

3.3 PROBLEM-SOLVING

3.3.1 Design thinking

Brief description, and rules of the implementation of the learning activity

Design Thinking is a way of thinking and working that involves coming up with creative solutions to problems ranging from subject-specific, cross-curricular to real live problems that the children may encounter in their own daily lives. Here we will solve problems by looking closely, if needed, empathizing, and thinking cleverly. It can be done both indoors and outdoors. Both surroundings have specific and different real-life problems for students. This learning activity stimulates problem-solving thinking by actively involving children in recognising and tackling real problems.

Skill focus

Primary Skill Focus

- Problem-solving

Complementary/Secondary Skill Focus

- Creativity
- Critical thinking
- Empathy

Age group	Student number	Duration
6 + years old	Individual or whole class working in pairs or small groups	50-100 minutes

Proposed step by step implementation of the learning activity

The design thinking revolves around these key ideas:

1. Understanding the problem properly: Don't start with a solution right away but get to know the problem really well first.
2. Coming up with creative ideas: Then you come up with many possible solutions.
3. Empathy: (if needed) You try to understand what someone needs or struggles with.
4. Trying out and making: You choose an idea and make a prototype (sample).
5. Testing and improving: You show it to others, see what works and adjust it.

Running the activity – step-by-step implementation

1. **Who has a problem/what's the problem? Understanding (if needed: Empathy):** “You look carefully around you: What is a problem? Who suffers from something, who could use help, or what could be better? The teacher and/or students present a problem. “
 - subjects, people, animals, groups, things or places

2. **What exactly is the problem? (Define):** “You will explore what is not going well or what is difficult. You ask questions, look carefully and try to understand the problem.”
 - something that needs to be combined, subject related, is difficult, works awkwardly, is missing or confusing, could be different
3. **What can we think of to help? (Coming up with ideas):** “You think of as many solutions as possible. All ideas are welcome! You think creatively, together or alone.”
 - make something, change it, add to it, improve it or think of something completely new.
4. **Make an example of your idea (Prototype):** “You make a model or example of your solution. You can do this with different materials. It doesn't have to be perfect yet.”
 - drawing, building, tinkering, pasting, digital design.
5. **Show it and improve it (Testing and improving):** “You show your idea to others. You listen to what they think of it and adjust your idea to make it even better.”
 - present, discuss, modify, build further, analyses critically

In this way, students learn to solve a problem in a clever and creative way

Indoor/Outdoor Classroom layout notes

It can be done both indoors and outdoors. Both surroundings have specific and different real live problems for students.

When indoors ensure that the (class-)room is quiet enough to allow focus and thoughtful discussion and explanations during research. If practiced outside, choose a quiet corner of the playground where students can stay focused and avoid interference.

How does this learning activity develop this particular skill?

This learning activity stimulates problem-solving thinking by actively involving children in recognising and tackling real problems. It starts with developing empathy: children learn to put themselves in other people's shoes and observe situations in which something is not going well. In this way, they learn to recognise problems, which is the first step in solving them. They then analyse the situation to clearly define the problem. By asking questions and distinguishing between main and secondary issues, they learn that a well-formulated problem leads to better solutions. Ideas are then generated in a creative phase in which all suggestions are welcome. This promotes free thinking, collaboration and imagination. The students convert their chosen idea into a prototype — a tangible elaboration such as a drawing, model or digital form. This encourages experimentation and shows that the process is more important than a perfect end result. Finally, the prototype is tested and improved based on feedback. Students learn to reflect, deal with criticism and think in iterations: improving by trying and adapting.

The role of the teacher here is that of a guide: someone who supports the thinking process, asks questions and creates a safe environment in which mistakes are allowed. In this way, children are encouraged to dare to think, do and improve — essential elements of sustainable problem-solving behaviour.

What do we want to achieve regarding primary skill development (student understanding and/or behaviour)?

As a result of this activity, students will:

- **Develop problem-solving abilities:** students learn to break down complex situations and think in steps.
- **Encourage creative thinking:** generating new, diverse ideas without fear of being wrong.
- **Strengthen critical thinking:** evaluating ideas, asking meaningful questions, and refining solutions.
- **Improve collaboration:** students work in teams, listen to others, and share their own ideas.
- **Foster empathy:** understanding the needs, feelings, and perspectives of others.
- **Build self-confidence:** by seeing that their ideas matter and have value.
- **Learn to take initiative and show ownership of their work.**
- **Embrace iteration:** understanding that trying, failing, and improving is part of the process.
- **Show perseverance:** staying motivated even when things are challenging.
- **Practice reflection:** thinking about what worked, what didn't, and how to improve.

Suggested use, and practical subject-related examples

Here are some examples of how Design Thinking can be applied across various subject areas:

Science

Problem definition: Plants in the classroom are not growing well and often die.

1. Who has a problem?

The class and teacher want healthy plants but don't know why they fail.

- Pupils observe the plants and talk about what they notice.
- Discuss why plants might be important for the classroom environment.

2. What exactly is the problem? (Define)

The plants may not be getting the right amount of water, light, or nutrients.

- Pupils ask questions: How often are plants watered? How much light do they get?
- Write observations on the board.

3. What can we think of helping? (Coming up with ideas)

Now the pupils get to be creative! We come up with as many ideas as we can to help.

- Brainstorm ideas: reminder system, self-watering pots, moving plants closer to light.
- Pupils draw and explain their ideas
- Discuss each other's plans, together we choose one idea from all the proposals.

4. Make an example of the idea (Prototypes)

We are going to make a model or example of our idea. It doesn't have to be perfect yet. Students will work in small groups. Crafting with paper, cardboard, LEGO, clay, valuable free material

- Build a model of a self-watering plant pot using bottles or recycled materials.

5. Show it and improve it (Testing and improving)

We show our idea to the problem owner person and ask: does this help? Each group shows how it would work and presents it to the class.

- Try the solution with a real plant.
- Observe changes and improve the design if needed.

6. The teacher and the class give feedback.

Adjustments to the idea if necessary are made.

Learning focus: scientific observation, experimentation, cause and effect.

Math

Problem definition: Pupils find it difficult to understand division with remainders.

1. Who has a problem?

Students feel confused and frustrated during math lessons.

- Teacher discusses how pupils experience division problems.

2. What exactly is the problem? (Define)

Division feels abstract and hard to visualize.

- Identify where learners get stuck.

3. What can we think of helping? (Coming up with ideas)

- Brainstorm ideas: games, visual aids, real-life examples (sharing food, toys).
- Pupils suggest creative tools.

4. Make an example of the idea (Prototypes)

- Create a hands-on division game using blocks, counters, or paper circles.

5. Show it and improve it (Testing and improving)

- Try the game in class.
- Pupils give feedback and adjust the rules or materials.

6. The teacher and the class give feedback.

- Adjustments to the idea if necessary are made.

Learning focus: problem-solving, logical thinking, hands-on math.

Environmental Studies

Problem definition: There is too much waste on the school playground.

1. Who has a problem?

The school community is affected by litter.

- Pupils observe the playground and discuss how it looks and feels.
- Discuss why is it bad that the schoolyard is full of litter?

2. What exactly is the problem? (Define)

Waste is not sorted properly, and bins are unclear or missing.

- Pupils ask questions and identify where and what kind of waste is found.
- Write observations on the board.

3. What can we think of helping? (Coming up with ideas)

- Brainstorm: better bins, signs, campaigns, rewards.
- Pupils sketch ideas

4. Make an example of the idea (Prototypes)

Students are going to make a model or example of our idea. Crafting with paper, cardboard, LEGO, clay, valuable free material

- Design a new recycling bin, posters, or a simple awareness campaign.

5. Show it and improve it (Testing and improving)

Students show their idea to the problem owner person and ask: does this help? Each group shows how it would work and presents it to the class.

- Present ideas to other classes or try them on the playground.
- Gather feedback and improve.

6. The teacher and the class give feedback.

Adjustments to the idea if necessary are made.

Learning focus: sustainability, responsibility, real-world problem solving.

Art

Problem definition: The classroom walls feel empty and unwelcoming.

1. Who has a problem?

Students want a nicer, more inspiring classroom.

- Discuss how the classroom environment affects mood and learning.

2. What exactly is the problem? (Define)

There is no visual identity or artwork representing the class.

- Decide what the classroom should express

3. What can we think of helping? (Coming up with ideas)

- Brainstorm murals, exhibitions, themed artwork.
- Pupils draw ideas and explain their concepts.

4. Make an example of the idea (Prototypes)

- Create small-scale versions or sketches of the artwork.

5. Show it and improve it (Testing and improving)

- Class discusses designs, gives feedback, and improves before creating the final artwork.

6. The teacher and the class give feedback.

Adjustments to the idea if necessary are made.

Learning focus: creativity, visual communication, collaboration.

Why This Works

- Starts from real problems
- Encourages empathy and teamwork
- Connects learning to meaningful, real-life situations
- Fits naturally into any subject

This makes learning active, engaging, and purposeful.

Materials and tools needed for implementation

For Design Thinking, you don't need expensive or complicated materials. It is mainly about thinking, doing and making - so materials that support creativity, collaboration and research are most important.

Here is an overview of possible tools and materials depending on your topic:

- Question cards (with who/where/why/how?)
- Worksheets to jot down observations or draw
- Photo camera or tablet to record things
- Post-its for initial ideas or comments
- Large sheets of paper or whiteboards
- drawing materials
- Brainstorming cards or inspiration photos
- Paper, cardboard, glue, scissors, tape
- Reusable materials (valuable no-cost materials such as toilet rolls, boxes, bottle caps, etc.)
- LEGO, blocks, clay or magnetic and/or construction materials
- Tablets or apps for digital design (optional)
- Open ended materials

Guiding questions

The teacher primarily asks questions to guide students' thinking process, without providing immediate answers. These questions encourage thought, exploration, reflection and collaboration during the various stages of Design Thinking.

For example:

- What would you do if you were in that situation?
- What is actually the real problem here?
- What ideas can you combine?
- Can you make something small that shows how it works?
- What worked well with your idea?
- What have you already discovered?

Tips and Tricks for dealing with challenges

- **Challenge:** Common problems here are differences in skills, frustration at failure, or group dynamic:

Tip Start small and simple. Start with a short and simple problem or practice project. This way children first learn about the process without making it too big or complicated. Delineating the roadmap to 3 steps can also help, for example:

- Who has a problem?
- What is the problem?
- What can we do to help?
- **Challenge:** Frustration at “not knowing” or “making mistakes”?
Tip 1: Repeat often that making mistakes is part of the process. Celebrate attempts, failures and improvements. Use posters or cards with phrases such as “I’ll try again” or “I don’t know yet, but...”
Tip 2: Bridge Differences in Working Together. Provide clarity about roles: for example, a draftsman, questioner, builder, or presenter. Allow children to alternate roles so everyone discovers their talents.
Tip 3: Focus on process, not perfect end product. Emphasize steps, not a beautiful result. “How did you come up with that idea?” is more important than “Did it turn out nicely?” Have several children tackle the same problem - then you’ll see how many ways there are to think!
Tip 4: Use smiley cards or stickers to give feedback visually. Keep it playful and flexible! Children learn best when they feel safe to explore. Leave room for fun, imagination, crazy ideas - and show that their voices matter.
- **Challenge:** Young learners feel stress or chaos because of the variety of choice.
Tip: Guide materials selection. Limit the number of materials with young learners to avoid choice stress or chaos. Create “prototyping kits” with simple items for each group: paper, tape, straws, cardboard, string, etc. (this is not the same as giving an example!)
- **Challenge:** Young children are frustrated because of the time pressure
Tip: Work with a time clock or hourglass for each step. Working short keeps them energized and organized. Have them write down or draw what they would do if there was no time - that too is valuable thinking!

Difficulty level tailoring

When working with Design Thinking in the classroom, you can differentiate into three levels. These levels match the age and developmental stage of pupils aged 6 to 10 and help make the process appropriate and achievable.

- **Beginner learners (6-7 years old):** they work on simple, recognizable problems and receive a lot of guidance from the teacher. They often choose from a few suggested solutions and, with help, create a prototype. The emphasis is on discovery, fun and learning in steps.
- **Advanced learners (8-9 years old):** they are given more freedom to explore a problem together and come up with their own ideas. They work in small groups, choose their own materials and learn to give and receive feedback. The teacher guides them through the process with targeted questions.
- **Expert learners (9-10 years old):** they work independently or in teams on more complex problems closer to the real world. They combine ideas, make multiple versions of a prototype and reflect critically on their process. Here, the teacher mainly has a coaching role and provides space for creativity and ownership.

Debriefing and Reflection questions

1. About the process (thinking and doing)
 - What did you enjoy doing most?
 - What was the most difficult part?
 - Did you do something you hadn't tried before?
 - What would you do differently next time?
 - When did you learn something from a mistake?
2. About working together
 - How did your group work together?
 - What did you do to help your group?
 - Did you listen carefully to others? And did they listen to you?
 - What went well in the collaboration, and what didn't?
 - If you could choose again: would you work together like this again?
3. About the idea and the result
 - What makes your solution clever or special?
 - Do you think your idea really helps? Why (not)?
 - What did others think of your idea?
 - Would you recommend your prototype to someone else?