Lesson 1: Empathy

Design Thinking

Time

25 to 30 minutes

Overview

Design Thinking is an iterative, solution-based process which seeks to understand a user and what they really need to solve a problem. One of the five key elements to Design Thinking is "Empathize". When individuals immerse themselves in the physical and social experience of other people, they gain a personal understanding of their problems. Hence, learning ***Empathy*** or how to empathize allows students to take on a beginner's mindset and become the user to understand how they feel, behave, or think.

Performance Standards Table

1. **NGSS**	**MS-SEP:** Asking Questions and Defining Problems **HS-SEP:** Constructing Explanations and Designing Solutions
2. **CCSS**	**Literacy:** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
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Lesson Objectives

After this lesson, students will:

- Understand and define empathy
- Practice ways to listen to and learn from others
- Reflect on themes and topics from interviews and observations

Materials

- Empathy videos
- White boards
- Writing paper for students

Vocabulary

Empathy is having a sense of understanding and compassion for another person. You have a sense of how it must feel to be in the situation of another person, understand what they want to do, and what their goals are.

Engage

Present a driving question; how is empathy reflected in the design thinking process?

Explore

Explore your students' experiences by having them provide examples of their personal stories of overcoming a challenge in a new way so students can better understand and relate to the experiences of their peers. When we understand the challenges faced by other people, we become more sensitive and compassionate. We are more likely to understand the day to day challenges that other individuals experience. Empathy often leads to a deeper understanding of the problems faced by others and action-oriented solutions. When we're empathetic, we can design solutions to problems that have meaningful impact for others.

Explain

Watch a Video clip that explains empathy and provides examples. After the students have watched the video, start a discussion by asking a few basic questions about empathy to see what students learned and understood from the video and their own experiences.

Elaborate

Group Activity 1: Practice empathy with a partner. This exercise helps students understand the importance of letting others talk, valuing what others have to say, and providing feedback to let them know you heard and understood their words and feelings.

a. Divide students in pairs and set a timer for 2 minutes.
b. Have each student talk about a personal experience that involves a challenge while the other listens without interrupting.
c. When the timer beeps, the first student stops talking, and the listener summarizes the words and any feelings expressed by the talker.
d. Repeat b and c for the second student.

e. When both students are finished, have the pairs discuss the experience, summarize, and share with the rest of the class.

   What was the experience like for you?
   What was it like for your partner?

Teacher Note: The students may struggle to wait for the beep before it's their turn to talk. But ask that they control the urge to cut in and talk. Asking students to summarize what they heard will most likely cause them to pay more attention to the other student's words and overall expression.

Evaluate

- How would you explain empathy to a kindergarten student?
- Why is empathy important?
- What does it mean to understand another person's challenges?

Extension

Ask students to think of situations in their own communities where showing empathy could improve the lives of others. How can they use empathy to make an impact?

Resources

1. AdventHealth Innovation Lab https://www.youtube.com/watch?v=XcYrvvu2ElM
2. National Arts Strategies https://www.youtube.com/watch?v=ThImiJf99dE
3. David Lee EdTech https://www.youtube.com/watch?v=cJQh9dTp1OE
4. Mindful Marks https://www.youtube.com/watch?v=q654-kmF3Pc&t=81s

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Lesson 2: Define the Problem

Design Thinking

Time

25 to 30 minutes

Overview

Correctly identifying the problem is the most important step in solving it. You must understand clearly the problem that your team is trying to solve before you are able to define it. In order to correctly define a problem team members must agree on what the problem is. Once the members of a team have decided on what the problem is they will set about to document this by writing down a clear description that identifies and defines that problem.

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Lesson Objectives

After this lesson, students will:

- Understand how to define a problem
- Practice techniques for analyzing and synthesizing data
- Practice techniques for clearly writing a problem statement
- Reflect on the process of problem identification and description

Materials

- Problem examples
- White boards
- Writing paper for students

Vocabulary

Problem is regarded as something that causes difficulty, and may be easy to go away. Problems can also be complex with many interdependent factors that make them seem impossible. A problem may also be a question that you want to get answers for or solve.

Problem statement is a clear and actionable description of a problem with three important traits: 1) it is human centered and leverages insights from the Empathise phase; 2) it does not focus on a specific implementation of a solution or describe a specific design; and 3) it is focused enough that it is a manageable scope.

Engage

Present a simple problem and have the students generate a series of questions about the problem. Example; How do we encourage people to recycle more? Invite students to generate some questions about this problem. Students may have questions like the following: What sort of people recycle more than others? Why do some people not recycle? Why do we want people to recycle more?

Explore

Explore your students' experiences by asking them to identify and create a list of some types of problems in their community. Students may choose to explore health related problems, safety problems, problems that concern equity for different groups of people; the elderly, racial and ethnic groups, left-handed people. Help the students to identify who can help them learn more about each problem. Who are the individuals or organization to contact to find out more information about a problem? The more questions they ask will provide them with a much better understanding and a clearer picture of how to describe these problem. Sometimes, the problem we are able to see is a surface problem which is related to a much deeper underlying cause. This is why it is important for students to ask as many questions as possible to uncover the real problem that needs to be described.

Explain

Explain to the students that the reason they need to ask questions is because this helps them get to the real root cause or problem. Taking the problem example giving above regarding recycling is a surface problem. Underlying this is that some communities don't have recycling programs or have no convenient places to recycle. Having students write their problems as questions helps them to think about how to solve it.

Elaborate

Group Activity 1: Students should practice how to define a problem. To do this, first have the students write one question and then practice rephrasing the questions in multiple ways ways? What can I do to encourage recycling? What steps can I take to make it easier to recycle things? How can I make recycling fun for others? This exercise forces the students to think about and understand a problem from several perspectives. Having different perspectives allows us to have several approaches and more possibilities to potentially solve the problem. For this next piece,

a. Divide students into teams of three and set a timer for 15 minutes.
b. Have each team chose a problem from the list that was generated by the class
c. Instruct students' pair to paint a picture in words of the problem and describe what will happen if this problem is not solved.
d. Record this description in their individual journals
e. Have students ask themselves "why is this a problem to be solved?
f. After the students had a team discussion ask them to write a simple problem statement like this in their journals. The problem we are solving is_____.
g. The next step is to have the students establish the need to solve this problem. Write a need statement for their group. For example, "If we solve the problem of _____ we will achieve the benefit of_____".

Evaluate

- What information should you provide in a problem statement?
- What are some things to consider as you write your problem statement?

Teacher Note: The students may want to rush quickly through this part of the process. Be prepared to explain that this is one of the most important part of the process and spending time to develop a clear definition of the problem will help them avoid pitfalls of a vague problem later.

Extension

Ask students to explore the "How Might We" questions. Generate guiding questions about how you might address parts of your problem statement.

- **How** suggests that we do not yet have the answer
- **Might** emphasizes that our responses are possible solutions not the only solution
- **We** suggests that the idea lies in collective teamwork

Students can turn their problem statements into "How Might We" questions by breaking their problem into smaller components. For example, if the problem to solve is that there are not enough convenient recycle bins for people to use, a How Might We question could be "How might we add more recycle bins to the area?" or "How might we let people find out where the nearest recycling bins are?".

Video Resources

1. Mindful Marks https://www.youtube.com/watch?v=TNAdanuvwtc
2. U.lab https://www.youtube.com/watch?v=wEdk1bn0nsM

Lesson 3: Ideate

Design Thinking

Time

30 to 45 minutes

Overview

Once you have clearly defined a problem, you are ready to beging ideating or generating new and creative ideas for solving it. Ideation is the process where you generate ideas and solutions through activities such as brainstorming, sketching, prototyping, and other creative techniques. All team members should participate in generating ideas, combining ideas, and eventually selecting which ideas they want to prototype and test.

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Lesson Objectives

After this lesson, students will:

- Understand how to structure brainstorming sessions
- Practice techniques for generating creative ideas (divergent lateral thinking)
- Practice techniques for narrowing down and selecting ideas to prototype (convergent thinking)
- Reflect on how focusing on small parts of a problem make it easier to brainstorm

Lesson 3: Ideate

Materials

- Problem examples
- White boards
- Writing paper for students

Vocabulary

How Might We Questions are questions used to focus brainstorming and other creative idea generating activities. "How" tells us that we want something actionable. "Might" tells us that there could be many ideas that we should consider. "We" reminds us that it takes a team to generate new ideas. A good "How Might We" question keeps a team focused on a small part of a problem they can solve without constraining them to a single solution.

Engage

Present a simple "How Might We" question from the previous lesson (Lesson 2: Define the Problem). For example, if you previous used the recycling example, one "How Might We" question might be "How Might We let people know where they can find recycling bins?". Encourage students to answer with any idea that comes to mind- especially if they think it's "weird" or "silly" or "bad". Anything that accomplishes the goal put forth in the question is a good idea. Next, ask students to pick ideas that they think are the most rational, or delightful, or are the longest shot to succeed. Are there any ideas they would combine and make better?

Explore

Ask your students to start with the problem statements and definitions that they generated in Lesson 2: Defining the Problem. Encourage your students to think about how they might break down their problem statement into smaller pieces to focus on solving. Ask them to generate a series of "How Might We" questions about their problem statements. For example, consider this possible student generated problem statement: "If we solve the problem of making recycling fun, we will achieve the benefit of encouraging more people to recycle". We are now going to make this a smaller problem by asking students to consider: "How might we make recycling fun?".

Explain

Explain to the students that the reason they need to break their problem statements into smaller pieces so that they can brainstorm about how to address each piece of their problem. The more "How might We" questions they generate, the more their problem statement becomes solvable and the easier it will be to brainstorm solutions. Encourage students to consider "How Might We" questions that cover all parts of their problem ,so that they can think about the broadest set of ideas.

Elaborate

Group Activity 1: Students will practice brainstorming for solutions to a specific "How Might We" question of their chosing. This exercise will have students generate a breadth of ideas that they will work to narrow down in the next exercise.

a. Divide students into teams of three and set a timer for 15 minutes.
b. Have each team write one problem statement and one "How Might We" question related to it of their choice on a large piece of paper.
c. Instruct students' to write down as many ideas as they can come up with to solve their "How Might We" question. They should avoid evaluating their ideas at this time. The goal is to get as many ideas down as possible.
d. Students can write, draw, or describe their ideas in any way that works for them.
e. If students seem stuck, ask them to think about the *worst* possible way to solve their "How Might We" question for a while. Even bad ideas are useful!
f. Students can also start by brainstorming by themselves for the first 10 minutes and then combining their ideas with their team for the last 5 minutes.

Group Activity 2: Now, students will practice combining and selecting ideas to focus on prototyping and testing. This exercise will ask students to reflect on their ideas and narrow down their potential solution through two techniques called "Four Categories" and "Post-It Voting".

a. Have the students reflect on their ideas for 5 minutes and write down any last-minute ideas that they come up with.
b. Now, ask each student to label, write down, or somehow mark four ideas using the following categories:
    - ***Most Rational*** - This idea is practical and makes sense to try
    - ***Most Delightful*** - This idea has the best chance of surprising people in a happy way
    - ***Darling*** - This idea is a personal favorite, but may not be rational
    - ***Long Shot*** - This idea is risky or difficult to do, or seems to be the wildest or most daring
c. Each student should select a rational, delightful, darling and long shot idea (use all four categories). They may double-up and mark a single idea with two categories.
d. Once all team members have had their turn, focus on the ideas with the most labels or marks and leave the other ideas on the brainstorming paper. Re-write the ideas with the most labels or marks on a new sheet of paper so the team can focus on just those ideas.
e. Now, ask each student to vote for two or three ideas from the remaining ideas. The ideas with the most votes should be prototyped and tested first.

Group Activity 3 (OPTIONAL): If there is time, ask students to work in their teams to describe the ideas that they have selected. Why are those ideas the best choices to solve the problem and the how might we questions they started with? Do any ideas have things in common? Can any ideas be combined? Could one idea solve more than one problem?

Evaluate

- What makes a problem easier to solve?
- What makes an idea a better fit to solve a problem?
- What are the differences between ideas that you like and ideas that your end-users would like?
- Would your users vote the same way that you did?

Teacher Note: Some students are less willing to share ideas with a group, but it's important for them to participate in the idea generating parts of this lesson. Letting them think on their own first, and then asking them to share their ideas can help make students more comfortable.

Extension

Ask students to begin sketching or prototyping their ideas and thinking about how they can get feedback on them. How would they go about building their idea? What materials do they need? What would it look like? Is there a person or set of people they could show their sketches to to get feedback right now? Do they have any questions before they start?

Video Resources

1. IDEO https://www.youtube.com/watch?v=VvdJzeO9yN8
2. IDEO https://www.youtube.com/watch?v=xXsHI_VlhmY
3. Mindful Marks https://www.youtube.com/watch?v=zbLxs6te5to
4. U.lab https://www.youtube.com/watch?v=zL8IznEjSCE

Lesson 4: Testing and User Feedback

Design Thinking

Time

30 to 45 minutes

Overview

Once students have an idea or a sketch, they can begin collecting feedback to make it better. They don't need to build a complete prototype first. In fact, asking for feedback early is a good idea - it will save them time by helping them fix problems with their prototype before they have spent a lot of time working on it. Getting feedback is also a good way to generate new ideas to prototype and test.

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Lesson Objectives

After this lesson, students will:

- Understand the importance of getting early feedback
- Practice techniques for collecting feedback
- Practice techniques for turning feedback into improvements on their designs
- Reflect on how to ask for feedback in a structured way

Materials

- Problem examples
- White boards
- Writing paper for students

Vocabulary

User feedback is receiving insight from a user to help understand their needs and better inform any further changes in your prototype in response to their feedback.

Engage

Draw a quick sketch or a simple diagram about one idea to solve a problem. This can be volunteered by a student from the previous lesson (Ideate) or continued from you earlier examples. For instance, if your Ideate Lesson focused on generating ideas to help people find recycling bins, you might draw a diagram about recycle bins with bluetooth enabled that could make a person's phone vibrate when they were close by. Or you might sketch a phone app that put the locations of recycle bins on a map like Google Maps. Ask students what they like about the idea and what they wish were different. Do they have any suggestions to make it better?

Explore

Ask your students to start by sketching out diagrams that describe how their ideas from their previous Ideating lesson work. Students might pick one idea to draw in detail, or draw small parts of many ideas. They might focus on how their idea looks, or they might tell a story about how a person would use their idea instead. Encourage them to put enough detail in that another person can understand what they are suggesting. Have them think about what they want to know more about. Do they want to know if people like how something looks? Do they want to know if people would find their idea useful? Are there any assumptions that they want to check?

Explain

Explain to the students that their sketches don't have to be perfect or polished. A clear idea roughly sketched is better than a pretty picture that they can't explain. There is plenty of time to revise and edit their work. They don't need a finished product - in fact, they will make their lives easier by starting simple now! Students may work as a team to sketch or diagram their ideas, but each team member should have their own sketches to show and be able to clearly describe them to others.

Elaborate

Group Activity 1: Students will practice asking for, capturing, and giving feedback.

a. Divide students into pairs and set a timer for 15 minutes. The pairs should not be students from the same teams as the Define or Ideate lessons.

b. Have one student present their sketches to their partner. Encourage them to point out parts that they have questions about.
c. Have the first student ask their partner what they like about the idea, what they wish were different, and if they have any "what-if" ideas (e.g. "What if you did X instead of Y to accomplish Z")
d. The first student should focus on capturing what their partner is saying, asking follow up questions, and answering any questions their partner has. They should not be trying to explain their ideas again or debate with their partner about their feedback.
e. After 15 minutes have passed, prompt the students to switch roles and reset the timer so the second student can get feedback using steps b, c, and d.

Group Activity 2: Students will evaluate the feedback they have collected from others and organize this feedback into a grid that shows what others liked, critiqued, questioned, or thought about their ideas.

a. Have students re-group with their teams from the Ideating lesson. Each student should have feedback that they collected from a student from another team.
b. As a team, have students go through each students' notes one by one and mark what other students liked, critiqued, and had questions about. Also mark any new ideas that the students from other teams had while they were giving feedback.
c. It's sometimes helpful to write notes or comments on Post-it notes so that students can begin to group similar feedback from different students together. This will help them spot patterns in the feedback that they have gotten.
d. Once the team has identified the likes, criticisms, questions, and ideas in their feedback, ask them to write a short summary about the feedback they've collected. Did they get similar feedback from any of the other students? Did other students ask similar questions? Are there any new ideas that would be good to use?

Evaluate

- What makes some feedback more helpful than other feedback?
- Why is it important to listen without debating when getting feedback?
- What questions does one need to ask to get helpful feedback?

Teacher Note: Asking for feedback is a difficult skill, even for professional designers. Remind students that the feedback they're after is feedback about the ideas and the sketches, and not about themselves as a person. Students can also find it difficult to be specific when giving feedback. Remind them that just saying that they like an idea is not as helpful as saying why they like an idea or what part of an idea they like best.

Extension

Ask students to revise their sketches or ideas based on one point of feedback they received. Next, ask them to return to the student who provided that feedback and ask them about the revised sketch. Did it improve the idea like they thought it would? Do they see something new now?

Video Resources

1. Mindful Marks https://www.youtube.com/watch?v=UVEQCNM6X-A
2. U.lab https://www.youtube.com/watch?v=zL8IznEjSCE
3. David Lee EdTech https://www.youtube.com/watch?v=5XC4JqXUJbw