# Problem-based learning

Problem-based learning (PBL) supports learning through an enquiry-guided method for students to solve a real-life problem. Students use 'triggers' derived from the problem to define their own learning outcomes/objectives. There is a specific, guided methodology for implementing PBL.

There are various ways to plan, design and implement PBL in your classroom. The following resources may suit your context:

- Wood (2007) identified a structure for incorporating PBL into the curriculum and emphasises that PBL will only be successful if the problems developed are of high quality.
- Ganareo and Lyons (2015) outline key steps to design, implement and assess PBL to help develop twenty-first-century skills such as teamwork, digital literacy and problem-solving.
- The 'Seven Jump' method (Gijselaers, 1995) used at Maastricht describes the key steps students go through to resolve a problem during PBL tutorial sessions.

| | 'Jump' activities | Timing |
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| **1.** | Clarify terms and concepts not readily comprehensible | First meeting |
| **2.** | Define the problem | |
| **3.** | Analyse the problem and offer tentative explanations | |
| **4.** | Draw up an inventory of explanations | |
| **5.** | Formulate learning objectives | |
| **6.** | Collect further information through private study | Between meetings |
| **7.** | Synthesise the new information and evaluate and test it against the original problem. Reflect on and consolidate learning. | Second meeting |

This lesson structure focuses on ideation. Edit for your context.

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| **Description** | This lesson engages students in a problem-based learning activity where they must generate innovative solutions to a complex, open-ended problem. The focus is on **ideation**, development, refinement, and critical evaluation of creative ideas. Students work collaboratively to explore the problem, identify knowledge gaps, and iteratively propose solutions, guided by the principles of PBL. |

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| **Learning outcomes** | By the end of the lesson, students will be able to:<br>• Define and frame complex problems suitable for ideation.<br>• Apply structured ideation techniques (e.g., brainstorming, SCAMPER, mind mapping) to generate diverse solutions.<br>• Critically evaluate ideas based on feasibility, originality, and impact.<br>• Collaborate effectively in groups to refine and select promising solutions.<br>• Reflect on the role of ideation in problem-solving and innovation |
| **How it works** | 1. **Problem Presentation (15 minutes):**<br>• Students are introduced to a real-world challenge: "How might we reduce food waste in urban university campuses?"<br>• Background context is provided (statistics on food waste, current initiatives, stakeholder perspectives).<br>2. **Problem Exploration (20 minutes):**<br>• In groups, students identify what they already know about the problem and what they need to learn.<br>• They generate guiding questions (e.g., "Who are the main contributors to food waste?" "What incentives could change behaviour?").<br>3. **Ideation Phase (30 minutes):**<br>• Groups use structured ideation techniques to generate as many solutions as possible.<br>• They cluster ideas, identify themes, and select 2–3 promising concepts.<br>4. **Critical Evaluation (20 minutes):**<br>• Groups assess their ideas against criteria: feasibility, originality, scalability, and ethical considerations.<br>• They refine their solutions based on peer feedback.<br>5. **Presentation & Reflection (20 minutes):**<br>• Each group presents its refined solution.<br>• Instructor facilitates discussion on the diversity of approaches and the importance of ideation in tackling complex problems.<br>• Students individually reflect on how ideation shaped their problem-solving process. |

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| **Resources required** | • Problem statement and background materials (statistics, case examples).<br>• Worksheets or digital templates for brainstorming and clustering ideas.<br>• Whiteboards, sticky notes, or online collaboration tools (e.g., Teams, Padlet).<br>• Evaluation rubrics for idea assessment. |
| **AI considerations** | • Students can use AI tools to **structure their brainstorming** outputs (e.g., organising ideas into categories or visual maps) and then critique the structure.<br>• AI can help **simulate alternative stakeholder perspectives** (e.g., student, cafeteria manager, sustainability officer), which students evaluate for relevance and accuracy.<br>• AI can **support rapid evidence gathering** (e.g., comparable initiatives in other universities), but students must critically assess the credibility and applicability of the information.<br>• Students should treat AI outputs as hypotheses or prompts for deeper inquiry, **questioning assumptions and refining ideas** rather than accepting them uncritically.<br>• **Reflection** should include consideration of how AI influenced their ideation process, ensuring students remain the primary drivers of critical thinking. |
| **Assessment** | • **Formative:** Observation of group discussions and ideation processes, with instructor feedback on collaboration and critical engagement.<br>• **Summative:**<br>  ○ Group presentation of refined solution, assessed on creativity, feasibility, and critical evaluation.<br>  ○ Individual reflection essay on the ideation process, including how AI tools were used to support critical thinking.<br>• Optional peer assessment to encourage accountability and diverse perspectives. |