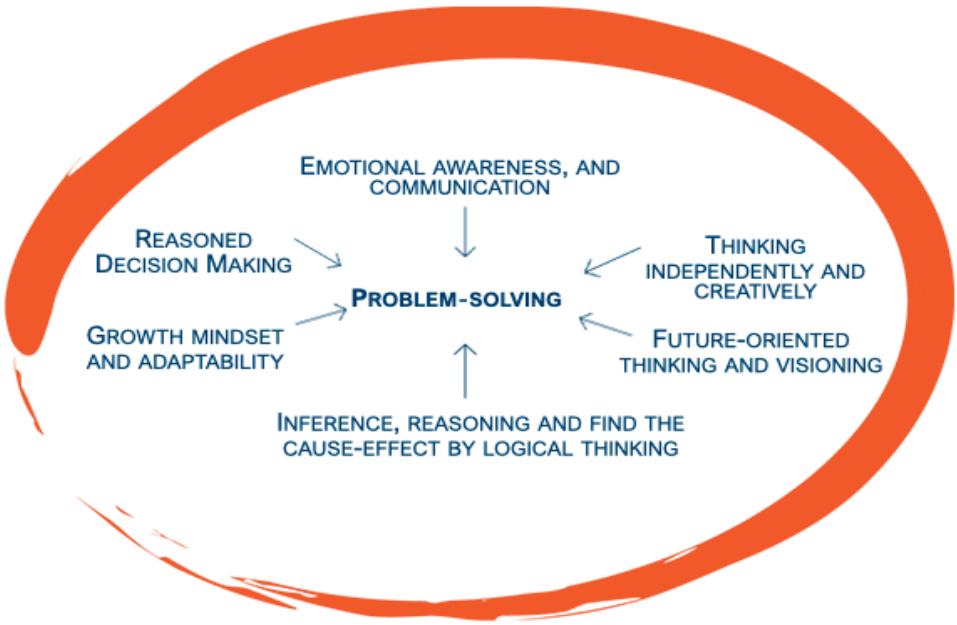
2.3 Problem-solving

Definition of the skill

The problem-solving process involves finding a solution to a problem by following several steps in a systematic way (= procedures or strategies). This is a structured approach to identify a problem, analyse it, and find and implement an effective solution. This skill typically transcends single disciplines and can be applied in different contexts. This skill involves critical thinking, creativity, and the ability to work through obstacles systematically. Problem-solving also requires adaptability, as not all solutions may work as expected, leading to adjustments and further exploration of alternatives.

Complexity of the skill



- **Emotional awareness, and communication** – children are motivated to solve a problem if they can recognise and verbalise why the situation is not good for them. (makes feel bad). Recognising and explaining it is an essential starting point for identifying, and solving the problem.
- **Future-oriented thinking and visioning:** children need to be able to imagine and articulate what a solved situation means to them. Describe the situation when the problem is really resolved. This requires “visioning” critical thinking.
- **Inferring, reasoning and finding the cause-effect**: adults break down the problem, find the cause-effect relationship and identify the areas they want to change in the problem-solving process. Children need help to do it. Working together to break the problem into smaller, more manageable chunks, and finding logical connections together. However, it is important that children have the ability to understand these cause-effect relationships well. Facilitate the processes with open-ended questions.

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- **Thinking independently and creatively:** Devise many possible solutions to all subproblems (divergent phase which involves CREATIVITY). Support children to do it. At this point, they don't even have to have "good" solutions.
- **Reasoned Decision Making:** Evaluating the possible solutions and deciding which one might be most effective and solve all subproblems (convergent phase which involves CRITICAL THINKING). It includes **assessing the options** (pros and cons of each possible solution), **weighting consequences**(which solution offers the most benefits) and finally **making a reasoned choice**.
- **Growth mindset and adaptability:** Trying out a chosen solution and learning from the results, even if it doesn't work immediately. Seek adjustments and further alternatives means that CRITICAL THINKING comes into play again in this phase.

The steps of the problem-solving process:

- Defining the problem; This stage articulates what the problem is precisely. Ask questions: What is the problem? When and where does it occur? Who or what is affected by it? Why is it a problem?
- Defining criteria for the main solution: when is the problem really resolved?
- Identifying possible subproblems
- Devise many possible solutions to all subproblems (Divergent phase which involves CREATIVITY)
- Solve all subproblems (Convergent phase which involves CRITICAL THINKING):
- Assess the options: Look at the pros and cons of each possible solution. Consider factors such as limitation and feasibility, cost, time and possible risks or obstacles.
- Weigh consequences: Consider the possible short- and long-term consequences of each solution. Which solution offers the most benefits and has the least adverse effects?
- Make a choice: Choose the best solution based on the analysis. This can be a single solution or a combination of several solutions.
- Integrate partial solutions to all subproblems: implement the solution to the main problem
- Testing, evaluating and adjusting/optimising the overall solution. Critical thinking comes into play again in this phase.

Importance of the skill for lifelong well-being

Problem-solving is a foundational transferable skill that enhances an individual's ability to succeed in various domains. People with strong problem-solving skills are typically creative, critical thinkers who demonstrate perseverance. These qualities enable them to face future challenges with confidence and resilience.

Additionally, strong problem-solving skills enhance one's ability to collaborate and communicate effectively. This helps in sharing ideas, delegating tasks, and uniting efforts toward a common goal.

In professional settings, employers highly value employees who can identify issues, take initiative, and provide effective solutions, contributing to greater efficiency and innovation within organizations.

The application of problem-solving skills leads to several positive outcomes:

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- Increased efficiency and productivity: Well-executed problem-solving can streamline processes, reduce unnecessary work, and save time by quickly addressing obstacles.
- Innovation and growth: Creative solutions to problems can lead to new opportunities for growth, whether it's in business, education, or personal development.
- Reduced conflict and better decision making: Problem-solving skills help manage conflicts or complex decisions by identifying root causes and facilitating rational discussions based on facts and solutions rather than emotions.
- Continuous improvement: Regular application of problem-solving leads to personal and professional development. Individuals improve their abilities by learning from each problem they tackle, leading to better performance over time.

Manifestation and development of this skill in ages 6-10

At the age of 6-10, the ability to problem-solve begins to develop. Children in this age group can already identify and solve simple problems independently, especially when they have concrete and visual tools. For example, they can solve a puzzle.

While children of this age often still use concrete, practical approaches, they are beginning to think more abstractly and may start planning simple solutions for more complex issues. Problem-solving at this age is therefore already recognizable, but it continues to develop. This process can be further stimulated through activities that challenge them to think about different solution strategies and encourage them to think creatively and flexibly. This could be different levels in the development of the skill:

Children between 6- 8 years

- simply recognize a problem and find a simple solution.
  They learn what a problem is and that trial and error is allowed (without the fear of making mistakes). They learn to collaborate and share ideas with others.
- learn to use different strategies to find solutions.

Children between 8-10 years

- work more independently, follow multiple steps to reach a solution, stimulate critical thinking, and understand why one solution works and another does not.
- approach problems more creatively.
  Solve problems that do not always have just one single answer.

Observation parameters for establishing class level

Level 1 (Beginner): Problem Identification: Needs help identifying problems. Generating Solutions (creativity): Suggests one simple solution. Use of strategies: Random approach, needs help. Perseverance and resilience: Gives up quickly, gets frustrated. Reflection and evaluation: Rarely reflects, struggles with evaluation. Independence: Highly dependent on guidance.

Level 2 (Semi-advanced): Problem Identification: Independently identifies simple problems, sometimes with help. Generating Solutions (creativity): Generates multiple solutions. Use of strategies: Uses strategies, sometimes with guidance. Perseverance and resilience: Shows perseverance,

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sometimes discouraged. Reflection and evaluation: Sometimes reflects, makes suggestions for improvement. Independence: Increasing independence, seeks confirmation.

Level 3 (Expert): Problem Identification: Independently identifies all problems. Generating Solutions (creativity): Offers creative and logical solutions. Use of strategies: Uses advanced strategies independently. Perseverance and resilience: Strong resilience, adjusts approach when facing setbacks. Reflection and evaluation: Regularly reflects, conducts in-depth analysis. Independence: Fully independent, initiates and adapts without help.

Interconnections with other skills

- Critical thinking: Both skills involve the ability to analyse, evaluate, and synthesize information. Problem-solving is often the practical application of critical thinking in decision-making and action-taking.
- Creativity: Problem-solving relies on creativity to generate novel and innovative solutions. The ability to think outside the box enhances one's ability to resolve issues effectively.
- Collaboration: Many problems are solved through teamwork. Effective problem solvers often work well with others, leveraging diverse perspectives to arrive at the best solution. Strong communication skills are essential in collaborative problem-solving.
- Decision-making: Problem-solving is a precursor to making decisions. After evaluating solutions, the ability to choose the best option and commit to an action is vital.
- Resilience and flexibility: The iterative process of problem-solving often involves trial and error, requiring individuals to adapt when initial solutions fail. Resilience is crucial in persisting through challenges and finding success.

Didactical tips for teachers

Teachers support children by encouraging them to think about the consequences of their actions, consider multiple solutions, and motivate them not to give up in the face of setbacks.

Here are some concrete tips for teachers to help develop problem-solving skills in children:

- Ask open-ended questions instead of closed questions (this encourages students to think more deeply and consider various aspects of the problem).
- Use games, puzzles, and concrete problem situations where students need to think and come up with solutions.
- Support the problem visually (use diagrams, charts, or mind maps to help students organize their thoughts).
- Encourage students to think creatively and experiment with different approaches to problems.
- Promote collaboration among students (1 + 1 = 3) to show how teamwork can lead to better solutions.
- Regularly practice problem-solving skills to build confidence and fluency.
- Integrate problem-solving activities across subjects such as math, language, or sciences (e.g., "How can we create a garden that attracts bees?").

These strategies help children not only solve problems but also develop a mindset that allows them to approach challenges with creativity and resilience.

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