, meaning the beginning connection is in the top layer, linking to more nodes in the next layer and connecting to more nodes in the next lower layer.

6. Select one of the networks from the matching activity and create a marshmallow and toothpick model of the network.
7. Take a picture or draw the toothpick model and place it below. Label the nodes and transmission paths that this network forms.

Draw a star network

Background

Each device is connected to many others in a network, forming many connections. In traditional networks, devices are connected to a central hub or router. Networks that work to connect devices can transmit information more quickly. Patterns of connection, called topology, form these different networks. A few types of network topology include bus, star, tree, hybrid, mesh, and ring.

Materials

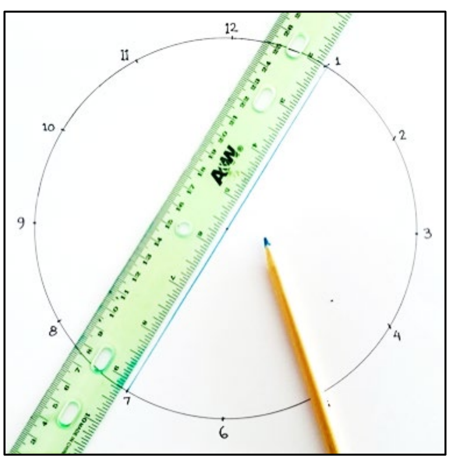
- Cardstock
- Compass – if dividing the circle
- Pre-divided circle template – if not dividing the circle
- Colored pencils
- Ruler

Directions for drawing a model of a star network

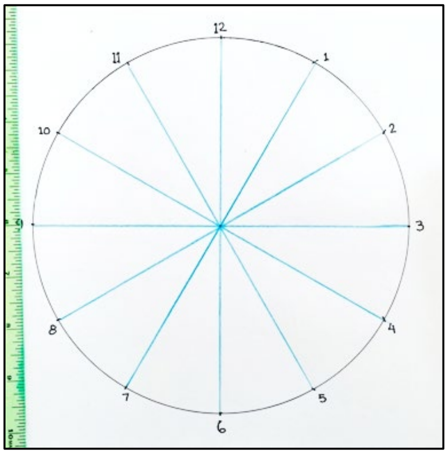
You will draw a model that shows a pattern of internet connection through a star network.

Use the circle template for the following activity. Students will create a drawn mesh network model using the circle dot template. The template is a circle divided into 12 dots equally spaced around the circumference.

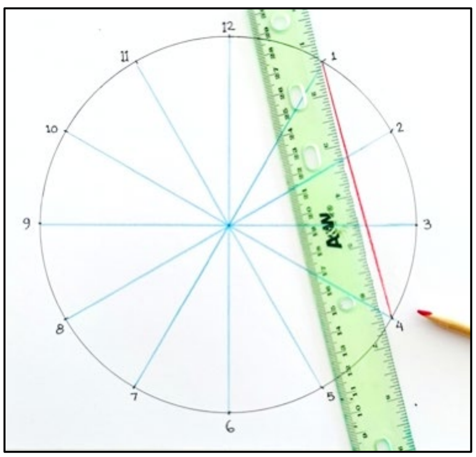
1. Use a ruler and draw a line from 1 to 7.



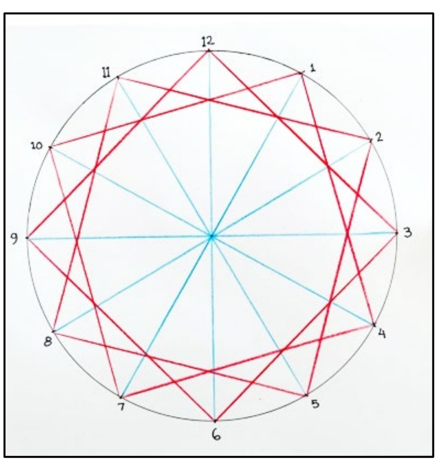
2. Using the same color selected in step 1, draw a line from 2 to 8, then 3 to 9, and continue around the entire circle.



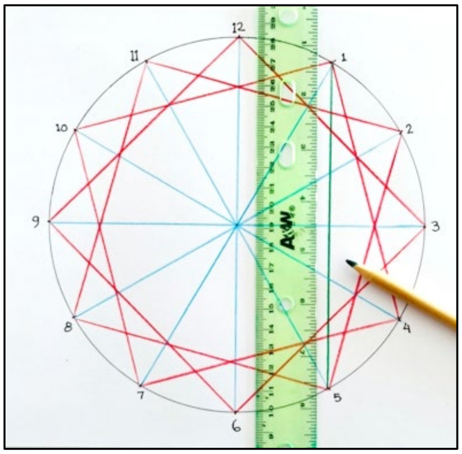
3. Select a second colored pencil. Use a ruler and draw a line from 1 to 4.



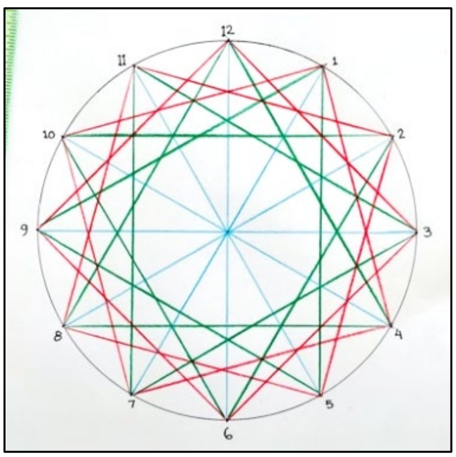
4. Using the same color selected in step 3, draw another line from 2 to 5 and 3 to 6. Continue around the entire circle.



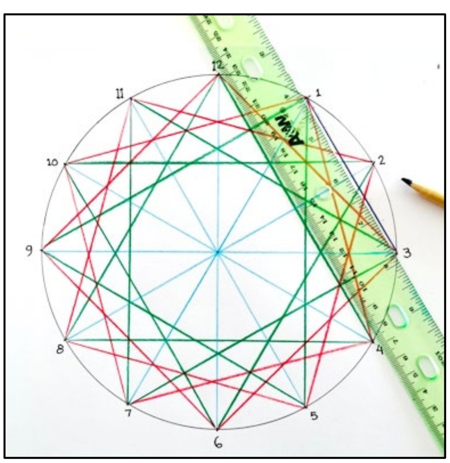
5. With a third color, use a ruler and draw a line from 1 to 5.



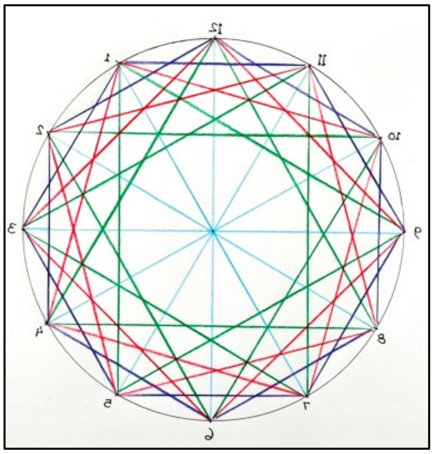
6. Using the same color selected in step 5, draw another line from 2 to 6 and 3 to 7. Continue around the entire circle.



7. Select a fourth color, use a ruler, and draw a line from 1 to 3.



8. Draw the second line from 2 to 4, then 3 to 5, and continue around the entire circle.



This model illustrates how the star network works. Every time users are added to the network, it grows more robust. More connections and routes are formed that transmit information from device to device.

Questions

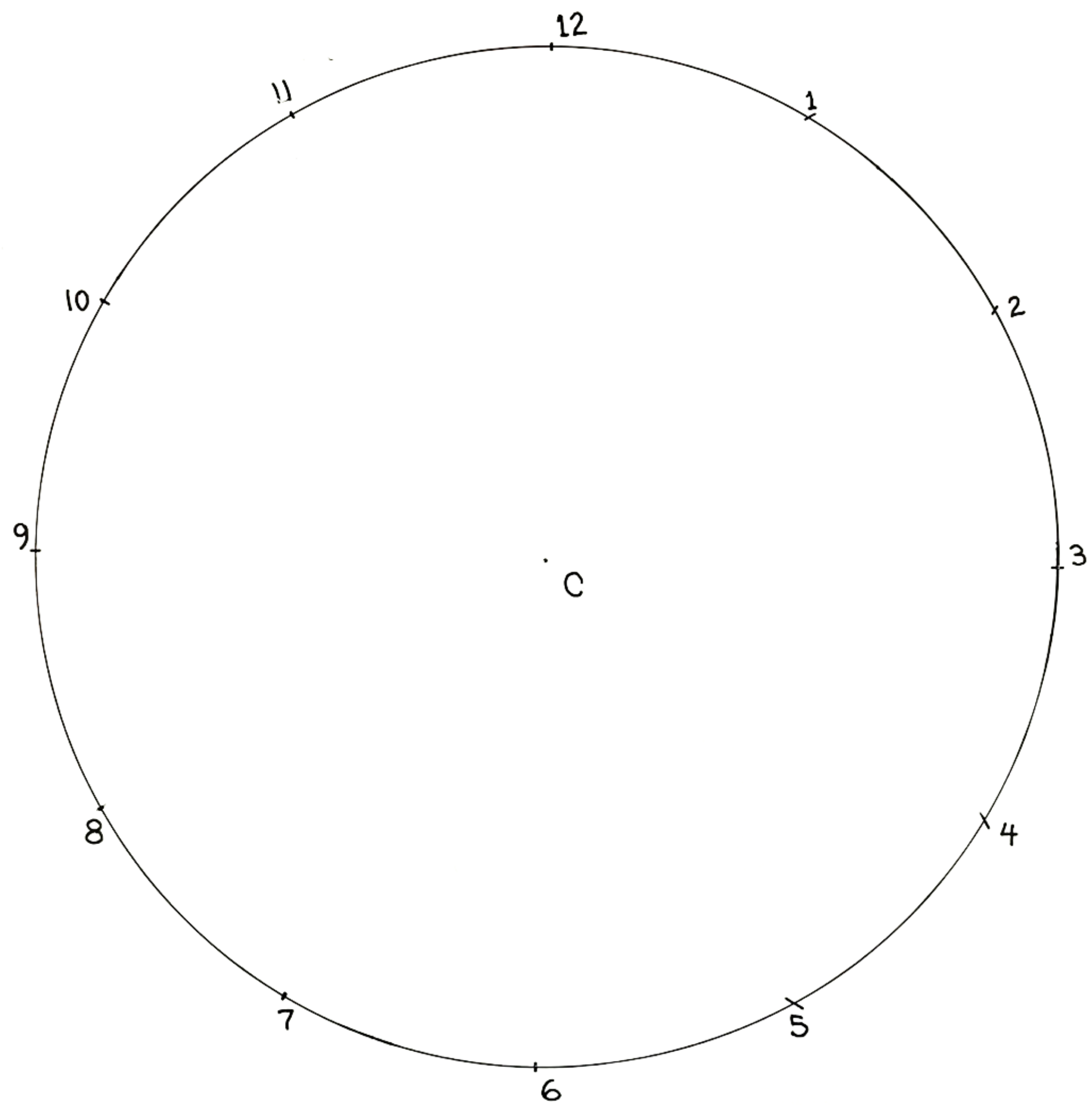
1. What do the numbers around the circle's circumference represent in the drawn model of the star network topology?

2. What do the lines that connect the numbers represent?

3. The lines cross in multiple places in the drawing. This could represent additional connections. Why is the star network topology faster than traditional networks that operate through one router?

Circle template

This circle is divided into 12 equal points around the circle's circumference. You can incorporate or copy the center point in your design without it. This template can also be copied on cardstock for the string art activity.



String art model of a mesh network

Background

In a network, each device is connected to several others, forming many connections. In traditional networks, devices are connected to a central hub or router. Networks that work to connect devices to each other (without going through a central hub) can transmit information more quickly. Patterns of connection, called topology, form these different networks. A few types of network topology include bus, star, tree, hybrid, mesh, and ring.

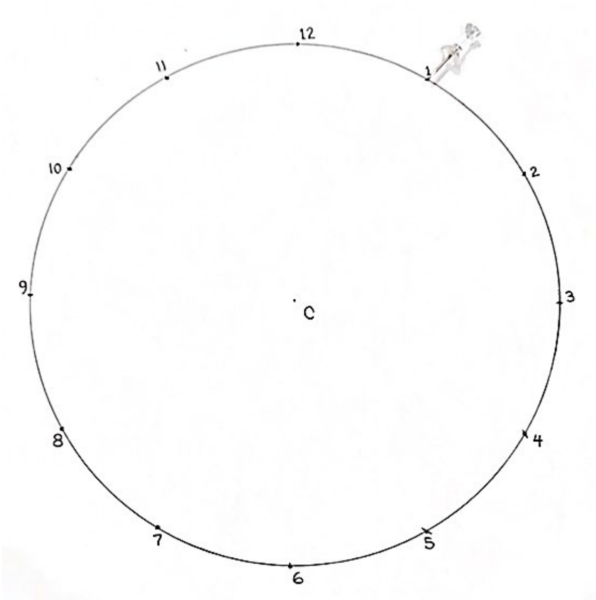
Materials

Create a string art model of a mesh network

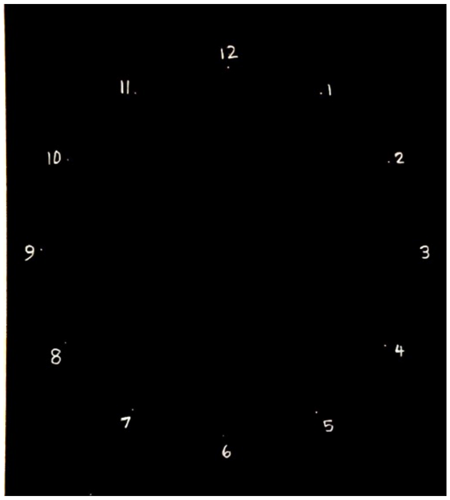
- Sewing needle
- Template on cardstock
- Pushpins
- Tape
- Cardboard
- Different colors of string

Directions for creating a string art model of a mesh network

1. Place the cardstock circle template on the cardboard.
2. Use a push pin to punch a hole in the numbered dots around the circle's circumference. Remove the cardboard.

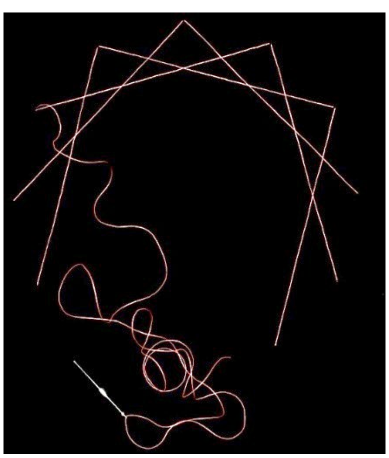


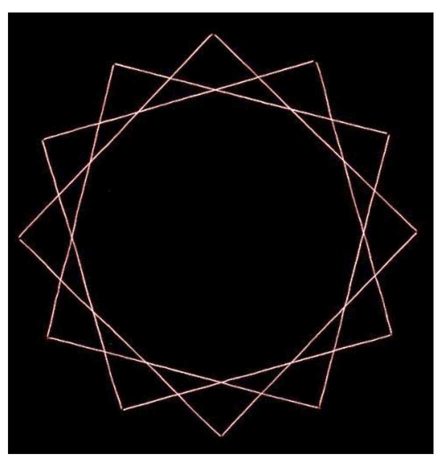
3. If using the black cardstock template, write the numbers 1 – 12 on the back of the string art template, as shown below.



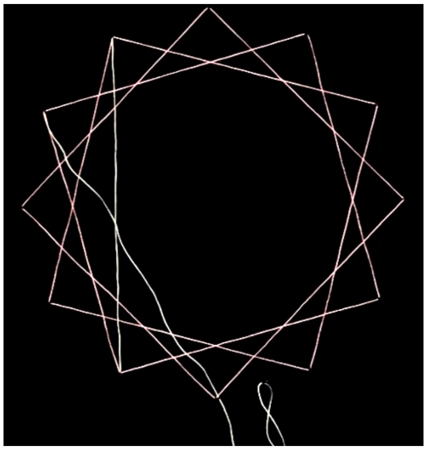
4. Use a needle and embroidery string to create a string art design. Sew through a hole from the back of the cardstock and tape the end of the string to the back of the cardstock template. Follow the guidelines below:
   a. Start from the back in hole 1 and tape the end of the string before you pull it through.
   b. On the front, sew back through hole 4 and pull the line so it's not overly tight.
   c. From back to front, go through hole 2
   d. From front to back, go through hole 5
   e. From back to front, go through hole 3
   f. From front to back, go through hole 6

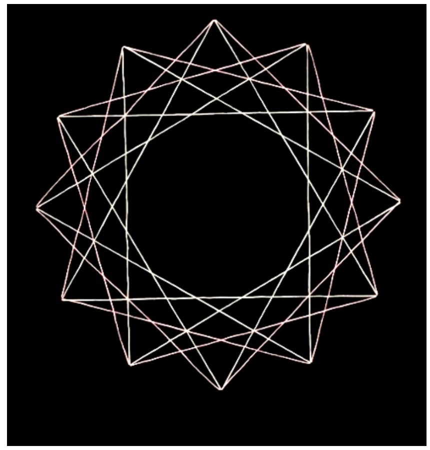
5. Continue this pattern around the circle until you get a string art model of a mesh network.



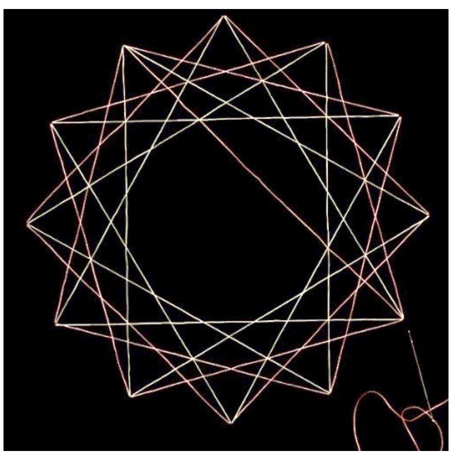


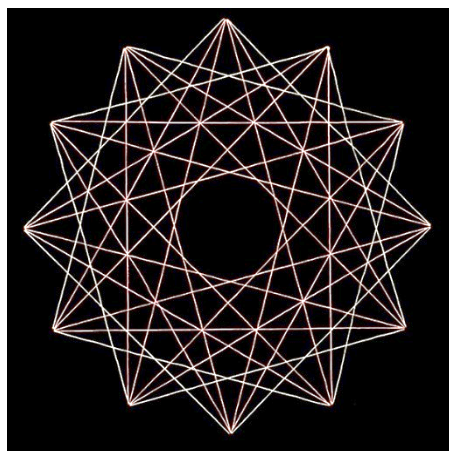
6. Using a second colored embroidery string and pattern, sew around the circle. Skip four holes by connecting 1 and 5, 2 and 6, and continue around the entire circle. The design will grow in complexity.





7. Using a third colored embroidery string and pattern, skip four holes, connecting holes 1 and 6, 2 and 7, and continue around the entire circle.





Questions

1. What do the holes in the string art model of a mesh network topology represent?

2. What do the strings that connect the holes represent?

3. The strings cross in multiple places in the model. This could represent additional connections. Why is the mesh network topology faster than traditional networks that operate through one router?

Create a random string art model of a community or global mesh network

Background

Mesh networks allow devices to connect directly to each other, creating a "mesh" of interconnected points of communication between nodes. Traditional networks rely on a central access point such as routers. In a mesh network, each node serves as both a data provider and a data consumer, facilitating a more resilient and flexible network architecture.

In a community setting, mesh networks provide local connectivity among devices within a neighborhood or town. Nodes in the mesh can be anything from smartphones and laptops to dedicated mesh network devices.

On a global scale, mesh networks can help decentralize the internet, reducing reliance on a few centralized service providers. This decentralization enhances privacy and reduces the risk of single points of failure.

Materials

- Sewing needles
- Template printed on cardstock
- Pushpins
- Cardboard
- Tape
- Different colors of string

Directions for creating a string art model of a community or global mesh network

Select the cityscape or world cardstock template. Create a random mesh network on one of the images. You can also print a satellite image of your community on cardstock and use it instead of one of the templates provided.

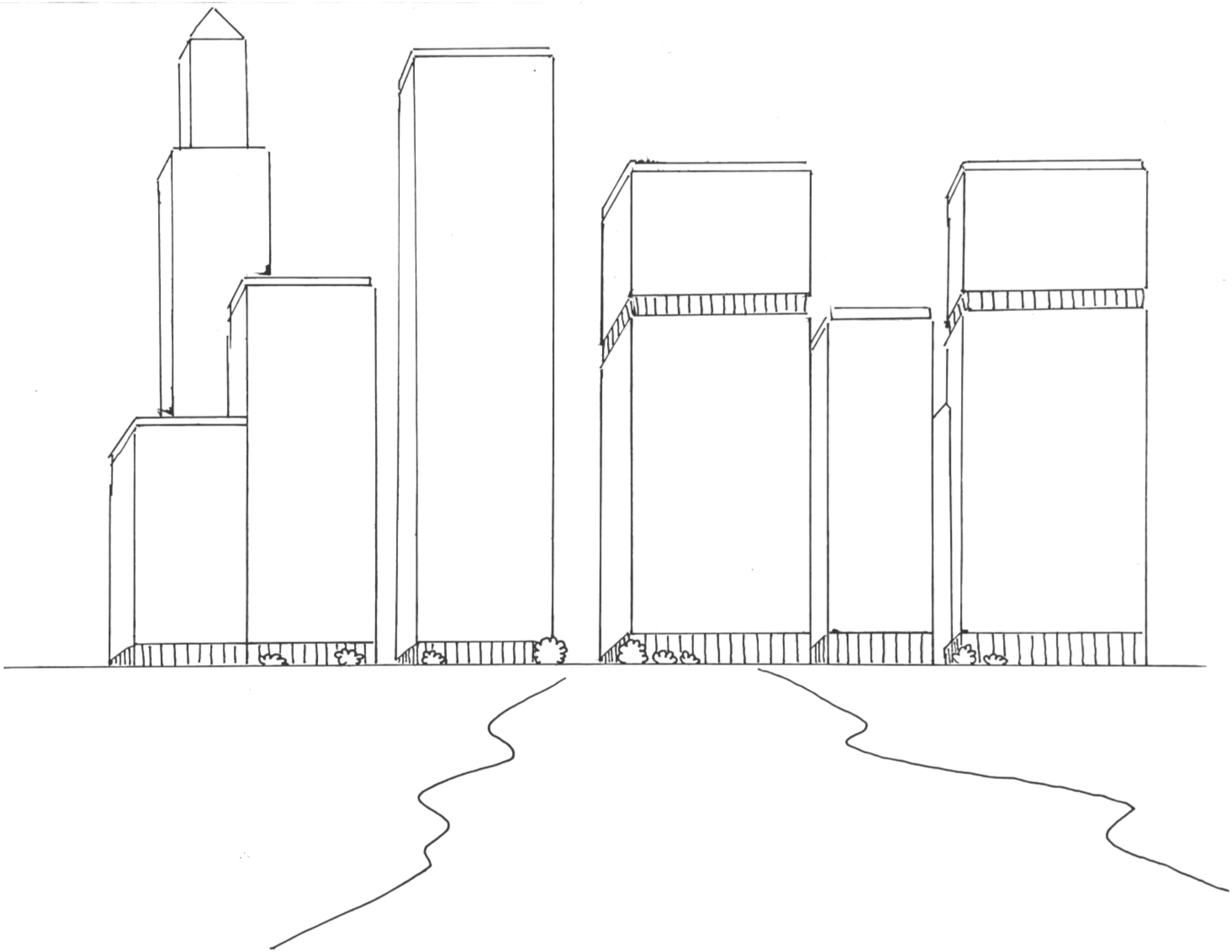
1. Lay the template on top of a piece of cardboard and use a push pin to poke holes through different buildings, countries, or land features. The holes represent nodes or connections. Avoid bending the cardstock.
2. Using colored embroidery string and a needle, start from the back of the card to the front so that the end of the string can be taped on the back. Sew the string from back to front and then front to back to connect the holes or nodes. This represents how internet users connect through nodes in a mesh network. The more nodes added, the greater the mesh network's complexity and the greater the number of businesses and community members it can serve.
3. When ending the string design, sew from front to back and be sure that the string is taped down on the back of the cardstock template so that no tape shows on the front.

Questions

1. What are the benefits of a community mesh network?

2. How does a global mesh network differ from a community mesh network?

3. What would happen to the network if one node breaks down?



Tinkering with a purpose

Background

In the spirit of David Petite's mantra, “Necessity is the mother of invention,” this activity will unlock your mechanical ingenuity and sharpen your problem-solving skills. Read the story about the challenges of having a home in Bocas del Torro, Panama, and build a house with a mechanical door closer.

The story of Bocas del Torro, Panama:

Step into the enchanting world of Boca del Toro, Panama, where homes are not just shelter but a dance with nature. Imagine a village where the air is thick with heat and humidity, and where many kinds of insects buzz around all day long. Homes are wrapped in a delicate embrace of netted walls, a necessity born from the unique blend of tropical challenges.

A whimsical solution to a pesky problem emerges. A ballet of pulleys and conch shells turns entering and exiting a home into a fascinating performance. As someone approaches the netted home, anticipation hangs in the air. A gentle push swings the door open, revealing the warm embrace of home. The moment they step inside and release the door, the conch shell, suspended in mid-air by a pulley system, gracefully floats down with a purpose, and the door glides shut.

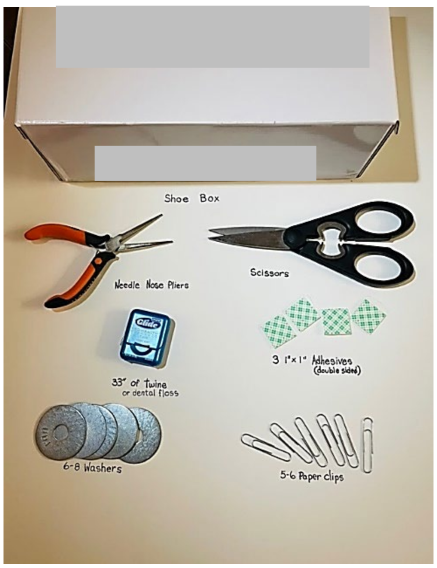
The village has found a harmonious solution to the intrusion of insects – a dance of technology and tradition that keeps the tiny invaders at bay.

Materials

- Dental floss
- Different size galvanized washers from quarter inch to 1.5 inch
- Shoebox
- Paper clips
- Adhesive mounting square or tape
- Needle-nose pliers
- Scissors

Directions

1. Gather the materials needed to build the house and door.



2. Cut a door in the shoebox.

4. Cut the adhesive squares in half.

5. Using needle-nose pliers, shape loops in the ends of large paper clips.

6. Use the mounting strips to attach paper clip loops to the shoebox above the door.

7. Bend a paper clip to hold the washers.

8. Attach the hook with the washers to the box so that the weight of the washers will close the door.

Test and iterate

1. Open your door and observe how it works.
2. Are there any ways you could improve the design of the door?

3. Revise your design, draw, prototype, and test the door again.

Timeline activity: David Petite's life

Background

Materials

- Puzzle pieces on cardstock
- Scissors
- Tape
- One large sheet of construction paper
- Markers or art supplies
- Article about David Petite

Directions

1. Cut out the puzzle pieces or create your own.
2. Choose six milestones from David's life that are significant and interesting.
3. Work individually or in small groups. Draw a graphic or picture on each puzzle piece and explain one aspect of David Petite's life represented on each part.
4. Assemble the puzzle by placing tape on the back. Tape the assembled puzzle on a large sheet of construction paper.
5. Display your puzzle in a location designated by your teacher.
6. Do a gallery walk of each puzzle in your classroom. Place Post-it® notes on the timelines displayed to identify similarities and differences compared to your timeline.
7. Present the information featured on your timeline. Share information from one of the Post-it® notes left on your timeline.

Meet Thomas David Petite, also known as David!

David was born on May 30, 1956, in Atlanta, Georgia. His dad, Robert Eugene Petite, was once a Native American Chief of the Fond du Lac Chippewa Tribe in Wisconsin. His mom is Helen Ruth Byrd.

Atlanta, Georgia

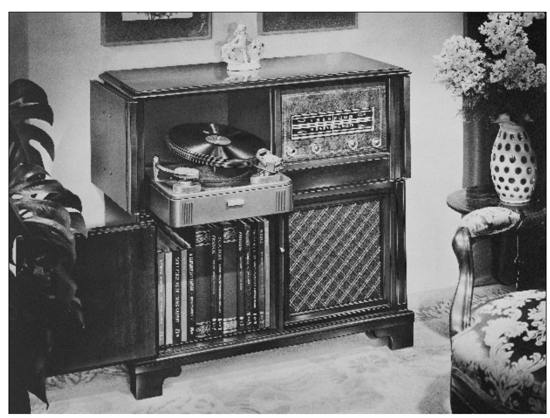
Even though David grew up in Atlanta, his father taught him about his cultural heritage. He instilled in David a sense of values and pride. David spent much time on the Fond du Lac Reservation with uncles, aunts, and cousins.

Fond du Lac Chippewa Reservation, MN

His upbringing was influenced by his time with family members on the reservation. His father played a pivotal role in nurturing David's curiosity by sharing stories of their Native American ancestors' ingenuity and innovations to improve farming methods. Historic inventions created by Native Americans included grass and rabbit-skin diapers, hardwood canoes, bulbed syringes made from animal bladders and bird bones, and bark toboggans.

David was a curious child. He loved playing with toys and figuring out how they worked. His mom used to say he would take a toy out of the box and try to make something new from the box. He liked learning about famous inventors like Thomas Edison, Nikola Tesla, and Benjamin Franklin. From an early age, he knew he wanted to be an inventor.

David said his father was the most intelligent man he ever met. His dad was in the Navy and worked with sonar and radar. He even helped design systems that we still use today, and fostered David's interest in how things work.



Philco® radio

David used to sit with his dad and tinker with their Philco® radio. This was when David became fascinated with radio waves and wireless technology. David's father taught him that wireless is not only a science – it is an art.

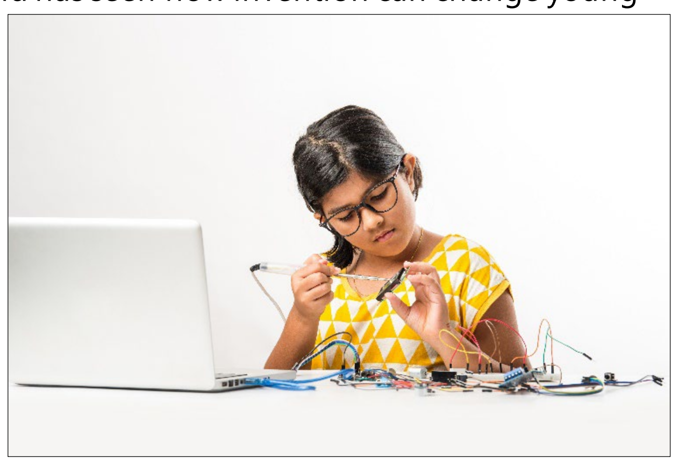
David Petite holds over 130 patents, dating back to the 1990s. As an innovator, he helped lay the groundwork for the Internet of Things (IoT), which enables everyday devices to connect to each other and to the internet. For example, sensors that send a signal to a phone app to let people know when their plants need watering.

Wireless mesh technology

David founded StatSignal Systems in 1993. This was the first company to patent and introduce wireless mesh technology to healthcare and utility industries. This enabled companies and consumers to monitor electricity use in homes and businesses. He and his wife founded the Smart IP Company (SIPCO) in 2003. SIPCO is a company that has licensed its wireless mesh technology to other companies.

David Petite founded the Native American Intellectual Property Enterprise Council (NAIPEC) in 2009. NAIPEC helps young Native American inventors with their inventions and guides them through obtaining intellectual property protection. Through this foundation, David works with tribes nationwide, teaching them about intellectual property rights, including patents, trademarks, copyrights, and trade secrets. He instills the value of creativity and how it can empower each tribe's economic development.

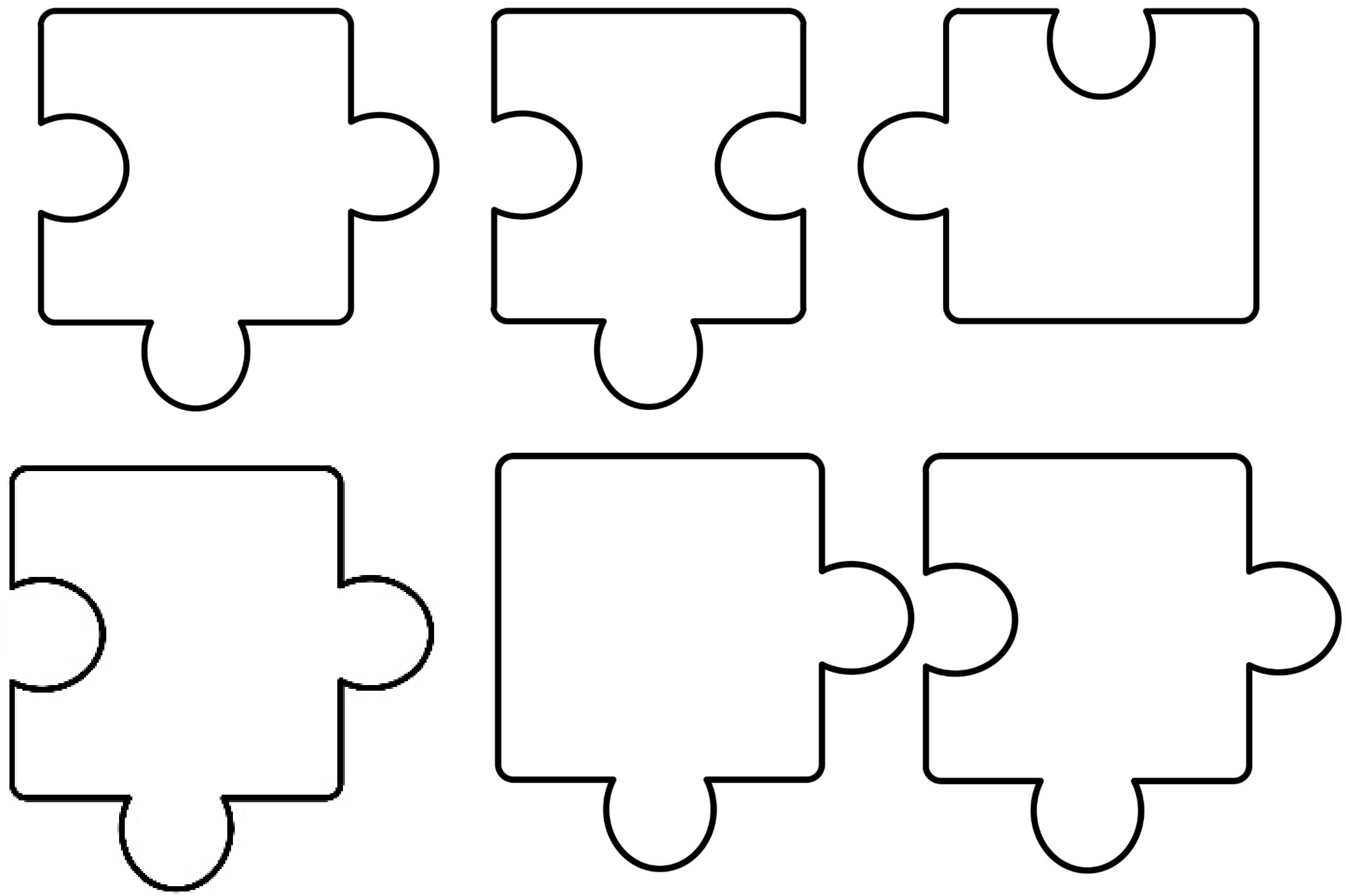
David's passion extends to education, where he sets up inventor competitions in elementary and middle schools. He believes that anyone with access to information can invent and create. He emphasizes the importance of nurturing ideas and has seen how invention can change young people's lives. He remembers an 11-year-old girl who entered one of his contests. Her idea was to make shoes that would grow with her to prevent her single-parent mother from having to buy shoes so often. The most rewarding part of his work has been reading letters from parents about the impact his work has had on students. In a CNN interview, David said, "Look in the mirror and say, 'I am going to make a difference for the people around me,' and you will be rewarded."



Child inventing

Now, David is traveling and seeing the world with his wife. When they are not traveling, they split their time between Atlanta and Costa Rica. David also owns the house on the Fond Du Lac Indian Reservation in Minnesota that once belonged to his grandfather. He continues to visit and stay involved with the tribe and his relatives.

Puzzle pieces



Operation Invention

Background

You will engage in an invention challenge to enhance the lives of individuals or communities facing challenges. David Petite's various inventions span medical, environmental, robotics, and engineering fields, and have improved technology access for millions of people. His inventions in wireless mesh technology, including those used within public Wi-Fi networks, facilitate activities such as home monitoring, weather checks, and instant communication. Think of an invention beneficial to yourself or others, recognizing that its impact could benefit many more.

Materials

- Operation Invention supply box for each group of students
- Pencil and paper

Directions

1. Work in pairs.
2. Ask your partner to identify a problem someone might encounter in daily living or doing a job. The problem could be related to your community or associated with a specific population (for example, people with disabilities or aging people).
3. Define the problem and research the issue.
4. Draw your invention and label all components, describing functions. Black ink or pencil makes the drawings easier to see if scanned or copied.
5. Create a prototype of the invention, using the materials provided to demonstrate how it will work.
6. Test your rapid prototype.
7. Iterate, modify, and build a revised version of your prototype.
8. Brand your invention by using the Trademark Zone on the EquIP HQ website.
9. Refer to "A USPTO inventor card activity challenge: World of mesh topology with David Petite" and the EquIP HQ Patent Sensei interactive activity to learn more about patents.
10. Prepare and deliver a pitch for your invention, integrating the types of intellectual property protection that apply to your invention.

Use the directions and template on the next page to identify the problem tour invention will solve, sketch and design your invention, brand it, and plan your invention challenge pitch.

Invention challenge quick guide

1 Invent

Identify a problem to solve

- Select a problem that many people experience.
- Avoid problems that impact one person.
- Select a problem that is meaningful to you and others whom it impacts.
- Find people that will give feedback about the problem and possible solutions.

3 Branding

Design a trademark

- Create a name for your invention.
- Draw a logo.
- Write a slogan for your brand.

In your group, select a problem and invent.

2 Sketch, label, and search

Draw your invention

- Create line drawings using black ink or pencil.
- Make drawings large so that you can number the parts of your invention.
- Place numbers on the drawing that point to significant components of your invention.
- Search for similar inventions.

4 Plan the pitch

Invention Statement

- Describe the invention.
- Explain the features of the invention and how it would be used.
- Explain how the brand was created.
- Identify the forms of IP that could be applied to protect the invention.

Invention challenge quick guide

1 Invent

The problem selected is:

Who is impacted by the problem?

Ideas for an invention from group brainstorming:

3 Branding

Name the invention, create a logo, and write a slogan for the invention.

What makes the invention novel?

2 Sketch, label, and search

Sketch, label, and search for your invention:

4 Plan the Pitch

Plan and map a mesh network pattern for your community

Background

When a community needs a plan for a wireless network, they usually turn to a Wireless Network Engineer. These professionals design wireless communication systems to make sure that they work and are efficient. These networks are necessary for everything from health care services to home entertainment. When planning networks, engineers consider the following:

1. **Resilience:**
   - Mesh networks allow messages to travel through different devices or nodes.
   - Mesh networks work best because messages can move along many paths.
2. **Cost-effectiveness:**
   - A mesh network is less expensive than traditional networks.
   - Communities can benefit from cost savings.
3. **Community empowerment:**
   - Communities can fix their own equipment.
   - Mesh networks provide communities greater access because they are less expensive.

Materials

- A printed satellite image of your community
- Colored pens or pencils
- Straight edge

Directions

1. Research wireless mesh network requirements to learn where nodes should be placed.
2. Using the satellite image of your community, label each node (i.e., hospital, police station, school).
3. Use the star network example to complete a mesh network map drawing. Draw lines to show how data will be sent and received between nodes and across the network.