

DECISION MAKING

*Future Ready Skills: A College & Career Readiness
Curriculum for High School Freshmen*

By Dr. Jennifer K. Richards and Alexis N. Hall

U|EXTENSION
INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE



FUTURE READY

9TH GRADE CURRICULUM

8 Units of Essential Skills

- | | |
|----------------------|--------------------|
| 1. Freshman Bootcamp | 5. Teamwork |
| 2. Who Am I? | 6. Design Thinking |
| 3. Future Me | 7. Communication |
| 4. Decision Making | 8. Growth Mindset |

Future Ready is an innovative college and career readiness curriculum created for students to develop the social, emotional, and interpersonal skills necessary to navigate the world after graduation. Each unit includes lesson plans and student handouts that require minimal preparation.

Students will discover personal strengths, practice effective communication strategies, and explore growth opportunities. The curriculum is aligned with Tennessee Career Exploration course standards and other state standards in STEM, English/Language Arts, and Social Science. It is easily adaptable for Advisory and other settings.

Future Ready was written by former classroom teachers, Dr. Jennifer Richards and Alexis Hall, at the University of Tennessee Institute of Agriculture. It was created in collaboration with Hardeman County Schools Pilot Teachers and Unit 1 Co-Authors, Nikki Boatwright, Jennifer Cox, and Sherri Johnson. For more information, contact jennifer.richards@utk.edu.



**HARDEMAN
COUNTY SCHOOLS**
"Preparing for the Future, One Child at a Time"

Unit 4

The **BIG** Idea

How can I make logical decisions and solve problems?

OVERVIEW

Lesson 1: Six Thinking Hats

- *Big Idea:*
- What are common decisions I make every day?
How can I approach making big decisions?
- Time: 90 minutes

Lesson 3: Cognitive Bias

- *Big Idea:* How can I make logical decisions?
- Time: 45 minutes

Lesson 2: Seven Steps to Decision-Making

- *Big Idea:* What are strategies for making decisions?
- Time: 45 minutes

Lesson 4: Bug on the Run Design Challenge

- *Big Idea:*
- How can I solve complex problems?
- Time: 45 minutes

OBJECTIVES

Lesson 1: Six Thinking Hats

- Engage in a systematic approach to decision making

Lesson 2: Seven Steps to Decision-Making

- Engage in a systematic approach to decision making

Lesson 3: Cognitive Bias

- Justify a choice using rational thought

Lesson 4: Bug on the Run Design Challenge

- Identify the steps of the Engineering Design Process.
- Use the engineering design process to create a habitat

Six Thinking Hats

The **BIG** Idea

What are common decisions I make every day? How can I approach making big decisions?

AGENDA

Approximately 90 minutes (2 class periods)

Day 1

1. Warm Up (15 minutes)
2. Which Hat are You? (15 minutes)
3. What are Thinking Hats? (10 minutes)
4. Wrap Up (5 minutes)

Day 2

1. Warm Up (5 minutes)
2. Six Thinking Hats Cards (35 minutes)
3. Wrap Up (5 minutes)

MATERIALS

Day 1

Large Wall Post-Its (1/ group of 4)

Markers

Six Thinking Hats Slides

<https://docs.google.com/presentation/d/1k6RsWWWhQi5iCnRU9xGRwZe2ZXANXzW3REnxwrp-K3h8/edit#slide=id.p1>

Six Thinking Hats Posters

Six Thinking Hats Day 1 Handout (1/person)

Day 2

Six Thinking Hats Slides

Six Thinking Hats Cards (1 /group of 6)

Six Thinking Hats Day 2 Handouts (1 /group of 6)

OBJECTIVES

During this lesson, students will:

- Engage in a systematic approach to decision making

STANDARDS

- Career Exploration 15: In a team, research, identify, and apply the steps of the problem solving process (problem identification, brainstorming, evaluating, solution selection, monitoring and revising) in a contextualized situation to determine a solution to a work-related problem presented from a specific career cluster area.
- English/Language Arts 9-10.SL.CC.1 Initiate and participate effectively with varied partners in a range of collaborative discussions on appropriate 9th- 10th grade topics, texts, and issues, building on others' ideas and expressing one's own ideas clearly and persuasively.

OVERVIEW

Students will learn a thinking strategy called the Six Thinking Hats to solve a series of real-world problems with a group.

PREPARATION

- List the day's **BIG IDEA** and activities on the board.

Day 1

- Place large sticky notes around the room. There should be enough for each group of 4 to work at each sticky note.
- Print the Six Thinking Hats Posters and hang them up throughout the room. Make copies of the Six Thinking Hats Day 1 Handout (1/person).

Day 2

- Make copies of the Six Thinking Hats Cards. Cut each set and paper clip them together or place them in an envelope. Each group of six will need their own set.
- Print copies of the Six Thinking Hats Day 2 Handout (1/group).

RESOURCES

Delorean, Pat. How to Use Six Thinking Hats in the Classroom.

https://gagc.org/Resources/Documents/2015%20Convention/Handouts/Hampton/Six_Thinking_Hats_Card_Game_Free_Resource.pdf

Hertberg Davis, Holly. University of Virginia. Six Thinking Hats in Action: A Sample Lesson.

https://agilityportal.io/images/easyblog_articles/1011/Six-Thinking-Hats.pdf

ACTIVITY STEPS

Day 1

I. Warm Up (15 minutes)

1. Place large wall post-it notes around the rooms. Leave enough room for groups of 4 at each post-it note. Ask students to move to one of the wall post-its with no more than 4 per group.
2. **SAY SOMETHING LIKE:** Starting from the time you woke up this morning, make a list of decisions you've made so far today.
3. Encourage students to include even tiny, seemingly insignificant decisions such as whether to brush their teeth, shower, what to eat for breakfast, with whom to sit on the bus, etc. Give groups about 5 minutes to create their lists.
4. Ask each group to share a couple of decisions from their lists.
5. **SAY SOMETHING LIKE:** We make decisions every day. Some decisions are small and easy to make, and some bigger decisions need more time and thought. Decision making is a process of gathering information to help us understand our choices. It is easy to get stuck in our ways or let emotions rule our decisions. Today we are going to learn a flexible thinking strategy to enhance our decision-making abilities.

II. Which Hat are You? (15 minutes)

1. Give students the **Six Thinking Hats Day 1 Handout**.
2. Use the **Six Thinking Hats Slides** (Slides 8-9) to guide students through ranking which hat is most like them. After they complete their rankings, they will go stand at their #1 thinking hat poster to meet classmates who chose the same hat.

III. What are the Hats? (20 minutes)

1. Teach students about each of the thinking hats using the **Six Thinking Hats Slides**.
2. While going through the slides, students should use the **Six Thinking Hats Day 1 Handout** to write down the questions that each hat focuses on when making decisions.

IV. Wrap-Up (5 minutes)

1. Ask students the following questions:
 - a. Now that you know more about the hats, do you think you are still most like the one you chose? Why or why not?
 - b. Which hat do you think is the most important? Why?

Day 2

I. Warm Up (5 minutes)

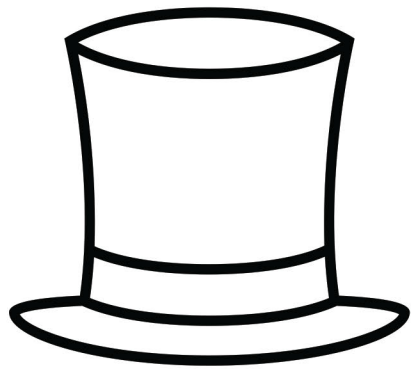
1. On a sheet of paper, ask students to write down as many of the thinking hats and their functions as they can without looking. After 2-3 minutes of brainstorming, tell students they can get their handouts from last class to see how many they got correct. Tell students that they will now practice using the thinking hats to make a decision.

II. Six Thinking Hats Cards (30 minutes)

1. Divide students into groups of six and give each group a set of the Six Thinking Hats Cards.
2. Tell students to place each of the hat cards upside down and shuffle them before randomly giving one to each person. They should set aside the three scenario cards for later.
3. Give each group a copy of the **Six Thinking Hats Day 2 Handout**
4. Guide students through the **Day 2 section** of the **Six Thinking Hats Slides** to solve two problems using the thinking hats. The person who represents each hat is responsible for completing their section of the handout.

III. Wrap-Up (5 minutes)

1. Ask students to complete the reflection question on the last slide of the **Six Thinking Hats Slides**.



Six Thinking Hats

Day 1



What comes to mind when you think of **GROUP WORK?**



What do you think?

Many people do not like working with a team to complete a project. Talk to the people around you about how you feel when working with a group.



No matter how you feel about group work, a strategy called the “Six Thinking Hats” could improve your teamwork process.

The Six
Thinking Hats
gives us a
system to
solve
problems

Six Thinking Hats®



Blue Hat
Process



White Hat
Facts



Red Hat
Feelings



Green Hat
Creativity



Yellow Hat
Benefits



Black Hat
Cautions

Six Thinking Hats Benefits



Seeing things from a new point of view



Easier to challenge ideas



Focus your thinking



Guides brainstorming



Six hats



Six colors



Six types of thinking



The hats are directions, not
descriptions of thinkers



Each thinker should be able to
use each hat

Which hat are you?

On the next slide, you will see a list of 6 statements.

Rank these from 1 to 6. Rank the one that is the most like you as 1 and the one that is the least like you as a 6.

*1= **most** like me 6= **least** like me*

Example:

1= black (most like me)

2= green

3= red

4= white

5= yellow

6= blue (least like me)

Rank these from 1-6

1= *most like me*

6= *least like me*



Yellow= I tend to be optimistic, seeing the good side of everything.

White= I tend to be very rational and objective; I feel most comfortable looking at the facts.

Red= I tend to be emotional, and to think about how things make me and other people feel.

Black= It is easy for me to see the flaws in things and to know when an idea is wrong. I tend to be very logical.

Green= I tend to think about how things could be improved or changed. I like to invent and create things.

Blue= I tend to think about how a situation needs to be managed or handled– I like to be in charge.

Six Thinking Hats®



Blue Hat
Process



White Hat
Facts



Red Hat
Feelings



Green Hat
Creativity



Yellow Hat
Benefits



Black Hat
Cautions

© 2008 The McQuaig Group • Stock Number 80704
www.deBonoForSchools.com

► The 6 Thinking Hats are on the wall.

► Go stand by the one you ranked as the most like you (#1).

► Talk to the people who picked the same hat.

► Why did you choose this one?



blue hat



Where should we start?

What are we trying to
accomplish?

What should we do next?



white hat

What information is available?

What information do we need?

How are we going to get the missing information?



red hat

What are my feelings right now?

What does my intuition tell me?

What is my gut reaction?



black hat

What are some possible problems?

What difficulties could we encounter?

What are the risks?



yellow hat

What are the benefits?
What are the positives?
Can this be made to work?





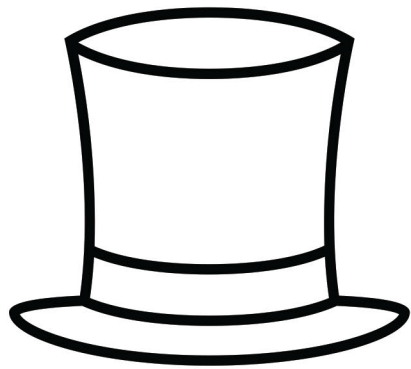
green hat

What creative ideas do we have?

What are the alternatives?

How can we overcome the black
hat difficulties?





Six Thinking Hats

Day 2

Six Thinking Hats®



Blue Hat
Process



White Hat
Facts



Red Hat
Feelings



Green Hat
Creativity



Yellow Hat
Benefits



Black Hat
Cautions

Let's use the 6 Thinking Hats to solve a problem.

Imagine that your teacher gave your team a grade on an assignment that you disagree with. What should you do?

As we work through the problem together, take notes on the first page of the Six Thinking Hats handout.

We are now going to break into groups of 6.

I am going to assign each of you to represent a different hat.

It may or may not be the one you picked.

Either way, you are going to take the lead on talking about that hat to solve a problem.

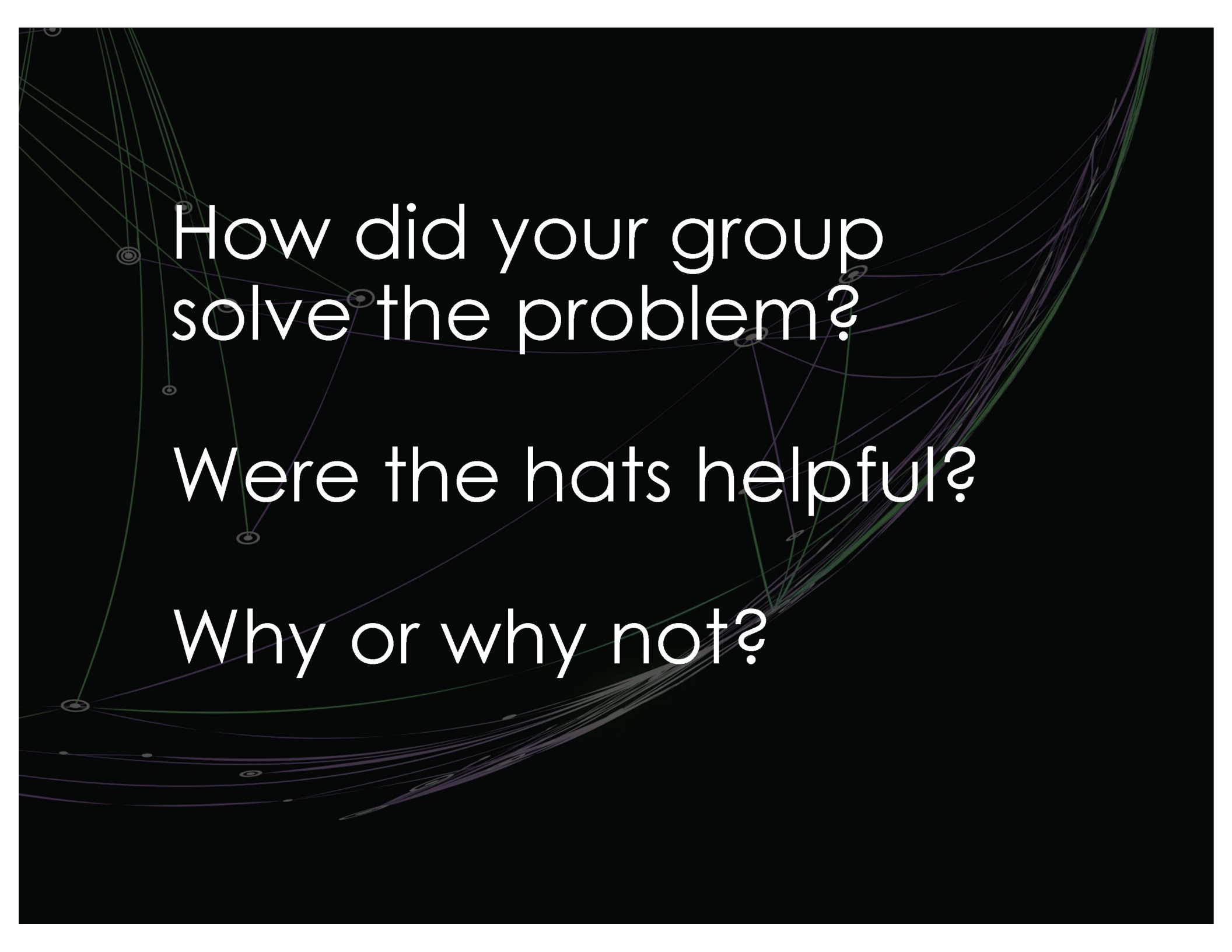


Solve this problem with your group.



Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?

Take notes on the second page of the Six Thinking Hats handout.



How did your group
solve the problem?

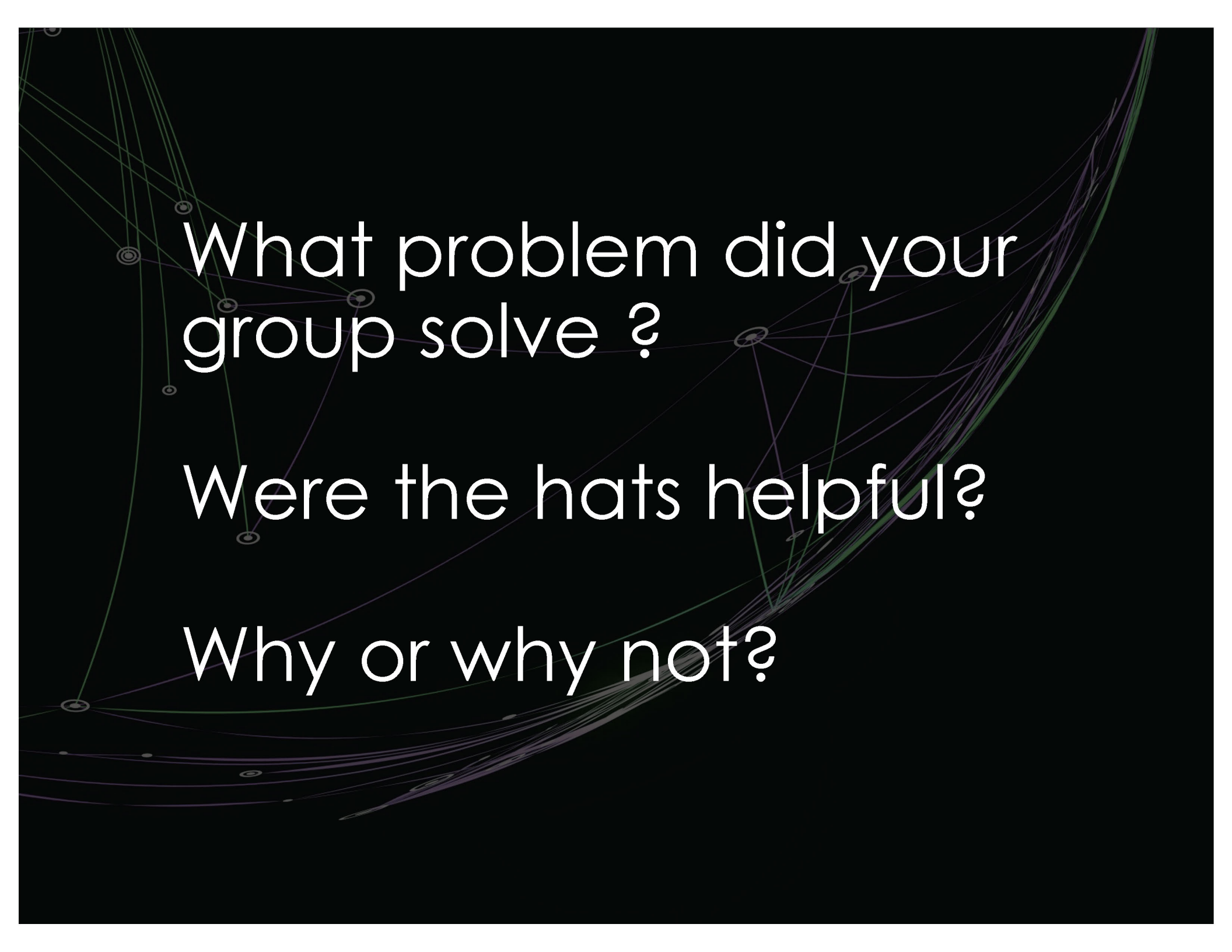
Were the hats helpful?

Why or why not?



On the last page of the Six Thinking Hats handout, create your own problem to solve with your group.

What is something that annoys you about your life at school, home, or work?



What problem did your
group solve ?

Were the hats helpful?

Why or why not?

A solid red vertical bar is located in the top right corner of the slide.

Think about some of the more
challenging decisions you have
made.

How might you use the Six
Thinking Hats to solve more
complicated problems in the
future?



Blue Hat



White Hat



Red Hat



Black Hat



Yellow Hat



Green Hat

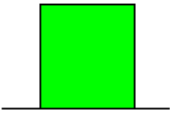
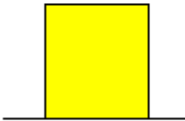
Six Thinking Hats

Rank these from 1 to 6.

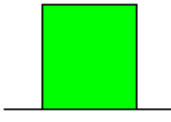
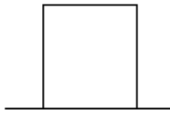
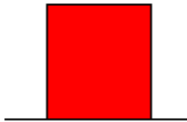
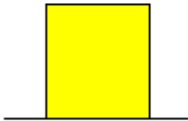
Rank the one that is the most like you as 1 and the one that is the least like you as a 6.

1= **most** like me 6= **least** like me

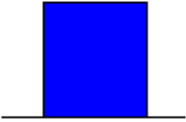
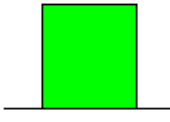
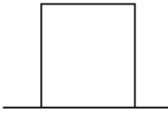
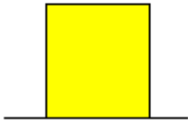
- **Yellow**= I tend to be optimistic, seeing the good side of everything.
- **White**= I tend to be very rational and objective; I feel most comfortable looking at the facts.
- **Red**= I tend to be emotional, and to think about how things make me and other people feel.
- **Black**= It is easy for me to see the flaws in things and to know when an idea is wrong. I tend to be very logical.
- **Green**= I tend to think about how things could be improved or changed. I like to invent and create things.
- **Blue**= I tend to think about how a situation needs to be managed or handled— I like to be in charge.

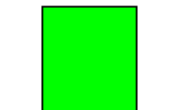
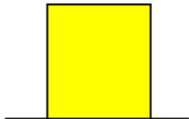
Big Picture and Direction  Blue Hat	Creativity and New Ideas  Green Hat
Facts and Information  White Hat	Gut Instinct and Emotion  Red Hat
Difficulties and Weaknesses  Black Hat	Positives and Strengths  Yellow Hat

Scenario #1

Big Picture and Direction  Blue Hat	Creativity and New Ideas  Green Hat
Facts and Information  White Hat	Gut Instinct and Emotion  Red Hat
Difficulties and Weaknesses  Black Hat	Positives and Strengths  Yellow Hat

Create Your Own Scenario

Big Picture and Direction  Blue Hat	Creativity and New Ideas  Green Hat
Facts and Information  White Hat	Gut Instinct and Emotion  Red Hat
Difficulties and Weaknesses  Black Hat	Positives and Strengths  Yellow Hat

Big Picture and Direction  Blue Hat	Creativity and New Ideas  Green Hat
Facts and Information  White Hat	Gut Instinct and Emotion  Red Hat
Difficulties and Weaknesses  Black Hat	Positives and Strengths  Yellow Hat

Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?	Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?
Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?	Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?
Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?	Scenario #1 Imagine that a new friend invited you to a party next week. You really want to go, but you are scheduled to work at your job that night. What should you do?

Create your own scenario to discuss as a group. Write it below.

Create your own scenario to discuss as a group. Write it below.

Create your own scenario to discuss as a group. Write it below.

Create your own scenario to discuss as a group. Write it below.

Create your own scenario to discuss as a group. Write it below.

Create your own scenario to discuss as a group. Write it below.

Seven Steps to Decision-Making

The **BIG** Idea

What are strategies for making decisions?

AGENDA

Approximately 45 minutes (1 class period)

1. Warm Up (10 minutes)
2. Seven Steps to Decision Making (25 minutes)
3. Wrap Up (10 minutes)

MATERIALS

Seven Steps to Decision-Making Envelopes (1/group)
 Red, white and blue poker chips
 Clear plastic bag
 Seven Steps to Decision-Making Handout
 (1/student)
 Seven Steps to Decision-Making Slides
https://docs.google.com/presentation/d/1wvtJql8iVf1w10_8Z1AgVLcuC_YT20OMXayt1vTyNAw/edit

OBJECTIVES

During this lesson, students will:

- Engage in a systematic approach to decision making

STANDARDS

- Career Exploration 15: In a team, research, identify, and apply the steps of the problem solving process (problem identification, brainstorming, evaluating, solution selection, monitoring and revising) in a contextualized situation to determine a solution to a work-related problem presented from a specific career cluster area.
- English/Language Arts 9-10.SL.CC.1 Initiate and participate effectively with varied partners in a range of collaborative discussions on appropriate 9th- 10th grade topics, texts, and issues, building on others' ideas and expressing one's own ideas clearly and persuasively.

OVERVIEW

Students will learn about the Seven Steps to Decision-Making to make decisions about a series of real-world problems

PREPARATION

- List the day's **BIG IDEA** and activities on the board.
- Make copies of the **Seven Steps to Decision-Making Sorting Activity**. Cut each step into strips and place in an envelope. Each group of 3-4 will need their own set.
- Pour a number of poker chips into one large zip-loc bag.
- Make copies of the **Seven Steps to Decision-Making Handout** (1/student).

RESOURCES

<https://www.fldoe.org/core/fileparse.php/7531/urlt/informed-decision-making.pdf>

ACTIVITY STEPS

I. Warm Up (10 minutes)

1. Show student a clear plastic bag filled with red, blue, and white poker chips. Ask for two volunteers to participate in the demonstration.
2. Explain the rules: I will hold the bag open for you. You may use only one hand and may only remove one chip at a time. You will have 30 seconds to take out as many poker chips as possible.
3. After the first participant completes his/her turn, change the information slightly: "I forgot to mention that the white chips are worth \$10; the red \$50; and blue \$100."
4. After participant number two completes their turn, have each participant sort and calculate their total. Record each person's total on board.
5. Participant number two will have the largest amount in dollars; however, they will not necessarily have the largest number of chips.
6. Discuss how a little knowledge about a decision can alter how one approaches a decision and how it can improve the outcome. Tell students that today they are going to learn a strategy for decision making.

II. Seven Steps to Decision-Making (25 minutes)

1. Make copies of the **Seven Steps to Decision-Making Sorting Activity**. Cut each step into strips and place in an envelope. Each group of 3-4 will need their own set. Give each group an envelope and ask them to arrange the steps in order.
2. Use the **Seven Steps to Decision-Making Slides** to practice the steps as a whole group. Help students identify the alignment between the Thinking Hat and each step. Then pose a decision and have small groups work through the process on the **Seven Steps to Decision-Making Handout**. Ask students to share their decisions with the class.
3. Review the Six Thinking Hats by asking the students to consider the next decision on the slideshow. Tell students to work through all six hats on the next page of the **Seven Steps to Decision-Making Handout**. Ask students to share their decisions with the class.

III. Wrap-Up (10 minutes)

1. Show students the reflection prompt on the slideshow: Think of a decision you've made recently. Work through this decision using the Seven Steps to Decision-Making on your handout.

Seven Steps to Decision-Making

Seven Steps to Decision-Making

1. Define your problem
2. Gather information and resources
3. List options
4. Weigh and compare options
5. Make a decision
6. Make a plan of action
7. Evaluate the decision

English Class vs. Concert

- Imagine that you have an English class paper that is due tonight at midnight. Your class average right now is a C, but this is a major assignment that will really affect your grade. You sit down to work on it when you get home, but then you get a call from your best friend saying that they won free tickets to see your favorite band perform nearby tonight. What do you do?
- Let's make a decision using the Seven Steps to Decision Making.
- Complete the sections on your handout as we talk through the steps.



Define your problem

You want to see the band with your friend, but you need to complete your English paper before midnight so it doesn't hurt your grade.



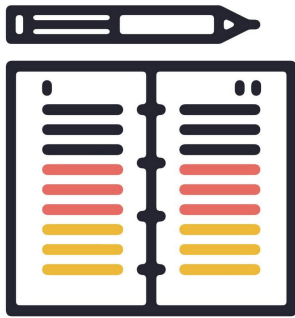
blue hat

Gather information and resources

- How much of an impact will the paper have on your grade?
- Do you know how many points it is worth or what percentage of your grade it will be?
- What is your teacher's late work policy?
- How close is it to the end of the year?
- What happens if you don't pass this class?



white hat



List options

- Leave for the concert immediately
 - Submit nothing for your paper
 - Submit the work you had already done on your paper
 - Fake sick tomorrow to see if you can get extra time
 - Ask a friend for a copy of their essay to submit
 - Find a similar essay online to submit
- Stay home and complete the paper
- Stay home until you finish the paper
 - Work for a long time on the paper
 - Finish it quickly, even if it's not good

Weigh and compare options

What are the pros and cons of each of these options?

How are the options similar and different to one another?

- Leave for the concert immediately
 - Submit nothing for your paper
 - Submit the work you had already done on your paper
 - Fake sick tomorrow to see if you can get extra time
 - Ask a friend for a copy of their essay to submit
 - Find a similar essay online to submit
- Stay home and complete the paper
- Stay home until you finish the paper
 - Work for a long time on the paper
 - Finish it quickly, even if it's not good



yellow hat



black hat

Make a decision



Which decision should you make?

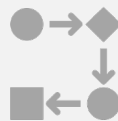


Talk with the people near you about what you would do.

Make a plan of action



Communicate your plan with
your friend



What other steps would we
need to do?



green hat



Evaluate the decision

Think about the decision you picked.
How will your future self feel about this decision?

Friends vs. Car

- Imagine that your parents frequently work on Friday nights. You are usually home alone that night, so you have friends over for parties all the time. Your friends are sometimes a little rowdy, but you haven't gotten caught yet. Recently, your friends have been asking you to take them for a ride in your parents' car, but you don't have your license yet. What do you do?
- Work with your group to make a decision using the Seven Steps to Decision Making.
- Complete the sections on the next page of your handout.

What did you decide?

Vacation vs. Savings

- Imagine that you have been working at McDonald's to save money for a car in a few years. Your friend invites you on a spring break trip with their family to Myrtle Beach. Your parents say that you can go, but only if you spend your own money for expenses. What do you do?
- Work with your group to make a decision using the Six Thinking Hats.
- Complete the sections on your handout.

What did you decide?

Reflection

- Think of a decision you've made recently.
- Work through this decision using the Seven Decision-Making Steps.
 1. Define your problem
 2. Gather information and resources
 3. List options
 4. Weigh and compare options
 5. Make a decision
 6. Make a plan of action
 7. Evaluate the decision

English Class vs. Concert

Define your problem

Gather information and resources

List options

Weigh and compare options

Make a decision

Make a plan of action

Evaluate the decision

Friends vs. Car

Define your problem

Gather information and resources

List options

Weigh and compare options

Make a decision

Make a plan of action

Evaluate the decision

Vacation vs. Savings

 Blue Hat	Big Picture and Direction	 Green Hat	Creativity and New Ideas
 White Hat	Facts and Information	 Red Hat	Gut Instinct and Emotion
 Black Hat	Difficulties and Weaknesses	 Yellow Hat	Positives and Strengths

Reflection: What's a decision that you've made recently?

Define your problem

Gather information and resources

List options

Weigh and compare options

Make a decision

Make a plan of action

Evaluate the decision

Define your problem

Gather information and resources

List options

Weigh and compare options

Make a decision

Make a plan of action

Evaluate the decision

Cognitive Bias

The **BIG** Idea

How can I make logical decisions?

AGENDA

Approximately 45 minutes (1 class period)

1. Warm Up (10 minutes)
2. Seven Steps to Decision Making (25 minutes)
3. Wrap up (10 minutes)

MATERIALS

- Teacher Computer & Projector
Kahoot Game Link - tinyurl.com/cognitivebiasgame
- Student Devices for Kahoot Game (1/student)
- Sticky Notes (1/student)
- Cognitive Bias Handouts (1/student)

OBJECTIVES

During this lesson, students will:

- Justify a choice using rational thought.

STANDARDS

- Career Exploration 15: In a team, research, identify, and apply the steps of the problem solving process (problem identification, brainstorming, evaluating, solution selection, monitoring and revising) in a contextualized situation to determine a solution to a work-related problem presented from a specific career cluster area.
- English/Language Arts 9-10.SL.CC.1 Initiate and participate effectively with varied partners in a range of collaborative discussions on appropriate 9th-10th grade topics, texts, and issues, building on others' ideas and expressing one's own ideas clearly and persuasively.

OVERVIEW

Students will explain cognitive barriers to logical decision making by creating skits to describe different types of cognitive biases. They will play and Kahoot game to test their knowledge and then consider ways to think more rationally.

PREPARATION

- List the day's **BIG IDEA** and activities on the board.
- Make copies of the **Cognitive Bias Handout** (1/student)
- Open the Kahoot Game link: tinyurl.com/cognitivebiasgame

RESOURCES

Roberson, Rachel. Lesson Plan: Can You Beat Cognitive Bias? <https://cdn.kqed.org/wp-content/uploads/sites/26/2017/05/Can-You-Beat-Cognitive-Bias-lesson-plan.pdf>

ACTIVITY STEPS

I. Warm Up (5 minutes)

1. **SAY SOMETHING LIKE:** Describe a time you tried to change someone else's mind, either about a decision they made or their views on an issue. Were you successful? Why or why not?
2. Invite students to share their experiences with the person sitting next to them. Ask a few students to describe an occasion when they changed someone's mind or when they unsuccessfully tried.
3. **SAY SOMETHING LIKE:** Whose fault is it when you can't change someone's mind? Is it that you aren't being convincing enough or that the other person is too stubborn? Call on students to share what they think.
4. **SAY SOMETHING LIKE:** It's no one's fault! Getting someone to change their mind about a firmly held belief is hard to do. We all have cognitive biases. Our brains think quickly using mental shortcuts that can limit our logical thinking. This explains why people have a hard time changing their minds or believe fake news stories. Today we will talk about some barriers we have to thinking logically and consider some ways to think more rationally instead.

II. Cognitive Bias Skits (25 minutes)

1. Give students a copy of the Cognitive Bias Handout and ask them to read the first page. Place students in groups of 3-4. Assign each group one of the five types of cognitive biases listed on the handout. Instruct each group to create a skit that explains their assigned type. The skit should include the definition, an example of someone using that cognitive bias, and some ways that people could avoid this bias in the future. Each skit should be thirty seconds to one minute long.
2. Tell students that they have 10 minutes to create their skits and then invite each group to perform their skit.
3. After all students have presented their skits, play the Kahoot game to test their knowledge: tinyurl.com/cognitivebiasgame

III. Wrap-Up (10 minutes)

1. Give each student a sticky note.
2. **SAY SOMETHING LIKE:** Think back to earlier in class when we discussed a time you tried to change someone else's mind. Which, if any, cognitive biases was that person using? How about yourself? Using what you know now about cognitive biases and Thinking Hats, how might you approach a situation like this differently in the future?
3. Ask students to write 3-5 sentences to answer the questions.

Bug on the Run Design Challenge

The **BIG** Idea

How can I solve complex problems?

AGENDA

Approximately 45 minutes (1 class period)

1. Warm Up (10 minutes)
2. Engineering Design Process Introduction (5 minutes)
3. Design Challenge (25 minutes)
4. Wrap Up (5 minutes)

MATERIALS

- Hexbug nano robots (1/group)
- Posterboard (1/group)
- Grocery Bags of Assorted Materials (1/group- All groups need the same supplies) Examples Include:
 - Tape
 - Scissors
 - Markers
 - Craft Sticks
 - Pipe Cleaners
 - Straws
 - Pompoms
 - Cotton Balls
 - Toilet Paper Tubes
 - Chopsticks
 - Disposable Dinnerware,
 - Legos or Other Building Toys

OBJECTIVES

During this lesson, students will:

- Identify the steps of the Engineering Design Process.
- Use the engineering design process to create a habitat

STANDARDS

- Career Exploration 15: In a team, research, identify, and apply the steps of the problem solving process (problem identification, brainstorming, evaluating, solution selection, monitoring and revising) in a contextualized situation to determine a solution to a work-related problem presented from a specific career cluster area.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

OVERVIEW

In this lesson, students will participate in a design challenge where they will build a maze for Hexbug micro robots, providing elements of habitat along the way. Hexbug brand toy bugs are small micro robots that move a lot like real insects. In this challenge, students will be divided into teams and given the challenge parameters.

PREPARATION

- List the day's BIG IDEA and activities on the board.
- Prepare the bags of building supplies (see materials list).
- Make copies of the STEM Challenge Planning Sheet (1/student).
- Make copies of the Bug on the Run Challenge Sheet (1/group).

RESOURCES

DeBruyn, Jennifer and Bain, Tonya. Bug on the Run Design Challenge.
<https://extension.tennessee.edu/publications/Documents/W930.pdf>

Richards, Jennifer. Irrigation Challenge.
<https://extension.tennessee.edu/publications/Documents/W674.pdf>

ACTIVITY STEPS

I. Warm-Up (10 minutes)

1. **SAY SOMETHING LIKE:** I'm going to tell you the names of 3 different objects and then give you 1 minute to see if you can guess what they have in common. **What do smartphones, skyscrapers, and shoes all have in common?** Give students a minute to think and make guesses before telling them that smartphones, skyscrapers, and sneakers are all designed by engineers. An engineer is a person who designs, builds or maintains complicated products, machines, systems, or structures. Engineers solve complex problems using the engineering design process. Let's watch a video to learn more about it.
2. Play the Crash Course Engineering Design Video: tiny.utk.edu/designprocess
3. **SAY SOMETHING LIKE:** We have learned about different methods to make decisions, including the Six Thinking Hats and the Seven Steps to Decision Making. Today you are going to solve a problem using the Engineering Design Process.

II. Engineering Design Process Introduction (5 minutes)

1. Give each student a copy of the **STEM Challenge Planning Sheet** and go over the following points:
 - The Engineering Design Process is a series of **steps** that engineers use to guide them as they solve problems.
 - It is a process that is cyclical, meaning you can begin at any step or move back and forth between steps numerous times.
 - There are five steps:
 - Ask:
 - Define the problem.
 - What is the issue or problem you need to solve?
 - What are the criteria and constraints?
 - Imagine:
 - Develop solutions by brainstorming ideas.
 - Consider all options, then choose the best one.
 - Plan:
 - Develop a plan that meets the criteria and constraints.
 - Identify materials needed.
 - Create:
 - Build a prototype.
 - Test the prototype - Does it work?
 - Evaluate the prototype - Does it solve the problem? How could it be better?
 - Improve:
 - Modify the prototype to address weaknesses.
 - Retest the solution to see if it works better now.

III. Design Challenge (25 minutes)

1. Give each team the **Bug on the Run Challenge Sheet**. Review the rules with students.
- A rare insect was discovered in Crockett County. Because it is so rare, it cannot be harmed in any way. All efforts are being made to protect the insect and provide for its basic needs of food, shelter and water. The goal is to move the rare insect to a local zoo, where it can survive. Until then, we need your help! Your challenge today includes the following:
 - Get your bug from start to finish using a maze
 - Your maze must cover most of your poster board
 - Your bug must have access to shelter, food and water
 - Your bug must climb over something
 - Your bug must travel from start to finish without stopping
 - Your bug cannot be touched once it starts the maze
 - You can only use the supplies provided
1. Divide students into teams of 3-4 and give them their supply bags. Tell students to take a quick look and see what they have. Allow students about one minute to explore their bags.
2. **SAY SOMETHING LIKE:** But before you just jump right in, let's remember what we just learned about the Engineering Design Process.
3. Lead students through an exploratory process that follows the Engineering Design Process:
- **Ask (1-2 minutes)**
 - What is your challenge? (Get your bug from start to finish using a maze.)
 - What are the criteria? (Your maze must cover most of your poster board. Your bug must have access to shelter, food, and water. Your bug must climb over something.)
 - What are the constraints? (Your bug must travel from start to finish without stopping. Your bug cannot be touched once it starts the maze. You can only use the supplies provided.)
- **Imagine (1-2 minutes)**
 - What designs can you make with your supplies?
 - Which do you think will be the best?
 - Which do you think will NOT work?
- **Plan (2 minutes)**
 - Decide as a group how you will build your habitat.
 - What roles will all the group members play?
- **Create (5 minutes)**
 - Build your habitat!
 - Test to see if you meet the required criteria and constraints.
- **Improve (5 minutes)**
 - Make changes to modify the habitat
 - Retest and repeat as needed

V. Wrap-Up (5 min)

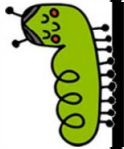
1. Lead students through a quick debrief:
 - a. Which designs were the best?
 - b. What strategies did not work well?
 - c. How did your final designs differ from your initial plans?
 - d. What did you learn about using the Engineering Design Process in this challenge?
 - e. Think back to the Six Thinking Hats. How is the Engineering Design Process different from the Six Thinking Hats? How are they similar?
 - f. Think back to the Seven Steps to Decision Making. How is the Engineering Design Process different from Seven Steps to Decision Making? How are they similar?

Bug on the Run

A rare insect was discovered in Crockett County and because it is so rare, it cannot be harmed in any way. All efforts are being made to protect the insect and provide for its basic needs of food, shelter and water. The ultimate goal is to move the rare insect to a local zoo, where it can survive. Until then, we need your help!

Your challenge to you includes the following:

- Get your bug from start to finish using a maze
- Your maze must cover the majority of your poster board
- Your bug must have access to shelter, food and water
 - Your bug must climb over something
- Your bug must travel from start to finish without stopping
- Your bug cannot be touched once it starts the maze
 - You can only use the supplies provided

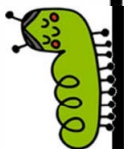


Bug on the Run

A rare insect was discovered in Crockett County and because it is so rare, it cannot be harmed in any way. All efforts are being made to protect the insect and provide for its basic needs of food, shelter and water. The ultimate goal is to move the rare insect to a local zoo, where it can survive. Until then, we need your help!

Your challenge to you includes the following:

- Get your bug from start to finish using a maze
- Your maze must cover the majority of your poster board
- Your bug must have access to shelter, food and water
 - Your bug must climb over something
- Your bug must travel from start to finish without stopping
- Your bug cannot be touched once it starts the maze
 - You can only use the supplies provided



STEM CHALLENGE



Ask

Problem:

Criteria:

Constraints:



Imagine

Ideas:

Best Idea:

Pros:

Cons:



Plan

Plan:

Materials Needed:



Create

Prototype:

Test Results:

What do we need to change?



Improve

Modify:

Retest:



UTIA.TENNESSEE.EDU

Real. Life. Solutions.™