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BRAIN FIRST
TECHNOLOGY SECOND

Teacher's Handbook

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1. Introduction

Artificial Intelligence is becoming part of everyday life, including the ways in which students access information, complete tasks, communicate and create content. Its presence in education is no longer limited to specialist subjects or experimental projects. Many students already use AI-based tools to look for explanations, organise ideas, practise languages, generate images or prepare assignments. Schools therefore need to address this reality in a thoughtful and educationally meaningful way.

The question is not simply whether AI should be used in education, but how it should be used. Technology can support learning when it helps students explore ideas, receive feedback, organise information or consider different perspectives. At the same time, it can lead to more passive learning when students accept generated answers without questioning them, checking their accuracy or developing their own reasoning. Teachers have a central role in helping students recognise this difference.

The BrAIn project is based on the principle that human thinking must remain at the centre of the learning process. AI can be a useful resource, but it should not replace curiosity, effort, dialogue, ethical reflection or independent judgement. Students need opportunities to use technology while continuing to develop the abilities that allow them to understand the world, make responsible decisions and participate actively in society.

This handbook has been developed through the collaboration of project partners from **Turkey**, **Denmark**, **Spain** and **Bulgaria**. Their different educational contexts, professional experiences and perspectives contribute to a shared European resource that is relevant across schools and adaptable to local needs. This cooperation reflects one of the main strengths of the project: creating practical guidance that can be used in different subjects, school environments and educational systems.

The handbook supports teachers in integrating AI literacy into everyday educational practice by linking it to five essential soft skills: Critical Thinking, Ethical Judgement, Problem Solving, Creativity and Communication. These skills are closely connected to academic learning, personal development and future participation in social and professional life. They are especially important in a context where students are increasingly exposed to automated information, recommendations and AI-generated content.

The handbook is intended for teachers with different levels of experience in using digital technologies. It does not require advanced technical knowledge or familiarity with a particular AI tool. Instead, it focuses on practical pedagogical questions: when can AI support learning? What risks should teachers consider? How can students be encouraged to question AI-generated content? How can technology support creativity without reducing originality? And how can responsible and ethical use be promoted both inside and outside school?

The first part of the handbook provides a theoretical basis for understanding the relationship between AI and each of the five soft skills. It explores educational opportunities, limitations and challenges, as well as the teacher's role in designing learning experiences where technology is used with purpose. The second part offers practical resources, including lesson plans, classroom activities, teaching strategies and case studies. These materials are designed to be flexible, allowing teachers to adapt them according to the age of their students, the subject area and the particular needs of their school community.

The handbook does not present AI as either a solution to every educational challenge or a threat to be avoided. It promotes a balanced approach in which students learn to use AI tools with awareness, confidence and responsibility, while strengthening the human capacities that must remain at the heart of education.

2. Objectives of the Handbook

The Teacher's Handbook has been developed as a practical resource for educators working in a context where Artificial Intelligence is becoming increasingly present in students' academic and everyday lives. Its purpose is to help teachers respond to this reality with confidence, pedagogical judgement and a clear focus on students' overall development.

The handbook is guided by a central principle of the BrAIn project: AI should support learning, not replace the thinking, effort, interaction and decision-making that education is expected to foster. It therefore aims to provide teachers with approaches that make constructive use of AI while protecting and strengthening the human skills that students need in school, in their personal lives and in future social and professional settings.

More specifically, the handbook seeks to:

- **Provide teachers with a clear foundation for addressing AI in education**: It offers accessible guidance on the educational role of AI, its opportunities, limitations and potential risks, without requiring teachers to become technical specialists.
- **Link AI literacy to essential soft skills:** The handbook focuses on five key soft skills — Critical Thinking, Ethical Judgement, Problem Solving, Creativity and Communication. These skills were selected through research and school-based consultation as the areas most likely to be influenced by students' growing use of AI. The handbook helps teachers understand how AI may affect their development and provides practical approaches for strengthening them through teaching and learning activities.
- **Promote responsible AI use both inside and outside school**: Students encounter AI tools beyond the classroom, often without guidance or reflection. The handbook supports teachers in addressing this wider reality by encouraging students to question outputs, check information, recognise limitations and make considered decisions about when and how to use AI.
- **Prevent over-reliance on AI-generated content**: The proposed approaches aim to ensure that AI does not become a substitute for independent thinking, original work, communication with others or sustained engagement with learning tasks. Students should remain active participants in their own learning process.
- **Offer practical and adaptable teaching resources**: Through lesson plans, classroom activities, teaching strategies and case studies, the handbook provides materials that can be adapted to different subjects, age groups and school contexts. The emphasis is on realistic activities that teachers can integrate into existing practice.

- **Support inclusive and meaningful learning experiences**: AI can offer useful opportunities for differentiation and accessibility, but its use must remain fair, transparent and appropriate to students' needs. The handbook encourages educators to consider inclusion, equity, privacy, authorship and ethical responsibility when designing AI-supported activities.
- **Encourage dialogue between school, students and families**: Although the handbook is primarily addressed to teachers, it also recognises their role in helping students and families develop shared expectations around responsible technology use. Schools can use its approaches to promote informed conversations about AI beyond formal lessons.
- **Create a shared European resource with long-term value**: Developed through cooperation among partners from Spain, Turkey, Bulgaria and Denmark, the handbook is designed to be relevant across different educational settings while remaining flexible enough to respond to local needs. Its content will also contribute to the Active BrAIn Platform, extending access to the project's resources beyond the partnership.

3. Scope of the Handbook

This handbook is intended primarily for teachers working in school education who want to address Artificial Intelligence in a way that is meaningful, responsible and relevant to students' real learning experiences. It is designed for educators from different subject areas and for teachers with different levels of confidence in using digital technologies. Its purpose is not to turn teachers into AI specialists, but to give them a clear pedagogical basis for deciding how, when and why AI may be used in learning.

The handbook focuses on AI literacy as part of a broader educational responsibility. It recognises that students do not only encounter AI at school. They may use AI-supported tools at home, when completing homework, searching for information, communicating online or creating content. For this reason, the handbook addresses both classroom practice and the wider learning habits that students develop beyond the classroom.

Its central focus is the relationship between AI and five essential soft skills: Critical Thinking, Ethical Judgement, Problem Solving, Creativity and Communication. These skills were selected through research and consultation with schools as areas particularly likely to be influenced by students' increasing use of AI. Each section examines how AI may support their development, while also considering how inappropriate or uncritical use may weaken them. The handbook therefore promotes activities and teaching approaches that keep students actively involved in analysing, questioning, discussing, creating and making decisions.

The content combines theoretical guidance with practical classroom resources. The theoretical section explains the educational relevance of each soft skill, the opportunities offered by AI and the risks that teachers should consider. The practical section provides lesson plans, classroom activities, teaching strategies and case studies that can be adapted to different subjects, age groups and school contexts. The resources are not intended to be followed mechanically; they are designed to support teachers in adapting ideas to their own pupils and learning objectives.

Inclusion is also part of the handbook's scope. AI may offer opportunities to personalise learning and support students with different needs, language backgrounds or levels of confidence. At the same time, teachers need to consider access, fairness, bias, privacy and the possible effects of technology on participation and wellbeing. The handbook encourages educators to make choices that are appropriate to their students and that do not increase existing inequalities.

The handbook has been developed through cooperation among organisations from Spain, Turkey, Bulgaria and Denmark. It reflects a shared European approach while recognising that schools operate in different educational, cultural and technological contexts. Its materials are therefore intended to be flexible and transferable rather than linked to one national curriculum, one specific AI tool or one teaching model.

The handbook does not provide technical training in the operation of particular AI systems, nor does it replace school policies, data-protection requirements, safeguarding procedures or professional judgement. It does not promote the use of AI in every activity. Instead, it helps teachers identify situations in which AI can add educational value and situations in which students benefit more from working independently, collaborating with others or engaging directly with a task without technological support.

Although the handbook is primarily aimed at teachers, it can also support conversations with students, school leaders and families about responsible AI use. In this way, it contributes to a more consistent approach between school and home, while the wider resources for students and parents will be made available through the Active BrAIn Platform.

4. Methodological Framework

The methodological framework of this handbook is based on a human-centred, competence-oriented and evidence-informed approach to Artificial Intelligence in school education. It recognises that AI can support learning, but only when its use is guided by clear educational purposes, appropriate safeguards and active teacher mediation.

The framework is directly aligned with the BrAIn project's objective of helping students use AI as a support for learning rather than as a substitute for independent thinking, problem solving, communication or creativity. It builds on the findings of WP2, which identifies the soft skills most affected by students' exposure to AI and translates them into practical educational strategies for teachers.

At European level, this approach is consistent with the Council Recommendation on Key Competences for Lifelong Learning, which highlights the importance of critical thinking, creativity, problem solving, collaboration and self-regulation in contemporary education (Council of the European Union, 2018). It also reflects the European Commission's work on ethical and critical AI literacy, which stresses that AI in education raises pedagogical, ethical and legal questions alongside its potential benefits.

4.1. Guiding Principle: Brain First, AI Second

The central methodological principle of the handbook is that **AI should enhance learning, not replace the intellectual and social processes through which learning takes place**.

Students should remain responsible for asking questions, developing ideas, assessing evidence, making decisions, communicating their reasoning and reflecting on their own learning. AI may be used to support these processes, for example by offering alternative explanations, generating initial ideas, providing examples or supporting practice. However, the educational value lies in what students do with the output: how they analyse it, improve it, challenge it or apply it to a meaningful task.

This principle avoids two unhelpful extremes. The handbook neither presents AI as a solution to every educational challenge nor treats it as a technology that should be excluded from schools. Instead, it promotes deliberate and proportionate use, based on the following question: *Does AI add educational value to this activity without weakening student autonomy or the target soft skill?*

4.2. Competence-Based and Cross-Curricular Approach

The handbook adopts a competence-based perspective. AI literacy is not treated as a separate technical subject, but as a transversal element that can be integrated into different curriculum areas and learning situations.

The five soft skills identified in the project — Critical Thinking, Ethical Judgement, Problem Solving, Creativity and Communication — provide the organising structure for the handbook. Each skill is explored in relation to the opportunities and risks created by AI-supported learning.

This approach understands AI literacy as a combination of knowledge, skills and attitudes. It goes beyond the technical use of tools and includes the ability to understand their potential and limitations, critically assess generated content, act safely and responsibly, and make informed decisions.

The handbook therefore does not focus only on whether students can operate a tool. It also considers whether they can:

- understand the role and limitations of AI.
- assess the quality and reliability of AI-generated content.
- recognise bias, inaccuracies and incomplete information.
- use AI in a way that respects authorship, privacy and fairness.
- explain and justify their own decisions.
- collaborate and communicate responsibly when AI is involved.

4.3. Human-Centred and Ethical AI Use

Ethical reflection is embedded throughout the handbook rather than being treated as an isolated topic. Every AI-supported activity should include opportunities for students to consider the consequences of using the technology, not only the outcome produced.

The methodology is informed by the European Commission's ethical guidelines for the use of AI and data in teaching and learning. These guidelines encourage teachers to make informed, context-based decisions, identify potential risks and use AI in ways that are safe, responsible and educationally meaningful (European Commission, 2026).

When using AI in teaching and learning activities, teachers are encouraged to consider the following questions:

- What information is being shared with the tool?
- Is personal, sensitive or identifiable student data being entered?
- Can the output contain errors, bias or inappropriate material?
- Is the student able to explain, verify and improve the result?
- Has the use of AI been acknowledged clearly?
- Does the activity strengthen learning, or does it merely produce an answer more quickly?

Teachers should select tools that are appropriate to students' age, school policy and data-protection requirements. Students should not be asked to enter personal data, sensitive information or identifiable work into tools that have not been approved for educational use.

The framework also reflects the wider European policy context, in which AI literacy is recognised as an important condition for the responsible use of AI systems (European Parliament and Council of the European Union, 2024).

4.4. Active Learning and Teacher Mediation

The integration of AI in the classroom is most effective when it is embedded in activities that keep students actively engaged in their own learning. Rather than simply receiving and reproducing automatically generated content, students need opportunities to analyse information, formulate questions, compare ideas and develop their own responses.

From a constructivist perspective, learning involves the active construction and reorganisation of knowledge. The teacher's role is therefore to create tasks, interactions and forms of support that enable students to participate meaningfully in this process (Coll, 2001; Pozo, 2008).

Teachers can use AI as a resource within inquiry, debate, comparison, cooperative work, experimentation, problem-solving, design or reflection activities. In these contexts, the tool may provide starting points, examples, alternatives or explanations, but it should not replace the effort involved in understanding, deciding, arguing or creating.

An important part of this work involves supporting students in critically reviewing the outputs generated. Comparing an AI-generated response with reliable sources, identifying differences between proposals, detecting weak arguments or correcting inaccurate information can help students develop a more informed relationship with technology. These practices are particularly useful for addressing source evaluation, misinformation and the responsible creation of digital content.

This approach is consistent with European evidence on media literacy education, which highlights active inquiry, discussion-based learning, project-based learning and collaborative learning as appropriate methods for developing students' critical engagement with digital content (McDougall et al., 2018).

The use of AI does not reduce the importance of the teacher's role. Teachers remain responsible for defining learning objectives, selecting appropriate resources, asking meaningful questions, facilitating dialogue and observing students' level of understanding. Their intervention is essential in ensuring that technology contributes to deeper learning rather than becoming a shortcut for avoiding it.

4.5. The BrAIn Learning Cycle for the Pedagogical Use of AI

To integrate AI into the classroom in an educational and responsible way, teachers can structure activities around a learning cycle that keeps students at the centre of the learning process. The tool should not replace understanding, reasoning or creation, but should contribute to enriching these processes.

1. Start with a clear learning objective:
Before using an AI tool, it is important to define what students are expected to learn and which skill is to be developed. The choice of tool should respond to this purpose, rather than to an interest in using technology for its own sake.

2. Make space for independent thinking:
Students should be encouraged to activate their prior knowledge, formulate hypotheses, propose solutions or develop an initial response before turning to AI. This allows them to compare their own ideas with the tool's contributions and recognise what they have personally brought to the process.

3. Use AI for a specific purpose:
AI may be used to generate examples, offer alternative perspectives, provide an initial explanation, review a draft or suggest possible solutions to a problem. Its use should be limited, transparent and appropriate to students' age and the objectives of the activity.

4. Analyse and verify the outputs obtained:
Students need to learn not to accept automatically generated responses without question. Teachers can guide them in comparing information with reliable sources, identifying errors, detecting possible bias, considering alternatives and assessing whether the response genuinely addresses the task.

5. Review, transform and add personal value:
The output provided by AI should be a starting point, not a final product. Students should review, correct, expand, reorganise or challenge the content, incorporating their own arguments, decisions and knowledge. In this way, the final product will reflect an authentic learning process.

6. Reflect on the use of the tool:
At the end of the activity, it is useful to allow time for students to consider how they used AI. Questions may include: What was useful? What errors or limitations did I identify? What did I have to do myself? Could I have completed the task without AI? This reflection supports a more conscious and responsible relationship with technology.

This cycle enables AI to be used as a supportive resource within an active learning experience. The value of the activity lies not only in the final result, but also in students' ability to understand, analyse, decide, create and justify their choices. Reflection and self-assessment are important components of formative assessment, as they provide evidence that can be used by both teachers and students to adjust teaching and learning processes (Black & Wiliam, 1998).

4.6. Inclusion, Accessibility and Equity

AI can expand opportunities for student participation when it is used with the diversity of the classroom in mind. It may provide adapted explanations, language support, materials in different formats or activities with different levels of difficulty. However, these benefits are not guaranteed simply because a digital tool is available.

When planning an AI-supported activity, teachers should consider whether all students will be able to access it under similar conditions and understand the instructions needed to use it. It is also important to provide alternatives for students who do not have an internet connection, appropriate devices or permission to access certain tools outside school.

AI-generated outputs should also be approached critically. They may reproduce cultural, linguistic, social or gender bias, use inaccessible language or present examples that are removed from students' realities. Such situations can become educational opportunities to explore how information is constructed, who may be under-represented and why generated responses need to be reviewed before they are used.

To promote equitable participation, teachers can combine digital and non-digital activities, provide different ways of accessing content and allow students to demonstrate what they have learned through different formats. Assessment should focus on understanding, reasoning, creativity, collaboration and the capacity for reflection, rather than solely on the apparent quality of an AI-generated product.

4.7. Adaptation, Co-Creation and Continuous Improvement

The activities proposed in this handbook can be adapted to the characteristics of each classroom, the educational level, the subject area, the resources available and the specific needs of students. Not all AI tools are appropriate for every group, and not all activities require the same degree of technological use. Teachers can adjust examples, questions, timing, materials and levels of complexity to ensure that the activity maintains a clear pedagogical purpose.

Adaptation also involves taking account of the school context and established rules relating to privacy, device use, data protection and assessment. In some cases, it may be more appropriate to use a teacher-led demonstration, work with pre-selected outputs or carry out the activity without students accessing an AI tool directly.

Co-creation can enrich this process. Involving students in defining criteria for assessing AI-generated responses, agreeing on rules for responsible use or reviewing an activity together can help them better understand their role as critical users of technology. Similarly, sharing experiences with other teachers can help identify difficulties, exchange resources and improve approaches to the use of AI within the school.

It is advisable to review activities after they have been implemented. Observing student participation, their questions, the quality of their reasoning and the outcomes achieved can help teachers assess whether AI has contributed genuine value to learning. This continuous review will support teachers in retaining practices that promote autonomy, reflection and the development of the targeted skills, while modifying or discarding those that do not offer clear educational value. Using evidence from students' reasoning, participation and self-reflection allows teachers to adapt subsequent activities and provide more effective support throughout the learning process (Black & Wiliam, 1998).

5. Theoretical Section

5.1. Critical Thinking

5.1.1. Definition and educational relevance

Critical thinking is the ability to analyse, question and evaluate information rather than accepting it automatically. It involves asking where information comes from, checking it against evidence, and remaining open to more than one possible explanation.

For primary students, none of this needs to start with formal arguments or debates borrowed from adult life. It grows out of small habits that fit naturally into an ordinary school day.

A student is already doing this work the moment they ask:

- How do we know this is true?
- Where did this come from?
- Could there be another explanation?
- What evidence do we actually have?
- Do I agree and why?
- Can we check this somewhere else?



It also shows up quietly: listening to a classmate's reasoning before agreeing, weighing two solutions instead of grabbing the first, noticing a gap in an explanation, or changing one's mind after a better argument.

None of this looks dramatic, but for a watchful teacher, these are signs a student has stopped passively receiving information and started working with it. Research ties this cluster of skills to more independent, careful learning later on (Wahyuni et al., 2025).

Critical Thinking in Primary Education: Ages 6–12

This skill does not arrive fully formed. It builds slowly, year by year, and a six-year-old cannot reasonably be expected to show it the same way a twelve-year-old does. Younger students generally do best with concrete examples: pictures, stories, spoken questions, hands-on tasks, comparisons the teacher walks them through step by step. After offering two competing explanations, a teacher might just ask: "Which one makes more sense to you? What makes you say that?"

Classroom-based work with primary-aged students confirms that this kind of teacher-guided, activity-based approach, rather than abstract explanation, is what allows critical thinking to take root at this stage (Morales-Pérez et al., 2024).
As students get older and more capable of independent work, teachers can start bringing in tasks that involve comparing sources, justifying an answer, spotting a gap in the information, weighing different viewpoints, judging how strong a piece of evidence really is.
None of this means treating a nine-year-old like a professional fact-checker. What matters is building, piece by piece, one habit that carries across every age and every subject:



PAUSE → QUESTION → CHECK → DECIDE

The task gets harder as students get older. The habit underneath stays the same.

A new layer has been added to this conversation. Children now encounter information not only from teachers, books and families, but also from AI tools that can produce confident-sounding answers within seconds. UNESCO's global guidance on generative AI in education notes that these tools are entering classrooms and homes faster than most countries have been able to establish clear frameworks for their use (Miao & Holmes, 2023). This does not change what critical thinking is, but it does explain why nurturing it early and deliberately matters more than ever.

Why does this matter more now, with AI in the picture?

Children increasingly run into information through digital tools, and a growing share of that content is produced or shaped by artificial intelligence. These tools can answer almost anything within seconds, and they tend to sound sure of themselves while doing it.

Most education systems are still catching up. UNESCO's global guidance on generative AI points out that these tools have reached classrooms faster than the policies and training needed to use them well (Miao & Holmes, 2023). One practical consequence: getting an answer is no longer the hard part for students. Learning to question that answer, weigh it against other sources, and decide whether to trust it is where the real work now lies.

This is one of the reasons Critical Thinking sits at the centre of the BrAIn project. Work Package 2 identified it as the competence most consistently affected by students' exposure to AI. Across the partner countries, classroom observations showed the same starting point: students tended to accept AI-generated answers without checking their accuracy or noticing possible bias.Once teachers introduced structured activities, such as comparing sources, spotting bias, running debates and guiding reflection, that pattern shifted. Students began evaluating AI outputs more critically and noticing their limits (BrAIn Project Consortium, 2026).

So critical thinking should not be boxed into a single lesson labelled “AI”. It belongs everywhere:



In science, asking whether the evidence really supports a conclusion.



In maths, comparing two different routes to the same answer.



In language work, telling fact apart from opinion.



In social studies, weighing different perspectives on the same event.



In any digital task, asking whether information is complete and reliable enough to use.

Key Message for Teachers

A child doesn't need to understand how AI works technically before they can start questioning its answers.

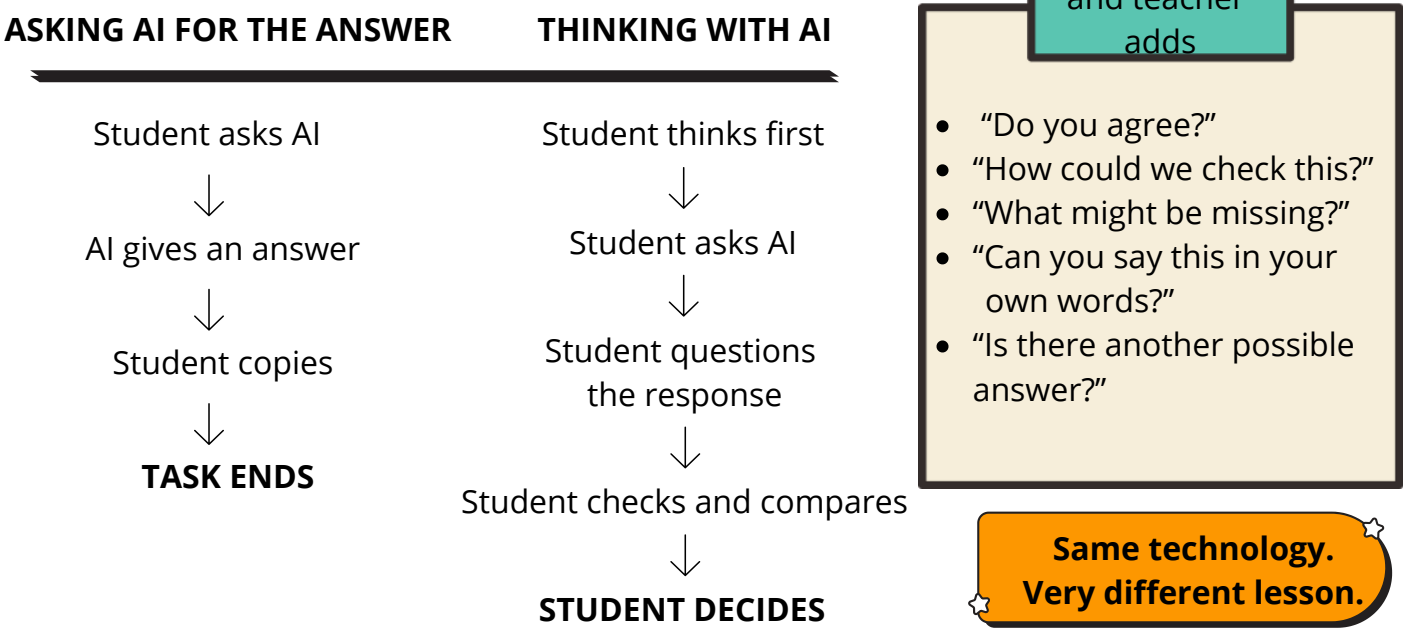
What they need is a habit built through repetition of pausing before accepting something as true.

5.1.2. Development of Critical Thinking through the use of AI

AI can pull critical thinking in either direction. Used one way, it opens up real chances to question, reflect and explore. Used another way, it quietly trains students to reach for a quick answer and stop thinking the moment they have one. Which of these happens is mostly down to how the activity is set up, not the tool itself.
A recent systematic review backs this up: AI does not automatically make students better or worse critical thinkers. What decides the outcome is the design of the task, how engaged the learner is, their AI literacy, and whether there is any scaffolding or guided interaction built in. Structured approaches, such as guided questioning and problem-based tasks, consistently produced deeper engagement than letting students use AI without any framing at all (Maslan & Ubaidah, 2026). For students aged 6–12, whose habits of independent reasoning are still forming, this distinction matters even more.

From asking AI to thinking with AI

Picture two moments that look almost identical from the outside.
In the first, a student asks AI a question, gets an answer, copies it down, moves on.In the second, the teacher takes that exact same AI answer.



A study involving 25 Year 5 students backs this up with actual classroom data. Researchers looked at how students questioned and reflected on generative AI responses through the lens of Bloom's Taxonomy, and found that higher-order thinking, particularly Creating and Evaluating, showed up strongly in what students asked and how they responded. structured activities, including comparing sources, spotting bias, holding debates and guiding reflection, students' evaluation of AI outputs improved noticeably. (Elim, 2026).

The role of teacher guidance



BrAIn's own WP2 findings point the same way. Students across the participating schools started out accepting AI-generated answers without much scrutiny. Once teachers brought in structured activities, including comparing sources, spotting bias, holding debates and guiding reflection, students' evaluation of AI outputs improved noticeably (BrAIn Project Consortium, 2026).

So the teacher's role hasn't disappeared just because AI can answer questions. If anything, it has shifted. A teacher doesn't need to supply every answer anymore. Instead, they need to structure the thinking that happens before, during and after a student talks to AI. For younger students, this can happen out loud, as a whole-class conversation. Older primary students can gradually start writing their own answers down, comparing sources, and justifying their conclusions with less close support.

Building a habit, not running one "AI lesson"

Critical thinking shouldn't live inside a single special lesson about artificial intelligence. Students need this kind of practice again and again, across subjects, in situations that don't always look like "an AI activity."

For younger students, a teacher might put a short AI-generated statement on the board and ask nothing more complicated than:

"True, false, or not sure yet?"

That last option, "not sure yet", matters more than it looks. It tells students that not knowing is a fine place to start, as long as they go and check.

For older students, a teacher might put an AI explanation next to a textbook passage and ask:

"What is the same? What is different? Is anything missing? Which source would you trust more, and why?"

The task gets harder with age. The underlying rule stays fixed: AI can supply information, but the student is still the one who has to think about it.

Key Message for Teachers

Don't stop at "What did AI say?"

Add: "What do you think about what AI said?"

That one extra question shifts the lesson from receiving information to evaluating it

5.1.3. Potentials of AI for strengthening Critical Thinking skills

The growing use of AI can genuinely support the development of students' critical thinking, provided it is used as a partner for thinking rather than a source of ready-made answers. This reflects one of the guiding principles of the BrAIn project: AI in education should be treated neither as a solution to every challenge nor as a threat to be kept out of the classroom.

Research on primary education supports this approach. AI-supported strategies can contribute to the development of analytical and evaluative reasoning, but only when combined with appropriate teacher guidance and learning tasks that require students to engage actively with the output, rather than simply receive it (Wahyuni et al., 2025).

Positioned in this way, AI can become a genuine resource for strengthening critical thinking, with its educational value lying not in what it produces, but in what students are subsequently asked to do with it. The following sections outline how this can be achieved in practice.

AI as a point of comparison

One approach that works well: ask students to come up with their own answer first, before they see anything AI produces. Then compare.

MY IDEA ↔ AI'S IDEA



A few follow-up questions are usually enough:

- What is similar? What is different?
- Which answer gives better reasons?
- Did AI notice something you missed, or did you notice something AI missed? Would you change your original answer? Why?

Here, the comparison itself is the lesson. AI isn't replacing the student's first attempt. Instead, it gives them something to test that attempt against.

AI as a starting point for discussion



AI can also generate several competing explanations or solutions that a teacher can bring into class discussion. Instead of asking it for “the best answer,” a teacher might ask for three possible ones, then let students argue it out: Which is strongest? Which would you pick? What are the trade-offs? Did AI miss an option entirely? The comparing and deciding stays with the students, while AI simply supplies more material to work with.

AI as a learning companion

There's another way to frame AI's role: not as a source of final answers, but as a companion in the process of learning. Research on AI-assisted learning suggests it can help students generate ideas and explore alternative angles, while the job of judging that information stays with the learner (Sukmaningsih et al., 2026). A learning companion can suggest, question, offer another angle, explain, give feedback. What it shouldn't do is make the decision for the student.



AI as a questioning partner

Teachers can also flip the usual set-up. Instead of students asking AI for answers,AI can be asked to question the students instead. For example, a teacher could use the following prompt: “Ask me three simple questions that would help me think more carefully about my answer. Don't give me the answer.” That one instruction turns AI from an answer machine into something closer to a thinking partner. For younger students this works best with the teacher steering the whole-class version; older students can take on more of it themselves, within whatever tool policy and age rules the school has in place.



AI as material for checking and verification

AI text also makes decent material for fact-checking practice. A teacher shows a short AI explanation and asks: “Can we trust all of this?” Students then check a few claims against a textbook, an approved website, or another reliable source. This lets children practise verification without needing to understand anything about how the AI system actually works underneath.



AI as a source of feedback and reflection

AI tools can also hand back feedback, explanations, follow-up questions. Research suggests this kind of feedback supports reflection and reasoning, provided that it is paired with active learning and real teacher guidance (Syahputra et al., 2026).
But that value only appears if students are still expected to think about the feedback rather than just take it. The aim is to move away from AI feedback → student accepts, and towards AI feedback → student considers → checks or discusses → decides whether to change anything.



Choosing tasks that invite thinking

Not every AI task builds critical thinking. Compare these two:
Task A: “Ask AI for five facts about bees and copy them.”
Task B: “Ask AI for five facts about bees. Pick two. Check them against a source your teacher gives you. Did you find the same information? Explain what you found.”

Both use AI. Only the second one forces verification, comparison, judgement. A useful question when planning any AI-based task: where, exactly, does the student have to think? If AI could finish the whole thing and the student just copies the output across, the task probably isn't doing much for critical thinking, however it's dressed up.

Key Message for Teachers
The goal isn't to use AI as much as possible.
The goal is to create better thinking opportunities whenever it's used.
AI supports critical thinking best when students have to:
QUESTION → COMPARE → EXPLAIN → VERIFY → RECONSIDER.

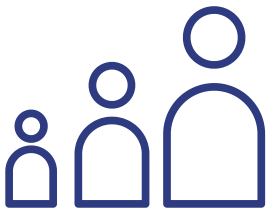
5.1.4. Risks and challenges for the development of Critical Thinking

Alongside its potential benefits, the growing use of AI can create real challenges for the development of students' critical thinking.The central concern is not the existence of AI itself, but the possibility that students increasingly accept its answers without questioning them.

The table below summarises the risks most relevant to primary education and to the BrAIn project's own classroom findings.

Age and developmental appropriateness

Age genuinely changes what's reasonable to expect. A six-year-old and a twelve-year-old aren't going to manage the same degree of independence, and shouldn't be asked to. Younger students in this range need concrete examples, visuals, spoken discussion and closer scaffolding. More demanding work, such as written justification and independent comparison of sources, can come in gradually as students get older.



Primary-focused research on AI backs this up, stressing that tools and tasks need to match a student's developmental stage, and that teacher readiness and thoughtful design matter just as much as the technology itself (Wahyuni et al., 2025). More independence with AI isn't automatically better. Sometimes it's simply too much, too soon.

Over-reliance and independent thinking

The biggest worry is fairly obvious: AI could become a shortcut around thinking instead of a support for it. A recent systematic review flags real risk of cognitive dependency when learners accept AI output without evaluating it. However, the same review is careful to note that this is not inevitable. Structured approaches like scaffolding, guided questioning and problem-based learning consistently produced deeper engagement and stronger critical thinking (Maslan & Ubaidah, 2026).

BrAIn's own WP2 data adds a project-specific angle. In Spain, teachers noticed weaker independent reasoning, characterised by fewer questions and less initiative, whenever AI was used without any guidance. Across the participating countries, structured activities were consistently linked to more questioning and evaluation of what AI produced (BrAIn Project Consortium, 2026).

The useful question here isn't “do students use AI?” It's “what is the student still responsible for thinking through, once AI is involved?”
“It sounds right” does not mean “it is right”

AI answers can sound confident and convincing even when they are incorrect, incomplete or biased. AI should therefore not be treated as the final authority; students need opportunities to question and verify its outputs (Sukmaningsih et al., 2026). One classroom rule sums this up for primary students:

CONFIDENT DOES NOT ALWAYS MEAN CORRECT.

Privacy and safe use



AI-supported activities also raise privacy questions that are easy to overlook in a busy lesson. Students shouldn't be typing their own or a classmate's personal, sensitive or identifiable information into any AI tool the school hasn't approved.The European Commission's ethical guidelines for educators cover exactly this ground, encouraging teachers to think through what data is being shared, and why, before a tool ever reaches students (European Commission, 2026). UNICEF's guidance on AI and children adds a related point worth keeping in mind: systems used by or around children need to match children's evolving capacities, rather than treating every age group the same way (UNICEF Innocenti, 2025).
This fits neatly into the same habit this chapter keeps coming back to: “Before I type this, should I be sharing it?”

Equity and inclusion



AI-supported lessons shouldn't leave behind students who have less access to devices, connectivity or digital support at home. The OECD's review of digital education systems flags exactly this risk, noting that uneven access can widen gaps between students if schools aren't paying attention to it (OECD, 2023). It's worth remembering that critical-thinking activities involving AI don't need one device per student. A teacher can put an AI response up for the whole class, print it out for group work, run one teacher-led AI interaction, have students work in pairs or groups, or set an equivalent task with no digital component at all. The point was always critical thinking, not access to a particular piece of technology.

5.1.5. Educational implications for fostering Critical Thinking in AI-supported learning environments

Everything in this chapter points to one practical conclusion: critical thinking doesn't grow just because AI happens to be in the room. Teachers need to build in regular, deliberate chances for students to question, compare, explain, verify and reflect. This matters even more for students aged 6–12, whose habits of independent reasoning are still very much a work in progress.From “using AI” to “learning with AI”
A better planning question than “How do I fit AI into this lesson?” might be:
“How do I design this lesson so students still have to think?”
The research backs this framing. Structured environments that include scaffolding, guided questioning and problem-based tasks consistently outperform unstructured AI use when it comes to deep engagement (Maslan & Ubaidah, 2026). Research on AI in primary education says much the same thing: the teacher is still the one designing and running the learning experience. Their job is to make sure technology supports students' thinking rather than doing it for them (Wahyuni et al., 2025).

The BrAIn Critical Thinking Routine

A simple five-step routine ties all of this together, and connects the theory in this section to the classroom activities that follow later in the chapter.

1. THINK

What do I think first? Before AI comes into it at all, the student makes a prediction, has a go at an answer, or attempts the problem. This protects a bit of space for independent thought before anything else happens.

2. ASK

What does AI suggest? AI comes in once it can genuinely add something. Its answer counts as one contribution among several and should never automatically be treated as the correct or final one.

3. CHECK

Can I trust this? Students look for evidence, notice what they're unsure about, use approved sources where they can. For younger students, the teacher can run this step as a whole class.

4. COMPARE

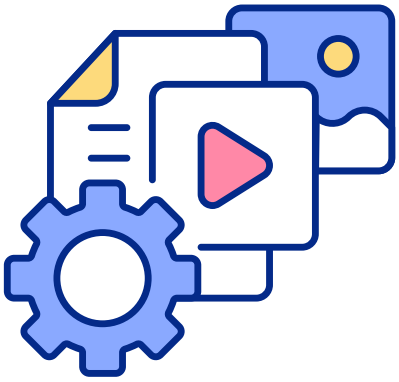
What's similar, different, or missing? Students set the AI answer against their own first idea, a classmate's idea, a textbook, an approved source, or another explanation entirely.

5. DECIDE

What's my final judgement, and why? The student reaches their own conclusion. AI may have contributed along the way, but the final call stays a human one.

This routine echoes exactly what BrAIn's WP2 findings documented in real classrooms: structured comparison, verification and reflection move students from passively accepting AI output towards genuinely questioning it (BrAIn Project Consortium, 2026).

Adapting the approach across ages 6–12



This Handbook covers a wide age range, and teachers will need to adjust how much independence they expect while keeping the same underlying goal in view. None of the following should be read as a strict rule, as teachers know their own students, curriculum and classroom better than any guideline can.

As a rough guide: the youngest students in this range (around 6–7) tend to do best with oral, whole-class versions of the routine, with the teacher modelling THINK – ASK – CHECK – COMPARE – DECIDE out loud. Students in the middle (roughly 8–10) can start owning individual steps, for example by writing down their own first idea before the class looks at an AI response together.The oldest primary students (11–12) can often work through the whole routine in small groups, with the teacher circulating rather than leading.

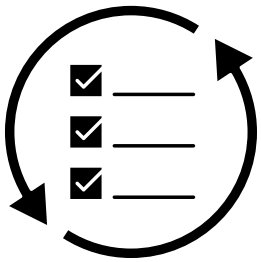
Keep human interaction at the centre

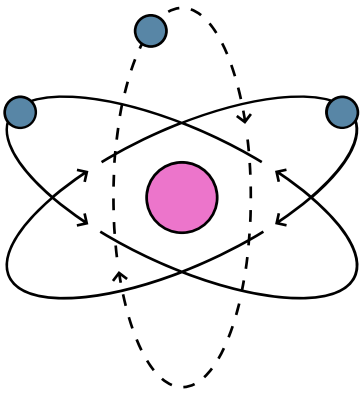
AI-supported critical thinking should never crowd out interaction with teachers and classmates. Class discussion, debate, group problem-solving, storytelling, hands-on experiments, questioning and students explaining things to each other. These remain some of the strongest ways to build reasoning.UNESCO's human-centred vision for AI in education makes a similar point: human agency and interaction, not the technology, belong at the centre of meaningful learning (Miao & Holmes, 2023). AI is one resource inside a much bigger, learner-centred environment. It was never meant to be the environment itself.



Start small and build routines

Teachers don't need to rebuild their whole curriculum around AI to make any of this work. One small change is often enough to begin: before consulting AI, ask “What do you think first?” After getting a response, ask “How could we check this?” Before wrapping up, ask “What's your final decision, and why?” Repeated across subjects over time, these three questions can quietly build a classroom culture where questioning information just feels normal.





Connecting the Theoretical and Practical Sections

The principles set out here form the foundation for Section 6.1, Critical Thinking. The lesson plans, activities, teaching strategies and case study that follow aren't there to teach students how to operate an AI tool. Their purpose is narrower and more important than that: helping students learn how to think while AI is present.

This reflects what WP3 was always meant to deliver: a structured, practical and research-informed resource that gives teachers clear guidance and workable classroom activities while making sure AI supports students' independent thinking rather than replacing it.

Key Message for Teachers

AI can produce an answer fast.

Let the student think first. Let AI contribute. Then let the student question, compare, check and decide.

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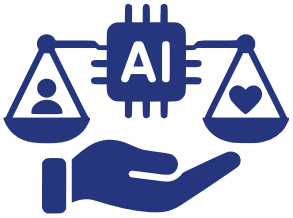
5.2. Ethical Judgement

5.2.1. Definition and educational relevance



Ethical judgement is the ability to recognise, analyse, and respond responsibly to situations in which the use of artificial intelligence involves competing values, interests, rights, or possible consequences. In the BrAIn project, ethical judgement is understood as the ability to make responsible and informed decisions regarding AI while considering issues such as privacy, fairness, transparency, empathy, responsibility, and the ethical use of technology (European Commission, 2022; UNESCO, 2021).

Ethical judgement should not be understood simply as knowledge of what is permitted or prohibited. Knowing a school's rules for using generative AI, for example, is not in itself evidence of ethical judgement. Ethical judgement becomes visible when students are able to recognise that a situation contains an ethical dimension, identify the people or groups affected, examine conflicting interests, consider possible consequences, and justify why one course of action may be preferable to another. It therefore involves moving from rule-following towards reasoned judgement.

This distinction is particularly important in relation to AI because many situations do not have a single predetermined correct answer. A system may, for example, improve efficiency while simultaneously collecting personal data. Personalisation may support one student while producing unfair outcomes for another. Automated assessment may create consistency while making it difficult for students to understand why a particular decision was made. Ethical judgement requires students to engage with these tensions rather than reducing them to simple categories of “ethical” and “unethical” (European Commission, 2022; UNESCO, 2021).

For education, this means that ethical judgement includes several interconnected processes. Students need to recognise that an ethical issue exists, analyse whose interests are involved, consider different perspectives, anticipate possible consequences, make a judgement and finally justify that judgement. More advanced ethical judgement also involves reconsidering an initial position when new information or another perspective becomes available.

AI makes these abilities increasingly relevant because automated and generative systems are becoming part of students' everyday information environments. Students encounter AI not only when they deliberately open a generative AI tool, but through recommendation systems, search functions, social media, adaptive learning technologies and automated forms of selection and decision-making. Consequently, ethical AI education cannot be limited to teaching students how to operate a particular tool. Students also need to understand that technological systems are designed by people, operate within social contexts, and may affect different people differently (UNESCO, 2023).

Questions such as:

Who is responsible for an AI-generated decision?, Is the system fair to everyone?, What happens to personal data?,
Whose perspectives are represented?
Should we trust a system when we cannot explain how it reached its conclusion?

Are therefore educational questions rather than merely technical ones.

The BrAIn comparative analysis strengthens the case for treating ethical judgement as a core competence. Ethical judgement was identified across all four participating countries – Denmark, Türkiye, Spain, and Bulgaria – and appears across policy-level material, teacher feedback and classroom evidence. At macro level, the comparative analysis shows a shared emphasis on critical thinking, information literacy and ethical judgement as necessary for navigating AI-generated information and automated decision-making. It also identifies a common emphasis on human agency and responsibility: students should be positioned as reflective and responsible users rather than passive recipients of AI outputs.

This gives ethical judgement a broader educational relevance. It is closely connected to digital citizenship, participation and human agency. The educational goal is not to prepare students to memorise a fixed catalogue of ethical AI rules. It is to prepare them to encounter technologies and dilemmas that cannot all be anticipated in advance.

Ethical judgement can therefore be understood as the ability to answer not only **“Can AI do this?”**, but also **“Should it?”, “Under what conditions?”, “For whose benefit?”, “At whose cost?” and “Who remains responsible?”**

In this sense, ethical judgement protects an important distinction at the centre of the BrAIn project: technological capability does not determine human responsibility. AI may contribute information, suggestions and possible courses of action, but the responsibility for interpreting consequences, weighing values and making value-based decisions remains human.

5.2.2. Development of Ethical Judgement through the use of AI

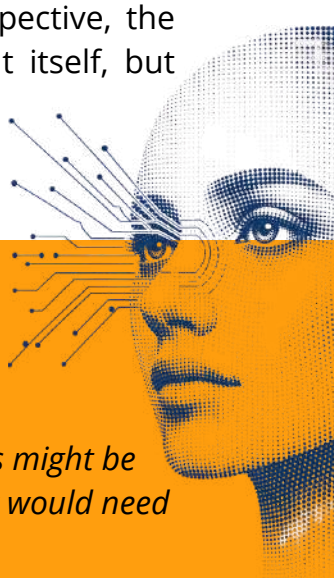
AI does more than introduce new ethical topics into education. It also changes the conditions under which students make judgements.

Traditional ethical dilemmas are often presented as hypothetical cases that students discuss from a distance. Generative AI can make such dilemmas immediate and interactive. A student may encounter a stereotypical response, an inaccurate representation of a social group, a confident answer without sources or a recommendation that appears unfair. The ethical issue is therefore no longer only something described in a textbook; it can emerge during the student's own interaction with technology.

This is important because the BrAIn findings suggest that ethical judgement does not automatically develop through exposure to AI. Routine use may contain very little ethical reflection. Students can prompt a system, receive an answer and continue working without considering how the answer was produced, what assumptions it contains or who might be affected by it. Ethical judgement becomes more visible when the normal flow of AI use is interrupted.

The comparative analysis identifies precisely this pattern. Competences related to ethical judgement, responsibility and systems thinking become particularly visible when students encounter problematic or surprising AI outputs, including bias and factual inaccuracies. Danish classroom observations, for example, showed that perceived bias or inconsistency could trigger immediate questioning of AI authority. Teacher mediation was important in transforming such disruption into a learning opportunity rather than leaving it as surprise or confusion.

This introduces the idea of productive ethical friction. An unexpected AI output creates a gap between what students expected and what they received. That gap can produce a reason to stop, question and discuss. From a didactic perspective, the important element is therefore not necessarily the problematic output itself, but what happens immediately afterwards.



A student might initially say:

"That answer is unfair."
This is a reaction, but not yet a developed ethical judgement.
The teacher can move the student further by asking:
What exactly makes it unfair? Who is treated differently? What assumptions might be behind the answer? Would the consequences be the same for everyone? What would need to change for the decision to become more acceptable?

The student is thereby moved from:

REACTION → ANALYSIS → PERSPECTIVE-TAKING → JUDGEMENT → JUSTIFICATION

This helps explain one of the central findings of the comparative analysis: competences become visible when teaching creates opportunities for friction, comparison or uncertainty that students must resolve through reasoning and dialogue. Moments of surprise, disagreement and perceived bias can therefore become pedagogically productive rather than merely technological failures.

A second important interaction concerns authority. Generative AI produces language that may appear coherent, confident and personalised. This can create an impression that the system has evaluated a question rather than statistically generated a response. When an AI system answers "The fairest solution would be…", students may interpret the formulation as evidence of authority.

Ethical education must therefore distinguish between AI-generated reasoning and human judgement. An AI system can generate arguments for several positions, identify possible stakeholders or simulate perspectives. It cannot assume moral responsibility for the consequences of the decision.



This changes the pedagogical question from:

"What does the AI think?"
to:
"What does the AI response give us to think about?"

AI can consequently function as an object of inquiry. Instead of merely evaluating whether an output is factually correct, students can investigate its assumptions and consequences:



Who might benefit from this answer?
Who might be disadvantaged?
Which perspectives are represented or missing?
What information might the AI not have?
Which values are in conflict?
Is everyone being treated fairly?
What personal information is required?
Can we understand why this recommendation was made?
Who would be responsible if the recommendation caused harm?
Would the judgement change if the affected person were different?
Would you make the same decision? Why?

This also connects ethical judgement to other competences identified. Students need critical thinking to challenge an AI output, information literacy to examine its basis, empathy to consider consequences for others, communication to articulate disagreement and systems thinking to consider effects beyond the immediate user. The comparative analysis therefore suggests that AI-related competence development is better understood as interconnected competence profiles than as isolated skills.

Ethical judgement thus occupies an important position between understanding AI and acting responsibly with AI. The educational objective is not simply that students become sceptical of AI. It is that they learn when trust is justified, when questioning is necessary, and how responsibility should be maintained even when technology contributes to the decision.



5.2.3. Potentials of AI for strengthening Ethical Judgement skills

AI can support the development of ethical judgement when it is deliberately used to expand rather than replace students' reasoning.

One important educational possibility is that AI can transform abstract ethical principles into situations that students can investigate. Concepts such as fairness, privacy, transparency and responsibility can be difficult to understand when presented only as definitions. They become more meaningful when students encounter a situation in which two legitimate interests conflict.

For example, students might examine a fictional AI system that uses previous school performance to recommend which students should participate in an advanced programme. The system might improve efficiency and consistency, but students can then investigate whether historical data could reproduce previous inequalities, whether teachers should be able to override the recommendation, whether students have a right to an explanation, and who should be responsible for the final decision. The ethical learning does not come from AI providing an answer. It comes from the tension between possible answers.

This allows students to investigate competing values such as:

Privacy ↔ Personalisation
Freedom ↔ Safety
Efficiency ↔ Fairness
Innovation ↔ Responsibility
Automation ↔ Human control

Rather than teaching one side of these relationships as inherently correct, students can examine the conditions under which different considerations should carry greater weight. Ethical judgement therefore becomes an exercise in weighing consequences and values rather than identifying a predetermined answer.

A second opportunity concerns perspective-taking. AI can help create different stakeholder perspectives around the same case. In a dilemma concerning facial recognition at school, for example, students might consider the situation from the perspectives of students, parents, teachers, school leaders, technology providers and people responsible for data protection.

The important pedagogical step is that students do not simply accept AI-generated perspectives. They compare them, identify missing voices and decide whether the representation is reasonable. AI therefore becomes a means of opening the discussion, while students remain responsible for evaluating it.

A third possibility is variation. Teachers can alter one variable in a dilemma and ask whether students' judgement changes. Would their position be different if an AI system were 60% accurate rather than 95% accurate? If it advised a teacher rather than made the final decision? If students could appeal the decision? If the data were anonymous? If the consequences were minor rather than life-changing?
Such variation can reveal the principles underlying students' judgements. Students move from saying *"I think this is wrong"* to explaining which conditions make it wrong and which changes might make it acceptable.

AI also allows ethical scenarios to be adapted to age, subject and context. A younger student might investigate whether an AI-generated picture treats people fairly. Older students might investigate automated recruitment, medical prioritisation, surveillance or AI-generated misinformation. The underlying competence remains similar even though the complexity of the case increases.

The BrAIn classroom findings provide another important direction. Ethical judgement and communication become particularly visible in activities based on discussion, debate and collective negotiation. This suggests that AI may have greater educational value for ethical judgement when it functions as a shared object of inquiry rather than an individual answer machine.

A group can disagree with an AI output. Students can disagree with each other about why it is problematic. They can propose competing solutions and defend them. Through dialogue, assumptions that remain invisible during individual interaction become public and available for examination.

The educational value therefore lies partly in moving AI away from the familiar pattern:

Student → AI → Answer
towards:
Students → AI output → Disagreement → Investigation → Dialogue → Judgement



This is consistent that productive AI integration depends heavily on pedagogical organisation. AI-supported environments foreground evaluation, reasoning, collaboration and creative development when these competences are intentionally built into the task. The positive contribution of AI to ethical judgement is consequently paradoxical: AI is valuable not because it can make ethical decisions for students, but because it can create rich material against which students can develop, test, revise and defend their own judgements.

5.2.4. Risks and challenges for the development of Ethical Judgement

The central educational risk is not simply that AI can produce unethical content. A more fundamental risk is that students may gradually delegate the process of judgement itself.

Generative AI makes delegation unusually easy. A student can ask for the fairest solution, the strongest argument, the best choice or even an ethical evaluation of a situation. Because the answer may be immediate, coherent and persuasive, the cognitive work involved in identifying competing values, examining consequences and forming a position can become invisible.

This connects directly with the broader concern regarding cognitive offloading and overdependence. The emphasises that AI should supplement rather than replace students' own thinking and identifies a risk that easy access to automated answers may reduce independent analysis and problem-solving (Gerlich, 2025; Zhai et al., 2024).

In relation to ethical judgement, this can be understood as ethical offloading: the student does not merely outsource information gathering but outsources the question of what ought to be done.

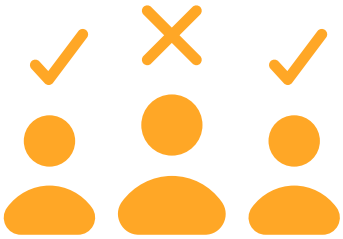
That distinction is crucial. A student may use AI to identify possible consequences without delegating the final judgement. Conversely, asking AI “What should I decide?” can bypass precisely the competence the educational activity is intended to develop.
A second challenge concerns automation bias. Students may attach greater credibility to a recommendation because it comes from a technological system. This becomes particularly problematic when AI-generated language is fluent and confident. Confidence of presentation can be mistaken for quality of reasoning.

Teachers therefore need to help students distinguish:

plausibility ≠ accuracy
accuracy ≠ fairness
efficiency ≠ ethical acceptability
AI recommendation ≠ human responsibility

A system can produce a factually accurate assessment while still being ethically problematic. Likewise, a highly efficient solution may distribute benefits and disadvantages unfairly.

Bias and discrimination constitute another important challenge. AI systems may reproduce patterns represented in their data or produce outputs that reflect stereotypes and unequal representation (European Commission, 2022; UNESCO, 2021). However, the educational task should extend beyond teaching students simply to "spot bias". Students should investigate how bias affects decisions, who experiences the consequences, and what safeguards might reduce harm.





Privacy raises a different kind of ethical problem. Students can easily share information with digital systems without recognising that providing data is itself an ethical decision. Ethical judgement therefore includes the ability to ask whether information is necessary, who should have access to it, what consent means in a particular context, and whether the potential benefit justifies the use of personal data (European Commission, 2022; UNESCO, 2023).

Transparency introduces another difficulty. Students cannot necessarily inspect the underlying processes of an AI system. Ethical judgement must therefore sometimes operate under uncertainty. Students need to learn that not knowing how a decision was reached is itself relevant information when deciding how much authority to give that decision.





Responsibility becomes similarly complex when multiple actors are involved. If an AI recommendation causes harm, responsibility may appear distributed between the developer, organisation, teacher, user and system. Students therefore need opportunities to distinguish between technological causation and moral responsibility.

These challenges should not be treated independently. A single AI application can involve privacy, bias, transparency and responsibility simultaneously. More advanced ethical judgement therefore requires students to understand AI use as part of a system of relationships and consequences, rather than evaluating one isolated output. The comparative findings add an important pedagogical warning. Digital competence and AI literacy are enabling competences, but technical proficiency alone does not guarantee deeper learning. When technical skills are not accompanied by critical thinking, ethical judgement and self-management, students may prioritise speed over depth.

A student can therefore become better at using AI without becoming better at judging its use.

For this reason, ethical education should not become a checklist of fixed rules. Checklists can support safe practice, but ethical judgement requires students to work with ambiguity, uncertainty and legitimate disagreement. If every classroom dilemma has an obvious **"correct ethical answer", students practise recognising the teacher's preferred answer rather than developing judgement.**
The educational challenge is therefore to design situations where students must decide – but also where they **must explain why.**



5.2.5. Educational implications for fostering Ethical Judgement in AI-supported learning environments

The findings point towards a central conclusion: ethical judgement must be designed for. It cannot be assumed to emerge simply because students use AI.

The comparative analysis shows a gap between policy ambitions and classroom enactment. Policy and research documents strongly emphasise ethical AI use, human agency and responsibility, but these competences become visible in classroom practice primarily when teachers translate them into concrete tasks, questions and forms of scaffolding.

This has an important implication for lesson design. Teachers should not begin by asking only:

"Where can AI be used in this lesson?"
They should also ask:
"Where will students have to make a judgement?"



An ethical learning activity should contain a point at which the student cannot progress simply by reproducing information. There must be something to consider, compare, prioritise or decide.

A useful progression is:

Identify → Analyse → Consider perspectives → Judge → Justify → Act

At the **Identify** stage, students recognise that a situation contains an ethical issue. At first, this may simply involve noticing unfairness, privacy concerns, bias or uncertainty about responsibility.

At the **Analyse** stage, students investigate what creates the dilemma.
What information is being used? How is AI involved? Which values are in tension?

At the **Consider perspectives** stage, students identify stakeholders and explore how the same technological choice might affect them differently.

At the **Judge** stage, students take a position. Importantly, ethical education cannot stop with endless discussion; students also need experience making decisions under uncertainty.

At the **Justify** stage, they provide reasons for that position and respond to counterarguments.

Finally, at the **Act** stage, students translate judgement into responsible action. They might redesign an AI use, propose safeguards, formulate a classroom guideline or decide under which conditions a technology should or should not be used.

This progression also makes differentiation possible. Younger students may work mainly with recognition, consequences and simple perspective-taking. Older or more experienced students can analyse conflicting rights, long-term consequences, transparency and distributed responsibility.

The teacher's role changes across the progression. Rather than providing the ethically "correct" answer, the teacher increasingly acts as a facilitator of reasoning. Questions become a central form of scaffolding:



Who have we not considered?
What evidence supports that judgement?
Would your answer change if...?
What might happen in the long term?
Who carries the risk?
Who receives the benefit?
Can two reasonable people disagree here?
What would make you change your mind?

The BrAIn observations provide a particularly useful strategy. Moments of surprise, disagreement, inconsistency or perceived AI bias can function as instructional triggers. Instead of immediately correcting an unexpected AI output, the teacher can pause and make it the subject of investigation. The comparative analysis shows that such moments can stimulate engagement, critical discussion and ethical reflection.
This leads to a central didactic principle:

Do not remove every problematic AI output from the learning environment. When pedagogically appropriate and safely framed, use unexpected, biased or questionable outputs as opportunities for students to practise ethical judgement.
The qualification safely framed is important. The purpose is not to expose students unnecessarily to harmful material. Teachers select, contextualise and mediate examples so that the ethical problem becomes accessible for analysis without normalising harmful content.

Assessment should follow the same logic. If ethical judgement is a reasoning competence, assessment should not primarily reward agreement with a predetermined conclusion. Two students may reach different defensible conclusions while both demonstrating sophisticated ethical judgement.

Teachers can instead observe whether students:

- *recognise that an ethical dilemma exists;*
- *identify relevant stakeholders, rights and values;*
- *distinguish technological possibilities from ethical acceptability;*
- *consider immediate and wider consequences;*
- *recognise issues involving privacy, bias, fairness and transparency;*
- *consider alternative perspectives, including perspectives different from their own;*
- *justify their judgement with relevant reasons;*
- *respond to counterarguments and new information;*
- *revise their position when warranted; and*
- *propose responsible action or safeguards.*

This makes progression observable. A student who says “The AI is wrong” demonstrates recognition. A student who can explain why an output disadvantages a particular group demonstrates analysis. A student who can compare competing values and defend a solution demonstrates judgement. A student who can revise the system or formulate safeguards moves from judgement towards responsible action.
The teaching sequence progresses from critical analysis of AI bias and information towards ethical dilemmas, reflection, the development of an ethical code and ultimately the design of AI-supported solutions that balance technological possibilities with responsibility.

Ethical judgement should therefore not become a separate “AI ethics lesson” disconnected from students' ordinary use of technology. It can function as a recurring practice across subjects: whenever AI provides information, generates representations, recommends actions or contributes to decisions, students can be asked not only whether the technology works, but whether its use is justified.

The ultimate educational objective is consequently not that students learn to trust AI or distrust AI. It is that they learn to determine when trust is warranted, when questioning is necessary, what consequences must be considered, and why human responsibility remains necessary even when AI contributes to the decision.
This reflects the central principle: AI should support rather than replace human thinking.

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5.3. Problem Solving

5.3.1. Definition and educational relevance

Problem solving is the ability to understand a problem, choose and carry out a suitable approach, and check whether it achieves the intended goal. When an approach does not work, it also involves identifying what went wrong and making a useful adjustment. In simple terms, problem solving means *working out what needs to happen, how to make it happen and whether the chosen approach works.* It involves connecting a goal with the actions needed to reach it, using the information and resources available.

A problem arises when someone wants to achieve something but the way forward is not immediately clear. The OECD framework highlights this element of uncertainty: the learner needs to work out a route to a solution rather than simply reproduce a familiar answer (OECD, 2013). Pupils may need to decide where to begin, which information matters or which method is most suitable.

This helps distinguish problem solving from practicing a procedure. When pupils complete calculations using a method they have just been shown, they are developing fluency. When they encounter a situation and must decide which calculation to use, how to organise the information and what the result means, they are also practising problem solving. **Both are important: familiar procedures provide tools that pupils can draw on when facing a new challenge.**

Some problems have one clear solution, while others allow several workable approaches. A mathematical task may lead to a specific numerical answer. Organising classroom materials may involve several possible arrangements. In either case, pupils need to check whether their approach meets the goal and respects relevant conditions, such as the available time, materials or space.

Problem solving also involves dealing with incomplete information. Pupils may discover that they cannot make a sensible decision until they know how many people will participate, how much a material costs or how much space is available. Recognising what needs to be found out is part of the process. It helps pupils avoid rushing into a solution based on assumptions.

What counts as a problem depends on the learner's experience. A task that one pupil can complete using a familiar method may require another to explore several possibilities. Teachers therefore need to choose challenges that give pupils something meaningful to work out while providing enough knowledge and support to begin. A suitable challenge allows pupils to make decisions, try an approach and learn from the result without becoming overwhelmed by unfamiliar demands.

What does problem solving involve?

Imagine that a class of 24 pupils is preparing for a drawing activity. There are six boxes of coloured pencils, and every pupil needs access to several colours. How can the class organise the materials so that everyone can participate? Pupils need to consider how many children can share each box, how to arrange the tables and how everyone will reach the materials. They might suggest six groups of four pupils, with one box on each table. Once the activity begins, they can observe whether the arrangement works. If some pupils cannot reach the pencils easily, they may move the boxes or change the seating.

This example illustrates several connected parts of problem solving. These actions do not always follow a fixed order. Pupils may try an arrangement and discover a condition they had overlooked. They may then return to their plan and revise it. Moving between planning, action and checking is a normal part of solving a problem.



UNDERSTANDING THE PROBLEM AND IDENTIFYING THE GOAL.
In this case, every pupil needs access to the materials required for drawing.



RECOGNISING THE CONDITIONS
Noticing what is available and what limits apply, including the number of pupils, boxes and suitable table spaces.



CHOOSING AN APPROACH
Deciding how to organise the groups and materials.



PUTTING THE APPROACH INTO PRACTICE
Arranging the classroom and trying the plan.



EVALUATING AND ADJUSTING
checking whether everyone can participate and making changes where necessary.

Why is problem solving important in education?

Problem solving **helps pupils apply their knowledge** to situations that require a decision. Knowing how to divide numbers becomes useful when organising equal groups. Understanding measurement helps pupils decide whether a design fits the available space. Knowledge gives them a basis for choosing and carrying out an approach.

It also **helps pupils organise their work.** They learn to identify a starting point, divide a larger task into manageable parts and recognise which actions need to happen first. For example, pupils planning a class activity need to establish how many people will participate before deciding how to distribute the materials.

Problem solving **develops flexibility.** Pupils learn that a method may need adapting when the situation changes. An arrangement that works for a small group may not work for a whole class. A timetable that fits three activities may need revising when an additional activity is introduced. Pupils practise identifying what can stay the same and what needs to change.

Unsuccessful attempts also have a useful role in learning. A timetable that exceeds the available minutes provides information about the approach. With teacher guidance, pupils can identify the cause and **choose a purposeful adjustment.** The aim is to help them use the result of an attempt to decide what to do next.

Another important aspect is recognising when a solution is not possible under the stated conditions. If all the planned activities cannot fit into the available time, pupils need to **identify the conflict.** They may need to shorten an activity, change the schedule or explain why more time is required. Recognising such a limitation is itself a valuable problem-solving outcome.

Supporting problem solving in primary education

Pupils need both relevant knowledge and opportunities to decide how to use it. Before setting a problem, teachers should check that pupils understand the essential facts, vocabulary and methods. Difficulty beginning a task may reflect missing knowledge rather than a lack of problem-solving ability.

Support can make the problem easier to work with while preserving the decisions pupils need to make. Younger pupils may use objects, drawings or practical demonstrations. Others may benefit from a table, diagram or timeline that helps them organise information.

Teachers can guide pupils with questions linked to the task:

- What are we trying to achieve?
- What do we know, and what else do we need to find out?
- Which conditions must our solution meet?
- What could we try first?
- How will we test whether it works?
- What needs to change after this attempt?

As pupils gain experience, teachers can gradually reduce the support and ask them to choose suitable methods more independently.

What should teachers look for?

Problem-solving competence becomes visible through pupils' decisions and actions. Teachers can observe whether pupils:

- Describe the goal clearly.
- Identify relevant information and important limits.
- Choose an approach that fits the task.
- Carry out the plan in an organised way.
- Check the result against the original goal.
- Identify a difficulty and make a reasoned adjustment.

A correct final answer is useful evidence, but teachers also need to understand how it was reached. A pupil may produce a successful result by following a supplied plan without understanding why it works. Another may not yet complete the task but may correctly identify why an approach failed and suggest a suitable next step. Assessment should therefore consider the pupil's contribution to the solution process, including the support they needed and the decisions they made themselves.

Relevance to the BrAIn project

AI can provide calculations, designs and plans before pupils have worked through a problem. For teachers, this raises a specific educational question: can pupils understand, apply and test the suggested approach in the actual situation? A generated timetable may still omit the time needed to move between activities. A suggested classroom arrangement may assume that more tables are available. A bridge design may need testing with the paper and supports pupils actually have.

Within BrAIn, developing problem solving means helping pupils work from a defined goal towards a solution they can carry out and evaluate. When AI contributes a suggestion, pupils still need opportunities to interpret the conditions, organise the actions, test the result and make necessary adjustments. This keeps practical problem-solving experience at the centre of learning.

5.3.2. Development of Problem Solving through the use of AI

AI can provide a proposed solution, but pupils still need to learn how to turn that proposal into actions that work. Reading a plan, understanding its steps and applying it successfully are different achievements.

For example, an AI tool might suggest organising 24 pupils into six groups of four to share six boxes of coloured pencils. The calculation works, but the classroom may not have six suitable table spaces. Pupils need to connect the suggestion with the actual setting and decide how to arrange the groups and materials. This creates an opportunity to practise three important actions:



Helping pupils use a method

A useful teaching approach is to provide a partial plan with a meaningful step left unfinished. For instance, the teacher could supply the number of groups but ask pupils to decide where those groups will sit and how they will access the materials. This gives pupils a starting point while leaving a practical decision to make. Afterwards, introduce a related problem. What would need to change if one box of pencils were unavailable? Pupils should identify which parts of the original arrangement remain useful and which need revising.

Research with high-school mathematics students illustrates why this distinction matters. Bastani et al. (2025) found that performance with AI assistance did not necessarily translate into stronger performance when the assistance was removed. Teacher-informed safeguards largely mitigated the negative effect found with unrestricted assistance. These findings concern older learners, but they give teachers a reason to examine what pupils can subsequently apply themselves.

5.3.3. Potentials of AI for strengthening Problem Solving skills

AI can support problem-solving activities by helping teachers prepare resources that guide pupils through particular difficulties. It can help organise a task, provide a focused hint or introduce a situation that requires pupils to revise a plan. Its educational value depends on how these resources are used and which decisions pupils continue to make.

For primary education, these opportunities can be explored through teacher-led activities and prepared materials. Pupils do not need individual accounts or direct access to an AI tool to work with a generated planning table, question or suggested method.

Helping pupils organise a complex problem

Pupils sometimes struggle because a task contains several pieces of information that they cannot easily connect. AI can help a teacher prepare a simple table, an outline or a set of task cards that makes these relationships easier to work with.

For example, planning a class activity might involve the number of pupils, the available materials, the room layout and the time allowed. A planning table could separate these details into:

1. What we need to achieve.
2. What we have available.
3. What limits we must respect.
4. What we still need to find out.

Pupils complete the table using the actual task information. This helps them establish the problem before choosing a solution. The teacher should ensure that the resource organises the information without making the main decisions for them.

AI can help teachers prepare examples showing how a larger problem can be divided into smaller tasks. Pupils can then decide the order of those tasks and identify which depend on earlier decisions. For instance, organising a classroom display may involve measuring the available wall space, checking the size of pupils' work, deciding on an arrangement and selecting a way to attach it. Pupils need to recognise that the arrangement depends on the measurements.

Providing support at the point of difficulty

A short, well-chosen hint can help pupils continue when they have reached a specific obstacle. AI can assist the teacher in drafting hints that direct attention to an overlooked quantity, relationship or action.

Suppose pupils are planning three activities within a 30-minute session. They allocate ten minutes to each activity but forget the time needed to move between them. A useful hint would be: *"What will pupils need to do between the activities, and where does that time appear in your plan?"* Pupils still need to calculate the movement time and adjust their schedule.

Teachers should select hints after identifying the difficulty. If pupils do not understand the task, they need clarification. If they understand it but cannot organise the information, they may need a diagram or table. If they have made a calculation error, they need support with that calculation. These situations require different kinds of help.

Helping pupils choose a suitable method

Some problems can be approached using different methods. AI can help a teacher prepare short examples that show how a drawing, a table or a practical model could be used.

For example, pupils deciding how to distribute materials might use counters to represent the objects or a table to record how many each group receives. The teacher can ask: *"Which method makes it easiest to see whether every group has what it needs?"*

The purpose is to help pupils select a method that suits the problem. They can try a representation and change it if it does not make the relationships clear. Over time, teachers can ask pupils to choose the representation themselves.

When a plan does not work, pupils may notice the difficulty without understanding its cause. AI can help teachers prepare focused questions that guide pupils towards identifying what needs to change. For example, pupils may have arranged groups to share coloured pencils, but some children spend too much time waiting for the colours they need. The teacher could use questions such as:

- Can everyone reach the box easily?
- Are several pupils waiting for the same colour?
- Are some pencils available elsewhere but not being used?
- Is the difficulty caused by the seating arrangement or by how the materials are shared?

Pupils observe what happens and choose an adjustment that addresses the cause. They might move the box to the centre of the table, redistribute unused pencils or agree on a way to take turns. They then try the revised arrangement and check whether waiting time decreases. AI can help prepare the troubleshooting questions, while pupils gather the observations needed to diagnose the problem and test their adjustment.

Exploring whether a solution works under new conditions

AI can help teachers prepare related versions of a problem in which one important condition changes. This gives pupils practice in adapting a method.

For example, pupils may have organised 24 children into six groups to share six boxes of coloured pencils. A follow-up task could ask them to reconsider the arrangement when only five boxes are available. Pupils need to identify which part of the plan is affected, decide how to reorganise access to the materials and check whether everyone can still participate. They might change the group sizes or introduce a sharing arrangement. These variations help pupils recognise that a method must fit the current conditions. Teachers should choose changes that pupils can understand and provide enough information to make a workable revision.

Improving a solution that already works

Problem solving can continue after pupils find a feasible solution. AI can help teachers prepare a plan that meets the goal but uses more time or resources than necessary.

For instance, a plan for moving classroom materials may transport everything successfully but involve several partly empty containers. Pupils can investigate whether a different packing arrangement would reduce the number of trips. They first check that the revised plan still meets the essential conditions: all materials must fit, containers must be manageable to carry and nothing should be left behind. They then calculate or test whether the revision improves the chosen measure.

This helps pupils distinguish between finding a solution that works and making that solution more efficient.

Using AI-prepared resources effectively

Teachers can use AI to draft planning sheets, partial solutions, hints and troubleshooting questions. Before sharing a resource, work through the task yourself. Check that the quantities are correct, the conditions are clear and the task can be completed with the materials and time available.

Preparation should begin with identifying which part of problem solving pupils need to practise. A blank table may help pupils organise information. Task cards may support planning a sequence. Focused observation questions may help pupils diagnose a difficulty. Selecting the resource according to the learning goal keeps the support relevant.

When asking AI to prepare a resource, teachers should specify:

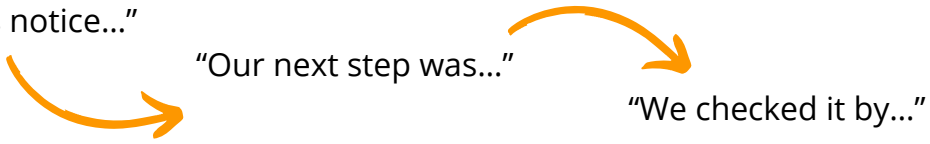
- The pupils' age and relevant prior knowledge.
- The problem, available resources and limits.
- The step pupils are finding difficult.
- The type and length of support required.
- What pupils should still work out themselves.

For example, a teacher could use the following prompt:
"Prepare one short hint for pupils aged 9–10. They are planning three activities within 30 minutes but have forgotten to include movement time. Ask a question that helps them notice the missing step. Do not calculate the timings or provide a completed timetable."

Teachers should review whether the response addresses the difficulty, uses understandable language and leaves pupils with a meaningful action to take. The wording may need shortening or simplifying. A single clear question can be more useful than a lengthy explanation.

During the lesson, the resource can be introduced when pupils reach the relevant difficulty. After receiving a hint, pupils should identify their next action and carry it out. If they remain stuck, the teacher may need to clarify missing knowledge or demonstrate a small part of the method. Introducing support gradually makes it easier to observe which assistance helps pupils progress.

The resource's usefulness becomes visible through pupils' subsequent actions. Teachers can observe whether pupils add the missing step, complete the table or revise the arrangement. Short reflection prompts can help pupils explain the connection:



The resource can also be provided in print or displayed on the classroom board so that participation does not depend on individual devices. For primary learners, teacher-mediated use and carefully selected materials support the age-appropriate approach recommended by UNESCO (Miao & Holmes, 2023).

The central consideration is what pupils will practise doing with the resource. Effective support helps them take a purposeful next step and understand why that step matters.

5.3.4. Risks and challenges for the development of Problem Solving

AI-generated solutions can make a task appear straightforward while leaving important parts of the planning process unexplored. Pupils need opportunities to identify what a proposal requires, determine whether it fits the situation and recognise why it may fail.

A solution may change the problem. A suggestion to give each pupil an individual set of coloured pencils would avoid sharing, but it would not solve a task requiring the class to use six existing boxes. Pupils need to distinguish between reorganising available resources and changing the conditions of the task.

A plan may omit necessary actions. A timetable may include every activity but leave out the time needed to distribute materials or move between stations. Teachers can ask pupils to trace the plan from beginning to end, including what happens between its main steps.

A suggestion may assume unavailable resources. Extra tables, materials or adult help may appear in a proposed plan even though they are not available. Pupils should identify what the plan requires and compare those requirements with the resources stated in the task.

An improvement may break another condition. Reducing the number of groups may make an arrangement simpler but leave too many pupils sharing one box of materials. Pupils need to establish whether a revised plan still meets all the essential conditions before judging it more efficient.

A prediction may be mistaken for a result. A suggestion that placing a box in the centre of a table will reduce waiting time is a prediction. Pupils need to try the arrangement and observe whether access improves. The result may show that the real difficulty is several children needing the same colour at once.

A supplied method may conceal a learning gap. Pupils may follow a completed grouping plan successfully but struggle to adapt it when fewer materials are available. A related follow-up task helps teachers identify whether pupils understand the method and can decide which part needs changing.

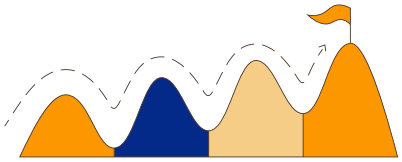
These difficulties can occur with plans supplied by people as well as AI. The teaching focus is on identifying the specific obstacle and choosing an adjustment that addresses its cause. Useful teacher question:

"Which part of the plan prevents it from meeting our goal, and what could be changed within the available conditions?"

5.3.5. Educational implications for fostering Problem Solving in AI-supported learning environments

Teaching problem solving in an AI-supported environment requires attention to the decisions pupils make throughout a task. Pupils need opportunities to organise information, choose an approach, carry it out and use the result to decide what happens next.
These opportunities can be built into ordinary subject lessons. In mathematics, pupils might organise groups or calculate material requirements. In language lessons, they might plan the stages of a class presentation. In environmental studies, they might develop and trial a system for sorting classroom waste. The problem should require pupils to apply relevant subject knowledge to a clear, achievable goal.

Establishing clear goals and conditions



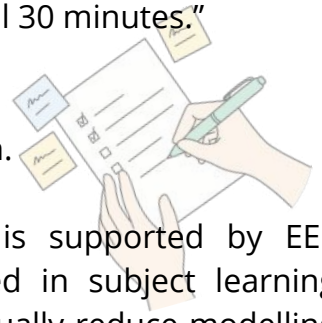
Teachers should distinguish between the goal and the conditions a solution must meet. For a classroom activity, the goal might be that every pupil completes all three stations. The conditions might include the available time, the number of places at each station and the materials provided.

Keeping these details visible gives pupils a practical basis for planning and checking. It also helps teachers explain why a proposal needs revising. A plan may include every activity but exceed the available time, or fit the time while leaving one group out.

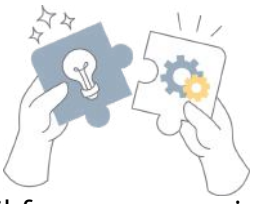
Modelling a useful planning process

Teachers can demonstrate a small part of the reasoning needed to begin or check a task. For example: “There are 30 minutes altogether. Some of that time is needed for moving between activities, so the activity periods cannot use all 30 minutes.”

The demonstration makes a relationship visible while leaving pupils to calculate the allocation and complete the plan.



Explicit teaching of planning, monitoring and evaluating is supported by EEF guidance, particularly when these processes are embedded in subject learning (Education Endowment Foundation, 2025). Teachers can gradually reduce modelling as pupils become able to select and use the methods themselves.



Providing support without removing the decision

Support should address the difficulty that prevents a pupil from progressing. A read-aloud version may help with understanding the brief. Counters may help represent quantities. A partially completed grid may help organise group movements. Teachers should distinguish between making the task accessible and supplying its solution. The amount of support may vary within the same class. A pupil familiar with the method may work independently, while another may need a shared example before attempting a related problem.



Checking solutions in practical ways

The method of checking should match the goal. Pupils can trace each group through a timetable, count the materials allocated or trial a sharing arrangement during a short activity. Teachers should help pupils distinguish between a predicted outcome and an observed result. An arrangement expected to reduce waiting time needs to be tried before pupils can judge whether it does. When a difficulty appears, pupils should identify its cause before making changes. Recording what happened helps them choose an adjustment and examine whether it improves the outcome.

Assessing individual learning

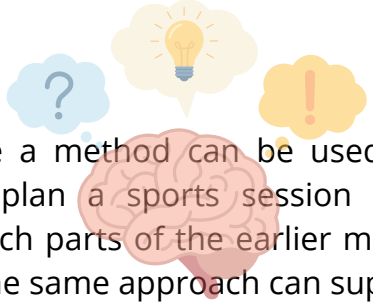
A completed group plan does not show what every pupil understood. Teachers can use short individual tasks to examine particular decisions, such as calculating the time remaining after transitions or explaining how resources would be redistributed. Assessment can consider:



- Whether the pupil identifies the goal and relevant conditions.
- Whether the chosen method fits the problem.
- Whether the pupil carries out an appropriate check.
- Whether a revision addresses the identified difficulty.
- What support was needed.

These observations help teachers select the next teaching step. Pupils who can calculate accurately but overlook transition time need different support from those who understand the schedule but struggle with the calculation.

Applying learning in another situation



A related task helps pupils recognise where a method can be used again. After planning classroom stations, pupils might plan a sports session that includes equipment changes. They should identify which parts of the earlier method remain useful and which quantities need adjusting. The same approach can support learning beyond school. A brief homework record can ask pupils to describe their plan, the help received and the check carried out. This keeps attention on the pupil's contribution to solving the problem and can be completed without access to an AI tool.

5.3.6. References

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5.4. Creativity

5.4.1. Definition and educational relevance

Creativity is the capacity to generate, connect, develop and refine ideas in ways that are original, meaningful and appropriate to a particular context. It is not limited to artistic expression. Creativity can appear when a student invents a story, proposes different ways of solving a mathematical problem, designs an experiment, finds an unexpected use for an everyday object, develops an alternative ending to a text, or combines existing knowledge in a new way.

The OECD distinguishes the broader concept of creativity from **creative thinking**, which it defines as a malleable capacity that can be developed through practice. In the PISA 2022 Creative Thinking Framework, creative thinking involves the generation, evaluation and improvement of original and diverse ideas. This approach is particularly relevant for education because it moves creativity away from the idea that some children are simply "creative" while others are not. Instead, creativity becomes something that can be encouraged, practised and strengthened through appropriate learning experiences (OECD, 2024).

This understanding is also strongly reflected in **European educational frameworks. The European Entrepreneurship Competence Framework (EntreComp)** identifies Creativity as one of the core competences within the area Ideas and Opportunities. It describes creativity as the capacity to "develop creative and purposeful ideas", including generating several ideas, experimenting with innovative approaches and combining knowledge and resources to create value (Bacigalupo et al., 2016).

Similarly, the **Council Recommendation on Key Competences for Lifelong Learning** identifies creativity as a fundamental element of entrepreneurship competence, together with critical thinking, problem solving, initiative, perseverance and collaboration. Creativity is therefore not an isolated ability; it contributes to children's capacity to transform ideas into actions that can generate social, cultural or economic value (Council of the European Union, 2018).

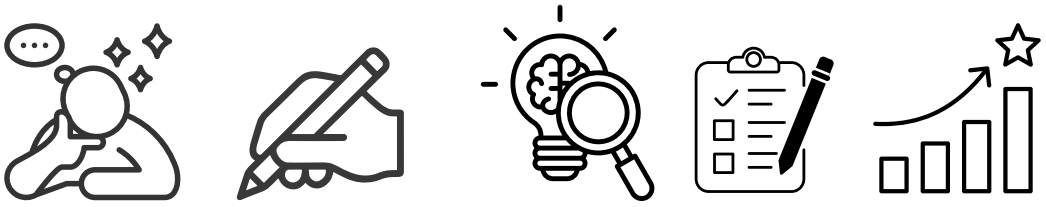
Creativity in Primary Education: Ages 6–12

During primary education, creativity develops through exploration, curiosity, imagination, experimentation and the gradual ability to evaluate and improve ideas. For younger students, creativity may emerge through simple questions:

"What else could we do?"
"Can you think of another way?"
"What would happen if we changed this?"
"Can you invent a different ending?"
"How many solutions can we find?"

As students grow older, teachers can gradually introduce more complex creative processes involving planning, comparison, experimentation, revision and justification. Students can be encouraged not only to generate ideas but also to decide which ideas are most suitable and explain how those ideas could be improved.

This is an important distinction. Creativity is not simply having an idea. It involves a process:



IMAGINE → GENERATE → EXPLORE → TEST → IMPROVE

Schools therefore play an important role in providing students with frequent opportunities to experiment without being afraid of making mistakes. Creativity is strengthened when children learn that an unsuccessful idea is not necessarily a failure; it may provide information that helps them produce a better one.

OECD work on fostering creativity and critical thinking in schools has highlighted the importance of pedagogical approaches that explicitly provide opportunities for students to generate ideas, explore alternatives and reflect on their own creative processes. Its work with schools across several countries also demonstrates that creativity can be addressed across curriculum areas rather than being restricted to arts-related subjects (Vincent-Lancrin et al., 2019).

In science, students may propose different hypotheses. In mathematics, they may search for more than one path to a solution. In language lessons, they can change characters, perspectives or endings. In social studies, they can imagine alternative responses to a community problem. In technology, they can redesign an existing object to serve a different purpose.

Why does Creativity matter more now, with AI in the picture?

Generative AI introduces a new dimension. Tools can now produce stories, images, designs, music, solutions and ideas within seconds. Generating a polished product is therefore becoming easier, but this does not automatically mean that the student has engaged in a creative process. The educational question changes from:

"Can the student produce something?"

to:

"What creative thinking did the student contribute to what was produced?"

This distinction is central to the BrAIn project. AI may expand students' possibilities, but it can also complete parts of the creative process that students need to practise themselves. The educational challenge is therefore to use AI in ways that increase exploration and imagination without replacing them.

Creativity is not the ability to produce a perfect-looking product. It is the ability to **imagine possibilities, develop ideas, make choices, experiment and improve**. AI may contribute material, but the student should remain the creator and decision-maker.

5.4.2. Development of Creativity through the use of AI

AI can influence creativity in two very different directions.

Used appropriately, it can stimulate curiosity, provide unexpected perspectives, generate alternatives and help students develop an initial idea further. Used without pedagogical guidance, it can remove precisely the mental effort through which creativity develops.

Consider two apparently similar classroom situations.

AI CREATES FOR THE STUDENT	STUDENT CREATES WITH AI
Student receives the task	Student receives the task
Student immediately asks AI	Student develops initial ideas
AI generates the solution	Student explores several possibilities
Student selects/copies it	AI is used to introduce alternatives or questions
Task ends	Student compares, changes and combines ideas
	Student produces and explains their own solution

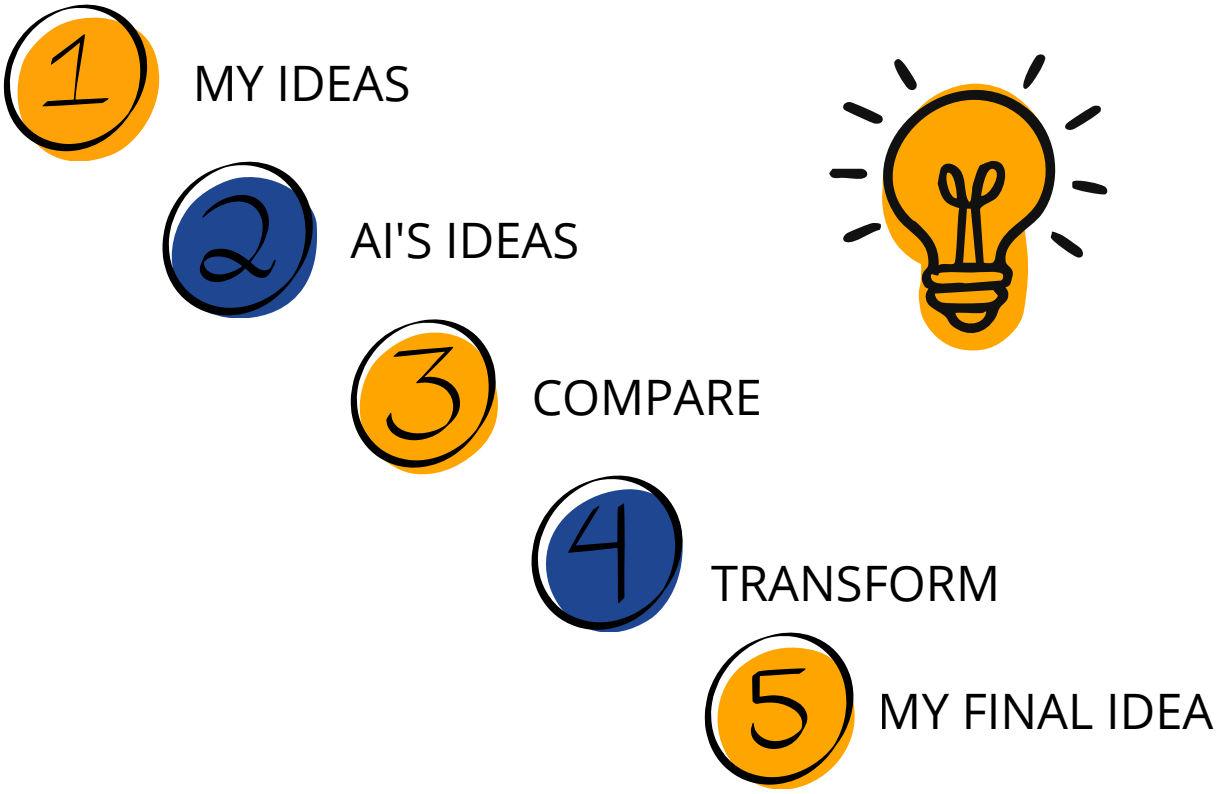
The same technology is involved, but the creative learning process is completely different.

Generative AI can quickly provide many alternatives. This can be useful when students are stuck, when teachers want to expose them to different possibilities or when a class wants to compare alternative approaches. However, if AI is introduced before students have had an opportunity to think, it may anchor their imagination around the machine-generated proposal.

This distinction is consistent with UNESCO's approach to AI education. Its AI Competency Framework for Students presents learners not merely as users of AI but as responsible co-creators, moving progressively through the levels Understand, Apply and Create. The framework emphasises human-centred use, critical judgement and responsibility rather than passive consumption of AI outputs (Miao, Shiohira, & Lao, 2024).

From prompting AI to developing ideas

An effective approach is to ask students to create something before consulting AI. For example:



A student designing an imaginary environmentally friendly playground might first sketch three possibilities. AI could subsequently suggest additional elements. The student then decides:

What is useful?
What is unrealistic?
What did AI think of that I did not?
What did I think of that AI missed?
Can two ideas be combined?
What would I change?

The creative work lies in these decisions.

Research with older learners and adults indicates why this distinction matters. Experimental studies suggest that generative AI can increase the quality, elaboration or originality of individual creative outputs. However, these findings also identify risks such as overestimating one's performance, reduced creative confidence or greater similarity between AI-assisted outputs (Doshi & Hauser, 2024; Habib et al., 2024; Urban et al., 2024).

These studies should not be treated as direct evidence for primary-aged children because their participants were adults or university students. Evidence specifically concerning generative AI in K–12 education remains comparatively recent. A systematic review of K–12 research highlights promising opportunities for innovative and personalised learning but also points to important gaps in empirical evidence and the continuing importance of teacher guidance, training and ethical safeguards (Marzano, 2026).

For children aged 6–12, therefore, AI should normally enter the creative process through deliberately structured and age-appropriate tasks rather than unrestricted independent use.

5.4.3. Potentials of AI for strengthening Creativity skills

Used within carefully designed learning activities, AI can create valuable opportunities for developing different dimensions of creativity. Its educational potential is greatest when it acts as a **stimulus, partner or source of alternatives**, rather than as the final creator.

AI as an idea generator

One obvious strength of generative AI is its capacity to produce alternatives quickly. Teachers can use this to encourage **idea fluency**.
Instead of asking AI: *"Design the best playground",* a teacher might ask it to produce several unusual playground ideas. Students could then identify strengths and weaknesses, combine features from different proposals and design an improved version themselves.

The objective is not to discover which AI proposal is "correct". It is to expose students to a broader field of possibilities from which their own thinking can continue.

AI for developing flexible thinking

Creativity involves being able to move beyond the first idea. AI can help students look at the same problem from another perspective. For example:

"How would a child solve this?"
"How would an engineer think about it?"
"How could we solve it without electricity?"
"What if we only had recycled materials?"
"What would this look like in the future?"

Such changes of perspective can help students recognise that open-ended problems can have multiple legitimate solutions.

This aligns closely with EntreComp, where creativity includes curiosity, developing several solutions, experimentation and combining knowledge and resources in new ways.

AI as a source of creative constraints

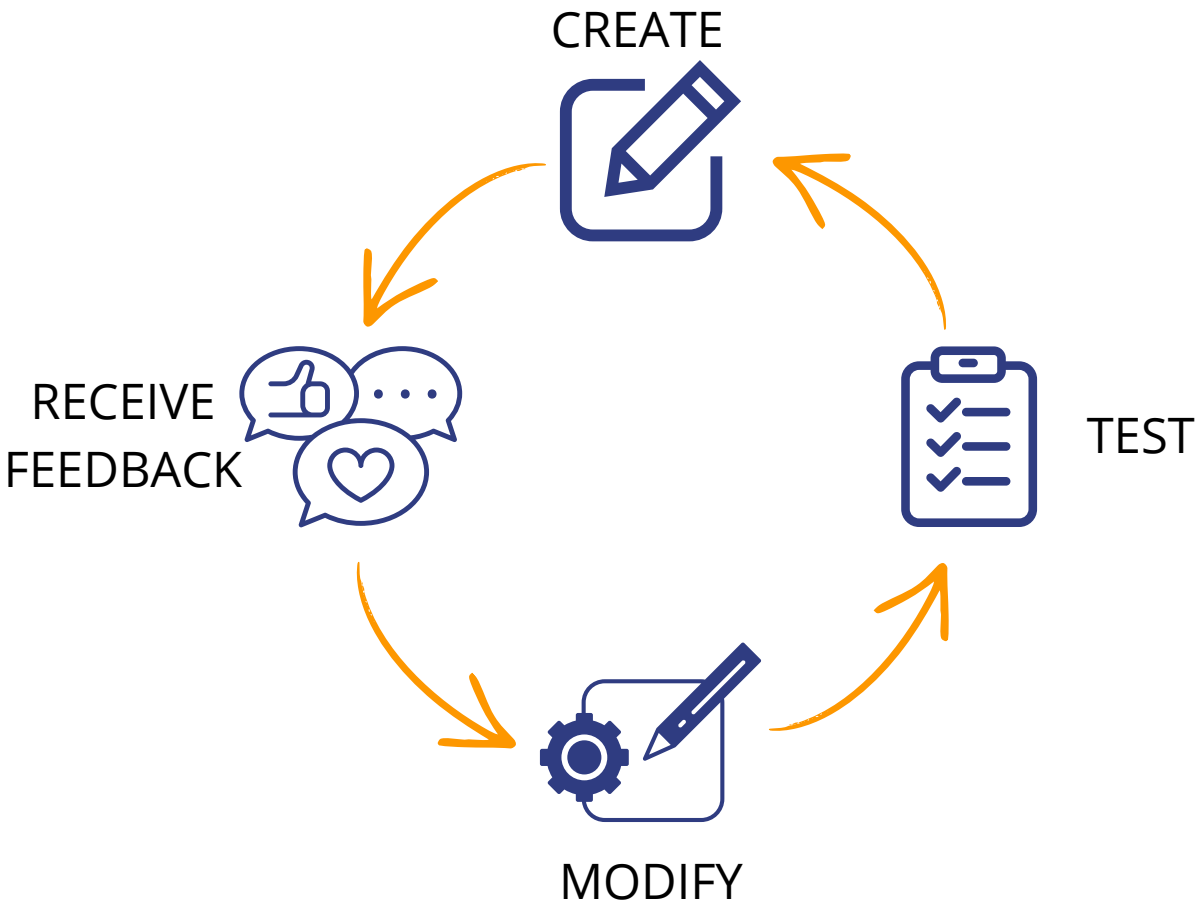
Creativity does not always increase when students have unlimited possibilities. Sometimes a restriction forces them to think differently. AI can generate creative constraints such as:

"Design it using only three materials."
"Tell the story without using the letter A."
"Make the solution useful for both children and older people."
"Redesign it so that it produces no waste."

The student still creates the answer; AI simply changes the conditions under which creativity must operate.

AI as a tool for iteration

Creative work rarely emerges fully formed. Ideas are developed through successive versions. A student might:



AI can offer suggestions or questions that help students reconsider an idea. The crucial step is that students decide whether the feedback is relevant and what they want to change.

This mirrors the OECD conception of creative thinking as involving not only idea generation but also the **evaluation and improvement of ideas**.

AI and multimodal creativity

Generative AI can also allow students to experiment with different forms of representation. An idea initially expressed through words could become an image, a storyboard, a dialogue or a simple design prototype.

This may be especially useful for learners who find one particular mode of expression difficult. A child who struggles to write a long story might begin through drawings or oral storytelling and subsequently develop the idea through other formats.

However, access to more sophisticated production should not be confused with higher creativity. A visually impressive AI-generated image may involve very little creative contribution from the student. Teachers therefore need to consider the decisions, changes and reasoning behind the product.

AI as a support when students are creatively "stuck"

Some children find open-ended tasks intimidating: *"I don't have any ideas",* AI may offer a starting stimulus, an unusual question, a random combination or an alternative perspective. This can reduce the difficulty of beginning.

Evidence from studies with older participants suggests that AI assistance may be particularly beneficial to individuals who initially perform less strongly on creative tasks, while also potentially improving self-efficacy (Doshi & Hauser, 2024; Urban et al., 2024).

For primary students, however, teachers should avoid turning AI into the automatic response whenever a child gets stuck. Productive difficulty, trial and error and moments of uncertainty are themselves important parts of creative development.

AI as a partner for collaborative creativity

AI can also become a shared object for classroom discussion. A teacher might display three AI-generated solutions and ask groups:

Which is most original?
Which is most useful?
Which would you reject?
What is missing?
Can your group produce something better?

In this arrangement, human-to-human discussion remains central. AI contributes material, while students negotiate, evaluate and create collectively.

This is consistent with the European Commission's current guidance, which encourages educators to use AI in ways that retain informed human judgement and to consider both educational benefits and possible ethical, legal and pedagogical risks. The updated guidelines are explicitly designed primarily for primary and secondary educators (European Commission, 2026).

5.4.4. Risks and challenges for the development of Creativity

AI-supported creativity also involves important risks. The central concern is not that AI "destroys creativity", nor that every use of AI makes students less creative. The greater risk is that poorly designed activities allow students to delegate the creative process itself.

Research currently points to a complex picture: AI may improve individual outputs while simultaneously encouraging dependence, anchoring or similarity between outputs. This reinforces the need for deliberate educational design rather than unrestricted adoption (Doshi & Hauser, 2024; Habib et al., 2024).

POTENTIAL CHALLENGE	WHY IT MATTERS FOR CREATIVITY
Premature dependence on AI ideas	Students may consult AI before developing their own possibilities, making the AI answer the starting point of their thinking.
Homogenisation of ideas	If many students rely on similar models and prompts, their outputs may become more alike, reducing collective diversity and originality.
Reduced creative effort	Instant solutions may reduce persistence, experimentation and willingness to work through uncertainty.
Loss of personal voice	A polished story, image or design may reflect AI conventions more than the student's own experiences, imagination and style.
Confusing output quality with creativity	A sophisticated final product does not demonstrate that the student generated, evaluated or improved the underlying idea.
Bias and stereotypes	AI systems may reproduce stereotypical or culturally narrow patterns present in training data.

POTENTIAL CHALLENGE	WHY IT MATTERS FOR CREATIVITY
Bias and stereotypes	AI systems may reproduce stereotypical or culturally narrow patterns present in training data.
Overconfidence	Students may assume that an attractive AI-generated proposal is original, accurate or appropriate without evaluating it.
Authorship and ownership	Students need to distinguish clearly between their own contribution and material generated or transformed by AI.
Privacy and data protection	Students should not provide identifiable or sensitive information to tools that have not been approved for educational use.
Unequal access	Differences in devices, connectivity, digital experience and support may create unequal opportunities.

Homogenisation and creative diversity

One particularly relevant concern is **creative convergenc**e. Doshi and Hauser (2024) found that access to generative AI improved evaluations of individual short stories, particularly for participants who were initially less creative. At the same time, AI-assisted stories became more similar to one another. The authors therefore identify a tension between improving individual creative performance and reducing collective diversity.

Although this experiment involved adults rather than primary students, it raises an important educational question:

If thirty students ask similar AI systems to solve the same creative task, will they explore thirty different directions—or converge around a smaller number of machine-suggested possibilities?

This is why students should normally develop their own initial ideas before seeing AI-generated alternatives.

Losing productive struggle

Creativity requires uncertainty. Children need opportunities to try something, discover that it does not work, make changes and try again. If AI removes every moment of difficulty, students may produce stronger products while practising less creativity.

A useful classroom principle is:

DO NOT REMOVE EVERY DIFFICULTY



DESIGN DIFFICULTY THAT STUDENTS CAN WORK THROUGH

Personal voice and ownership

Creativity is closely connected to identity. Children's stories, drawings, inventions and explanations often reflect their experiences and ways of seeing the world.

If an AI system repeatedly decides characters, vocabulary, visual style, solutions or structure, students may gradually become selectors of generated possibilities rather than authors of their own work.

The same concern appears in the Communication chapter of this Handbook, which emphasises that ready-made AI formulations may weaken opportunities for students to develop their own voice and independent expression.

Safety, privacy and responsible use

Creative use does not remove the ethical responsibilities surrounding AI. The European Commission's 2026 guidelines emphasise informed and context-sensitive decisions, data protection, AI literacy and compliance with frameworks such as the AI Act and GDPR.

For primary-aged children, age appropriateness is particularly important. Teachers and schools should determine which tools can legally and safely be used, under what level of supervision, and whether children should interact with them directly at all.

UNESCO's human-centred approach similarly places human agency and ethical responsibility at the centre of AI-supported education.

5.4.5. Educational implications for fostering Creativity in AI-supported learning environments

The educational goal should not be to maximise the use of AI in creative tasks, but to ensure that students continue to generate, explore, develop and justify their own ideas. Teachers should therefore pay attention not only to the final product, but also to the creative process behind it.

Student first, AI second

Whenever possible, students should begin a creative task by producing their own ideas before consulting AI. This protects independent imagination and prevents the first AI-generated response from setting the limits of the activity.

AI can then be introduced as a source of alternatives, questions or feedback. Students should compare these suggestions with their own ideas and decide what to keep, reject, combine or change.

A useful classroom principle is: "**Students should contribute the first ideas and remain responsible for the final creative decisions.**". This allows teachers to distinguish between simply using AI-generated content and genuinely developing creativity with AI support.

Encourage multiple possibilities

Creativity develops when students are given room to explore more than one possible answer. Instead of asking: "*Find the solution*" teachers might ask: "*Can you think of three different solutions?*". Students can later compare their proposals, evaluate their strengths and weaknesses and choose which one they want to develop further.

This combination of generating and evaluating ideas is consistent with the OECD framework for creative thinking and with EntreComp's emphasis on experimentation and alternative approaches (OECD, 2024).

Ask students to transform AI outputs

Simply selecting one AI-generated idea requires limited creative effort. Stronger activities require students to modify and personalise what AI provides.
For example, students might:

- combine elements from different proposals;
- change the perspective or audience;
- improve a weakness in an AI suggestion;
- adapt an idea to new conditions;
- add something based on their own experience.

The important question is not whether AI contributed, but whether the student developed the idea further.

Make the creative process visible

Assessment should include evidence of how an idea developed, not only the final story, drawing, design or presentation.

Teachers can use sketches, alternative versions, rejected ideas, short reflection notes or brief explanations of why students made particular choices.

A polished AI-assisted product should therefore not automatically be considered more creative than a simpler product showing greater originality, experimentation and independent thinking.

Maintain AI-free creativity

Not every creative activity needs AI. Students should continue to draw, build, write stories, improvise, brainstorm, experiment with physical materials and solve problems independently.

AI-supported activities should complement these experiences rather than replace imagination, play, collaboration and trial and error.

Human interaction should also remain central. Group brainstorming, peer feedback, storytelling, collaborative design challenges and discussion expose students to different perspectives and help them develop ideas together.

Adapt AI use to students' age

AI-supported creativity should be adapted to developmental readiness.

- For ages **6–7**, activities should generally be teacher-led, for example improving an AI-generated image or idea together as a class.
- For ages **8–10**, students can compare their own ideas with selected AI alternatives and collaboratively adapt them.
- For ages **11–12**, students can take greater responsibility when using approved AI tools, while explaining how AI contributed and what they changed themselves.

The European Commission emphasises that AI use should always be evaluated according to the educational context, learners' needs and potential risks rather than treated as automatically beneficial or harmful.

Develop creative AI literacy

Students should gradually understand that AI generates content from patterns in existing data. It can suggest possibilities, but it cannot decide whether an idea is meaningful, appropriate or valuable for the learner.

Teachers can encourage reflection through questions such as:

- *What part of this idea came from you?*
- *What did AI contribute?*
- *What did you change?*
- *Why did you make that change?*
- *What personal element could you add?*
- *Does the final result still reflect your own idea?*

UNESCO's AI Competency Framework similarly promotes learners as informed and responsible creators rather than passive consumers of AI-generated content (Miao, Shiohira, & Lao, 2024).

The role of the teacher

AI does not make the teacher less important in creative learning. Instead, teachers increasingly need to decide when AI should enter a task and which parts of the creative process should remain with the student.

This means creating opportunities for independent imagination, encouraging experimentation, monitoring over-reliance and asking students to explain their choices.

OECD evidence also highlights the importance of classroom environments in which teachers encourage original responses and alternative solutions (OECD, 2024).

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5.5. Communication

5.5.1. Definition and educational relevance

Communication is the ability to express ideas, information, needs, and perspectives clearly and appropriately, while also understanding and responding to others. It includes not only speaking and writing but also listening, interpreting meaning, asking questions, adapting messages to different audiences and contexts, and participating constructively in dialogue.



In education, communication is a fundamental part of learning. Students use communication to explain what they understand, ask for clarification, discuss different viewpoints, collaborate with peers, present arguments, give and receive feedback, and reflect on their own thinking. Communication is therefore not only a social skill; it also supports cognitive development, participation and independent learning.

Strong communication skills allow students to move beyond simply providing an answer. They help students explain how they reached a conclusion, justify an opinion, express uncertainty, listen to alternative perspectives and adjust their message when something has not been understood. Through these processes, students learn how to organise their thoughts, make meaning visible and engage effectively with others.

Communication also has an important interpersonal dimension. Effective communication requires students to listen actively, recognise the perspectives of others, respond appropriately and manage misunderstandings. These abilities are especially important in collaborative learning environments, where knowledge is developed through interaction rather than individual work alone.

Within the BrAIn project, Communication is particularly relevant because students are increasingly exposed to AI tools outside the classroom. These tools can generate, reformulate, translate, or complete written and spoken content. As a result, they may influence how students formulate ideas, express themselves, and engage in communication when they return to the classroom.

The central educational concern is not simply whether students use AI, but whether frequent reliance on AI reduces opportunities to practise communication independently. If students become accustomed to receiving ready-made formulations, they may have fewer opportunities to search for their own words, structure ideas, explain reasoning or respond spontaneously. In this sense, the apparent quality of a final text or answer may not always reflect the student's actual communication competence.

For this reason, communication should be understood as a human capability that needs regular practice. Developing communication means learning how to formulate one's own ideas, listen and respond to others, adapt language to context, express a personal viewpoint and take responsibility for the meaning of a message.

From an educational perspective, **fostering Communication** therefore means creating regular opportunities for students to explain ideas in their own words, engage in dialogue, listen actively, ask questions, present arguments, collaborate with others and communicate without relying on AI-generated formulations. The **objective** is to ensure that students remain confident and capable communicators in an environment where technology can increasingly perform parts of the communication process for them.

5.5.2. Development of Communication through the use of AI

The growing use of artificial intelligence is changing the way students communicate. Young people increasingly encounter AI tools when writing messages, preparing schoolwork, translating texts, searching for information, generating ideas or reformulating content. Although these tools can make communication faster and more convenient, they can also influence how students develop their own communication abilities.

Students learn to communicate by searching for the right words, organizing their ideas, explaining something when it is not immediately understood, listening to others, adapting their message, and responding to different viewpoints. These processes require effort, reflection, and interaction. When parts of this process are repeatedly delegated to AI, students may have fewer opportunities to practice these skills independently.

The impact may become visible in the classroom even when AI is not used during lessons. For example, a student who frequently relies on AI to formulate written responses outside school may become accustomed to receiving complete, well-structured formulations without going through the process of constructing them independently. In classroom discussions, presentations, or spontaneous tasks, the student may then find it more difficult to explain ideas in their own words, organize thoughts clearly, or respond without external support.

A similar effect may appear in written communication. If students regularly use AI to rewrite or generate texts, they may become less confident in developing their own sentence structure, vocabulary, and personal style.

AI use may also affect interpersonal communication. Human communication requires more than producing correct sentences. It involves listening, interpreting tone and emotion, recognising misunderstandings, responding to other people's reactions and adjusting communication in real time. These abilities develop mainly through direct interaction with other people. If students increasingly replace parts of human interaction with AI-mediated communication, opportunities to practise empathy, active listening, negotiation and spontaneous dialogue may decrease.

Another important aspect is the development of students' own voice. Communication is closely connected to identity and self-expression. Through speaking and writing, students learn how to express opinions, formulate personal perspectives and communicate uncertainty or disagreement. Frequent dependence on AI-generated wording may lead students to adopt language that sounds appropriate or polished but does not fully reflect their own thinking or way of expressing themselves.

For this reason, the development of communication in an AI-influenced environment requires attention to the process of communication, not only to the final result. Teachers need to observe whether students can independently explain their ideas, participate in dialogue, listen and respond, adapt their communication and express themselves without relying on AI-generated formulations.



The BrAIn project therefore approaches communication as a human skill that needs to be deliberately maintained and strengthened in an environment where AI can increasingly perform communication-related tasks. The objective is not to teach students to communicate through AI, but to ensure that their exposure to AI does not reduce their ability to communicate independently, authentically and effectively with other people.

5.5.3. Potentials of AI for strengthening Communication skills



AI is increasingly influencing how students prepare and express communication outside the classroom. Students may use AI to generate texts, rewrite messages, translate content, prepare presentations, or organize ideas.

While this can make communication faster and easier, frequent reliance on AI may reduce opportunities for students to practice important communication processes independently. These include choosing their own words, structuring ideas, explaining reasoning, responding spontaneously, and developing a personal voice.

The impact may also become visible in the classroom. A student may be able to produce a polished written text with AI support but still find it difficult to explain the same idea independently, participate in discussion, or respond to questions without assistance.

Communication, therefore, develops through active practice, not only through producing a good final result. Students need regular opportunities to speak, write, listen, explain and interact with others using their own abilities.

5.5.4. Risks and challenges for the development of Communication

The growing use of AI can create important challenges for the development of students' Communication skills. The main concern is not the existence of AI itself, but the possibility that students increasingly delegate parts of the communication process to AI and therefore practise these abilities less often.

Potential risks and challenges include:	
Reduced independent expression	If students regularly use AI to generate or reformulate texts, they may have fewer opportunities to practise expressing ideas in their own words.
Loss of personal voice	AI-generated language can sound polished and appropriate, but frequent dependence on it may make students less confident in developing their own style, tone and way of expressing opinions.
Weaker spontaneous communication	Students who are used to receiving AI-supported formulations may find it more difficult to respond immediately during classroom discussions, presentations or conversations.
Reduced active listening and interaction	Communication is not only about producing messages. It also requires listening, interpreting what others mean, responding appropriately and adapting to the flow of a conversation. These abilities develop mainly through human interaction.
Over-reliance on ready-made answers	When AI provides complete formulations, students may skip important steps such as organising their thoughts, deciding what information is relevant and considering how best to communicate it.

Potential risks and challenges include:	
Difficulty explaining ideas independently	A student may submit a strong written product with AI support but struggle to explain the same content verbally or answer follow-up questions. This can create a gap between the quality of the final product and the student's actual communication competence.
Limited development of vocabulary and language skills	If AI repeatedly selects vocabulary and sentence structures for students, opportunities to experiment with language and build confidence in independent expression may decrease.
Reduced ability to adapt communication to real situations	Real communication requires students to consider context, relationships, emotions and the reactions of other people. AI-generated communication may not always reflect these human and situational elements accurately.
Less practice in managing disagreement and misunderstanding	Students develop Communication by negotiating meaning, clarifying misunderstandings, defending their views respectfully and responding to different perspectives. These skills cannot be fully developed through automated interaction.
Difficulty distinguishing their own ideas from AI-generated content	Frequent use of AI can make it less clear where the student's own thinking ends and externally generated formulation begins. This may affect both communication competence and ownership of learning.
Overestimating communication ability	A well-written text or presentation does not necessarily mean that the student has developed strong Communication skills. Teachers may therefore need to consider the process behind the final product, not only its quality.

5.5.5. Educational implications for fostering Communication in AI-supported learning environments

To strengthen Communication in an AI-influenced environment, teachers need to provide regular opportunities for students to practice expressing, explaining, and discussing ideas independently. The focus should remain on the communication process, not only on the quality of the final product.

Teachers can ask students not only for an answer, but also to explain how they reached it. This strengthens both communication and independent thinking.



Useful educational approaches include:	
Prioritising students' own expression	Students should regularly formulate ideas in their own words before relying on external support. Short oral explanations, handwritten responses and spontaneous classroom discussions can help teachers observe students' actual communication abilities.
Creating more opportunities for dialogue	Pair work, group discussions, debates and peer feedback help students practise listening, responding, negotiating meaning and adapting their communication to others.
Encouraging explanation of reasoning	Teachers can ask students not only for an answer, but also to explain how they reached it. This strengthens both communication and independent thinking.

Useful educational approaches include:	
Supporting personal voice	Students should be encouraged to express opinions, experiences and perspectives in their own style. Teachers can emphasise that communication does not need to sound perfect to be meaningful and effective.
Using oral and written communication together	Asking students to explain written work orally, answer follow-up questions or present key ideas can help reveal whether they understand and can communicate the content independently.
Practising active listening	Classroom activities should require students to listen to others, summarize what they have heard, ask relevant questions and respond constructively.
Focusing on the communication process	Assessment should consider how students develop and communicate ideas, not only the polished final text or presentation.
Discussing the influence of AI openly	Teachers can help students reflect on how AI may affect the way they write, speak, and express ideas and why continued independent practice remains important.
Encouraging communication without digital support	Regular tasks where students communicate without AI or other automated assistance can help maintain confidence, spontaneity and independence.

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6. Practical Section

6.1. Critical Thinking

6.1.1. Lesson plans



Lesson plan 1: Ask, Check, Decide

Age group: 6–8 years old.
Duration: Approximately 30–40 minutes.
Subjects: Science, Environmental Studies, Language, Social Studies or cross-curricular learning.
Main focus: Questioning information before accepting it.

Learning Objectives

By the end of the lesson, students will be able to:

- give their own idea before hearing an AI-generated response;
- compare an AI-generated answer with a reliable source;
- identify information that may need to be checked;
- explain why checking information is important.

Materials Needed

- A simple factual question related to the current topic
- A teacher-approved AI tool or a pre-prepared AI-generated response
- A reliable classroom source such as a textbook, picture book or educational resource

Teacher Preparation

Before the lesson, select a question that students can reasonably think about using their existing knowledge.
For example: *"Why do some animals sleep for long periods during winter?"*

Generate or prepare an AI response in advance and check the response yourself.
Choose a reliable source containing age-appropriate information about the same topic.

The AI response does not need to contain an obvious error. A response that is broadly correct but incomplete can be even more useful because it encourages students to look carefully rather than simply hunt for mistakes.

Lesson Procedure:

Step 1 – THINK

Ask the class the selected question.
"Why do some animals sleep for long periods during winter?"
Give students approximately one minute to think independently.
Ask:
"What do you think?"
"What do you already know?"
Invite several students to share their ideas.
At this stage, do not immediately confirm which answers are correct or incorrect.
The purpose is to make students' existing thinking visible before AI enters the activity.



Step 2 – ASK

Tell students:
"Now we are going to see what AI says about the same question."
Display the AI-generated answer or read the pre-prepared response aloud.
For example:
"AI says that some animals sleep for long periods in winter because food becomes harder to find and sleeping helps them save energy."
Ask:
"Does that sound convincing?"
Do not confirm whether the response is correct yet.



Step 3 – CHECK

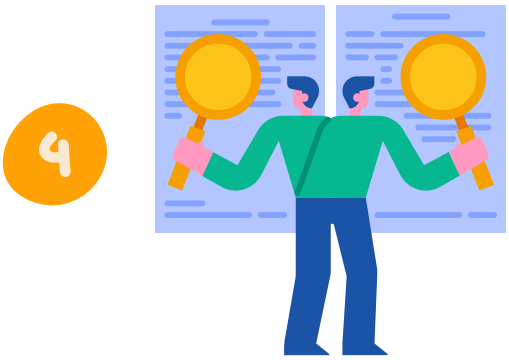
Ask:
"How could we check?"
Allow students to suggest possible sources.
Then use the reliable classroom source selected before the lesson.
Read the relevant section together.
Ask:
"What does our source tell us?"
"Does it support everything AI said?"
"Is there anything we still do not know?"

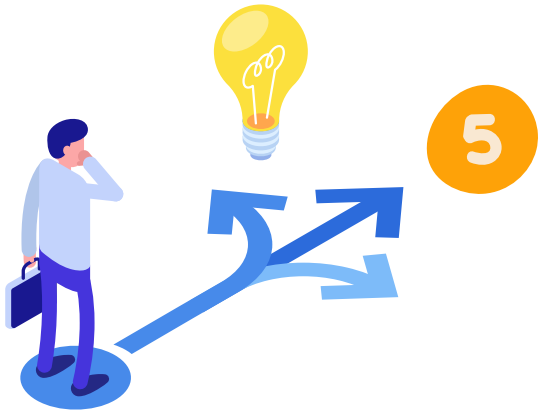


Introduce the useful critical-thinking response:
"We are not sure yet so we need to check."
Students should understand that "not sure yet" is a valid answer when evidence is insufficient.

Step 4 – COMPARE

Create three simple columns on the board:
Our First IdeasAI's AnswerWhat We Checked
Compare the information together.
Ask:
"What is the same?"
"What is different?"
"What did AI explain well?"
"Did our first ideas include something AI did not mention?"
The purpose is not to decide whether humans or AI are "better". The purpose is to examine information from more than one perspective.





Step 5 – DECIDE

Ask the class:
"What do we think now?"
Develop a final answer together using the evidence available.
Then ask:
"Did anyone change their first idea?"
"Why?"
"What helped you decide?"
Changing an initial opinion should be presented positively when it is based on better evidence.

Closing Reflection

Ask:
"Was AI's answer completely right, completely wrong, or somewhere in between?"
"How did we find out?"
"Why did we THINK before asking AI?"
"Why did we CHECK?"
Finish with:
"AI can give us an answer. We still need to think about the answer."

Lesson plan 2: Fact or AI Guess?

Age group: 9–12 years old
Duration: Approximately 45–60 minutes
Subjects: Science, Geography, History, Social Studies, Language or cross-curricular learning
Main focus: Evidence, source comparison and justified judgement

Learning Objectives

By the end of the lesson, students will be able to:

1. formulate their own answer before consulting AI;
2. identify key claims in an AI-generated response;
3. check those claims against a reliable source;
4. identify similarities, differences and missing information;
5. produce a final answer in their own words;
6. justify why they consider particular information reliable.

Materials Needed

- Student worksheet.
- Teacher-approved AI tool or pre-prepared AI response.
- Textbook, encyclopaedia or teacher-approved educational website.
- Pens/highlighters.

Teacher Preparation

Choose a curriculum-related question for which students already have some background knowledge. For example: *"Why do leaves change colour in autumn?"*

Select a reliable source beforehand. If students will interact directly with an AI tool, ensure that its use complies with school requirements and that students understand that they should not enter personal or sensitive information.

Lesson Procedure:

Step 1 – THINK

Give students the question.
Before AI is used, students write their own short answer.
Ask them also to indicate:
How confident are you?
They can select:
Very confident / Quite confident / Not sure yet
The purpose is not to grade prior knowledge. It is to make students aware of their own starting point.

Step 2 – ASK

Students consult the teacher-approved AI tool in pairs, or the teacher distributes a pre-prepared AI response.
Instead of copying the response word for word, students identify and record its main points.
Ask:
"What are the main claims AI is making?"
This keeps students actively engaged with the content.



Step 3 – CHECK

Students use the selected reliable source.
They identify information that:
supports the AI response;
contradicts the AI response;
or
adds something the AI response did not mention.
Teachers can remind students:
Checking is not the same as looking for a mistake. We are looking for evidence.



Step 4 – COMPARE

Students complete a comparison table:

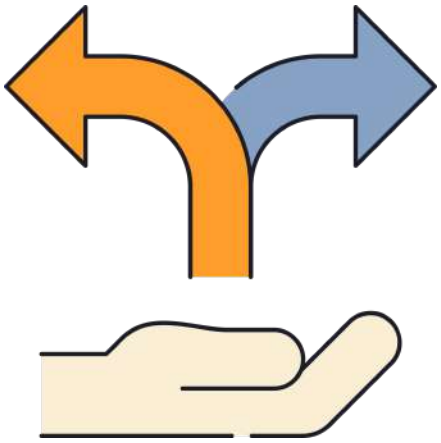
My First Idea	AI's Main Points	What the Reliable Source Says
What did I think first?	What did AI suggest?	What evidence did I find?

Then answer:
What is similar?
What is different?
What is missing?
Which claims are supported by evidence?
Is there anything we still need to check?



Step 5 – DECIDE

Students write a final answer in their own words.
They then complete:
"I trust this answer because..."
and:
"My thinking changed / did not change because..."
Students should be encouraged to explain their judgement using evidence rather than simply saying that the textbook or AI is "right".



Closing Reflection

Finish with a short whole-class discussion:

- Did the AI answer match the reliable source completely, partly, or not at all?
- Did you change any part of your first answer after checking the evidence?
- What did you do when the sources were different?
- Why is it important to check information before deciding what to believe?

End with the key message:
AI can provide an answer, but the final judgement belongs to the student.

6.1.2. Classroom activities

Activity 1: True, False, or Not Sure Yet?

Age group: 6–10 years old
Duration: 10–15 minutes

The teacher prepares three or four short statements related to the current topic. Some statements are accurate, while others are inaccurate or incomplete. They may be generated with an approved AI tool in advance or prepared by the teacher.

Students decide whether each statement is:
TRUE – FALSE – NOT SURE YET

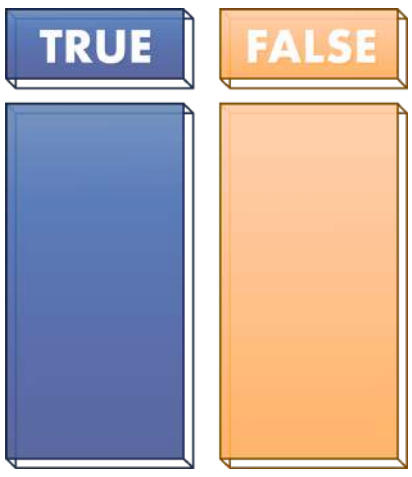
For each choice, students give a reason. When the answer is "Not Sure Yet", the class checks the information using a reliable source.

Useful teacher questions include:
"How do you know?"
"What evidence do we have?"
"How could we check?"

End by asking whether anyone changed their answer after checking the evidence.

Teacher Tip: Avoid obviously false statements. Plausible but inaccurate or incomplete statements encourage students to look more carefully.

Key Message:
Being unsure is not a problem. Critical thinkers know when they need more evidence.



Activity 2: My Idea vs AI's Idea

Age group: 8–12 years old
Duration: 15 minutes

The teacher asks an open-ended question with more than one reasonable answer, for example: *"What is the most important rule for working well in a team?"*

Students first give their own answer and a reason. The teacher then presents an AI-generated response to the same question.

In pairs, students compare the two answers:
"What is similar?"
"What is different?"
"Did AI include something you had not considered?"
"Did AI miss something important?"
"Which ideas are better supported, and why?"

Students then decide whether to keep, change or combine their original answer and briefly explain their decision.

Teacher Tip: The aim is not to decide whether the student or AI "wins". Students should evaluate the quality of the ideas and reasoning.

Key Message: AI can suggest an idea, but the student evaluates and decides.



6.1.3. Teaching strategies for Critical Thinking with AI

The strategies below are not tied to a single lesson. They can be used across different subjects to help students develop consistent habits of questioning, checking and evaluating AI-generated information.

Strategy	How to Use It
Think first, then use AI	Ask students to form their own idea, prediction or answer before consulting AI, so that independent thinking remains part of the learning process.
Keep tasks open-ended	Use questions that require explanation, comparison or judgement rather than only one short factual answer.
Make checking a routine	Regularly ask: “Is this accurate?”, “What is the evidence?”, “How could we check?” and “Is anything missing?”
Normalise “Not sure yet”	Encourage students to recognise when they do not have enough evidence and need to check before deciding.
Value the process, not just the answer	Ask students to explain how they reached a conclusion, not only what their final answer is.
Compare before deciding	Encourage students to compare their own ideas, AI-generated information and reliable sources before making a
Build in reflection	End activities by asking what AI contributed, what students worked out independently and whether their thinking
Adjust independence by age	Use oral and teacher-led activities with younger students and more independent source-checking and written justification with older students.
Keep human interaction central	Use discussion, peer explanation and collaborative reasoning alongside AI-supported activities.

Teachers do not need to introduce all these strategies at once. A simple starting point is to ask: ***"What do you think first?"***

Once students become familiar with thinking before consulting AI, teachers can gradually introduce checking, comparison, evidence and reflection.

Key Message for Teachers

The purpose is not to make students distrust AI, but to help them avoid accepting its answers automatically. AI can contribute information or ideas; students still need to question, check and decide.

6.1.4. Case Studies or Best Practices

From First Trust to First Questions: Evidence from BrAIn Classrooms

This case study draws on classroom implementation findings recorded during Work Package 2 of the BrAIn project, particularly evidence related to Critical Thinking in Türkiye and Bulgaria (BrAIn Project Consortium, 2026).

Starting Point

During the classroom implementations, students initially tended to accept AI-generated responses without sufficiently questioning their accuracy, completeness or possible bias. Students also tended to use AI for quick answers or idea generation without reflecting sufficiently on the reasoning behind the response.

This highlighted an important challenge: when AI provides an immediate and convincing answer, students may accept the information before considering whether it should be questioned or verified.

What Teachers Did

Teachers introduced structured opportunities for students to engage more critically with AI-generated information. These included:

- comparing information with other sources;
- fact-checking;
- identifying possible bias;
- discussing missing context;
- classroom debate;
- ethical discussion;
- guided reflection.

Instead of treating the AI-generated answer as the end of the task, teachers used it as a starting point for further questioning and discussion.

Evidence from Türkiye

In the Türkiye implementation, students questioned AI-generated responses, identified missing context and discussed stereotypes and bias.

Students also proposed strategies for verifying information and recognised the importance of thinking independently rather than immediately accepting an AI-generated response.

These experiences show how simple teacher prompts can shift attention from:
"What did AI say?" to: *"Should we accept what AI said, and how can we check?"*

Evidence from Bulgaria

In Bulgaria, students initially showed a tendency to accept AI-generated information at face value. Structured fact-checking and ethical discussions encouraged greater questioning, argumentation and evaluation of credibility.

Debates and dilemmas related to misinformation and the social impact of AI also created opportunities for students to explain and defend their judgements.

What This Case Suggests for Practice

The BrAIn classroom findings suggest that students benefit from structured opportunities to question AI-generated information rather than being expected to develop this habit automatically.

Teachers can support this by asking simple but consistent questions:

"How do we know?"
"What evidence supports this?"
"Is anything missing?"
"Could there be another perspective?"
"How could we check?"

These practices connect directly with the BrAIn Critical Thinking Routine:

THINK → ASK → CHECK → COMPARE → DECIDE

The aim is not to teach students that AI is always wrong. It is to help them understand that an AI-generated answer, like information from other sources, may need to be questioned, compared and verified before it is accepted.

Key Message for Teachers

An AI-generated answer can become a critical-thinking opportunity when students are asked to question it, check it against evidence and make their own final judgement.

6.1.5. References

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6.2. Ethical Judgement

6.2.1. Lesson plans

A central question when teaching with AI:
When should we allow AI to contribute to a decision – and when should humans remain in control?

The activity explores the ethical questions that arise when artificial intelligence is used not simply to provide information, but to influence decisions about people. The focus is therefore not primarily on how AI works technically, but on how students can reason about responsibility, fairness, transparency and human agency when AI becomes part of a decision-making process.

A central principle of the activity is that students should experience ethical judgement as a process rather than as the search for one correct answer. They are expected to identify competing considerations, examine the issue from different perspectives, justify their position and remain open to revising it when new information becomes available.

Target group: Primary and lower-secondary education.
The complexity of the case, stakeholder perspectives, terminology and expected level of argumentation can be adapted to students' age. Younger students may work with a small number of clearly defined stakeholders and familiar concepts such as fairness, choice and responsibility. Older students can work with more complex issues such as transparency, bias, privacy, accountability and the relationship between automated recommendations and professional judgement.

Duration Approximately 90 minutes.

The activity can also be divided into two shorter sessions. If more time is available, the stakeholder analysis, AI dialogue and critical-friend phase can be expanded.

Learning objectives
Students should be able to:

- *identify ethical dimensions of an AI-supported decision;*
- *distinguish between technical capability and ethical acceptability;*
- *identify stakeholders affected directly or indirectly by an AI system;*
- *recognise competing values, interests and rights;*

- *consider both intended and unintended consequences;*
- *consider short- and long-term consequences;*
- *make and justify an ethical judgement;*
- *listen and respond to alternative perspectives;*
- *recognise uncertainty and limitations in available information;*
- *reconsider their initial judgement when presented with new information;*
- *critically evaluate suggestions generated by AI;*
- *propose safeguards or changes that could make an AI-supported decision more responsible.*

The activity particularly develops students' ability to move from an immediate personal reaction towards a more considered ethical judgement. The quality of the learning should therefore be evaluated through the development of the students' reasoning rather than through whether they arrive at a particular conclusion.

Preparation

The teacher selects an age-appropriate case involving an AI-supported decision. The case should deliberately contain competing considerations rather than presenting students with an obvious right or wrong answer.
For example:
A school introduces an AI system that analyses students' previous assignments, test results and learning behaviour. The system recommends which students should receive additional support and which students should be offered advanced learning activities. Teachers can see the recommendation but do not know exactly how the AI reached it.

The system may make support more efficient and identify students who might otherwise be overlooked. However, previous student performance may not tell the whole story, some students may be categorised incorrectly, and neither students nor teachers can fully explain the recommendation.

The dilemma therefore contains several tensions:

efficiency ↔ fairness
personalisation ↔ privacy
automation ↔ professional judgement
prediction ↔ opportunity
consistency ↔ individual circumstances

The teacher should avoid explaining all these tensions before the activity. Discovering and articulating them is an important part of the students' ethical work. If the teacher identifies the ethical problems in advance, students risk simply reproducing the teacher's analysis rather than developing their own.

The teacher should avoid explaining all these tensions before the activity. Discovering and articulating them is an important part of the students' ethical work. If the teacher identifies the ethical problems in advance, students risk simply reproducing the teacher's analysis rather than developing their own.
The teacher's role is instead to support the students through questions such as: Who might be affected? What information are we missing? Who benefits? Who carries the risk? Who should be responsible if the system makes a mistake?

1 Make your own judgement

Before discussing the case with others or consulting AI, students individually answer:

Should the school use the AI system?

They choose:

Yes / No / Only under certain conditions



Students briefly explain why they made their choice.

The purpose is not to evaluate whether their first answer is correct. Instead, the response creates a baseline that students can return to later. This makes their own reasoning process visible.

An initial judgement may, for example, focus primarily on efficiency: The school should use the system because it can help teachers identify students who need support. Later, the student may recognise questions concerning privacy, incorrect categorisation or responsibility.

Ethical learning can therefore become visible not only through a change of opinion but through a change in the complexity and quality of the reasoning behind the opinion.

2 Identify the dilemma

Students work in small groups and begin with a deliberately open question:

What is the problem?

The teacher should resist immediately introducing concepts such as privacy, bias, fairness and transparency. Students first describe the problem in their own words and identify what they themselves consider important.



They then consider two questions:

What can the AI system do?
What should the AI system be allowed to do?

The distinction introduces an important principle:

- *Technological capability does not determine ethical acceptability.*
- *Something may be technically possible, efficient or accurate without necessarily being desirable or ethically acceptable.*

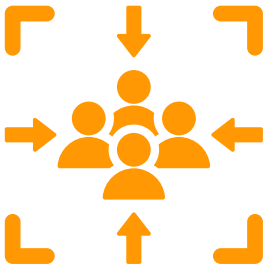
Groups formulate one or more ethical questions contained in the case, for example:

- *Is it fair to judge students on the basis of their previous performance?*
- *Should students have a right to know why they received a particular recommendation?*
- *Should a teacher be allowed to overrule the AI?*
- *Who is responsible if an AI recommendation disadvantages a student?*

This transformation from problem to ethical question is important. Students move from describing what the technology does to examining what ought to happen.

3 Stakeholder mapping

Each group identifies people who might be affected by the decision.
These could include:



- *students receiving additional support;*
- *students not receiving support;*
- *students offered advanced activities;*
- *teachers;*
- *parents;*
- *school leaders;*
- *developers of the AI system.*

Students create a simple stakeholder map.
For each stakeholder, they consider:

What could they gain?
What could they lose?
What might they be concerned about?
How much influence do they have over the decision?
Who carries the consequences if the AI is wrong?

This step deliberately moves ethical judgement beyond the student's immediate perspective. A decision that appears beneficial from the school's perspective may look very different from the perspective of a student who has been incorrectly categorised.

Students may also discover that benefits and risks are not necessarily distributed equally. One stakeholder may receive most of the benefits while another carries most of the risks. This introduces questions of fairness and responsibility without requiring the teacher to provide a predetermined ethical conclusion.

4 Investigate the values

Students identify the values involved in the case.
Possible values include:



fairness – privacy – safety – efficiency – autonomy – transparency – equality – responsibility – opportunity – trust

Groups select the two or three values they consider most important and explain why.

They then discuss whether these values point towards the same solution. Usually, they will not.

That tension is central to the activity. Ethical dilemmas often arise not because one side represents something good and the other something bad, but because several desirable values cannot all be maximised at the same time.

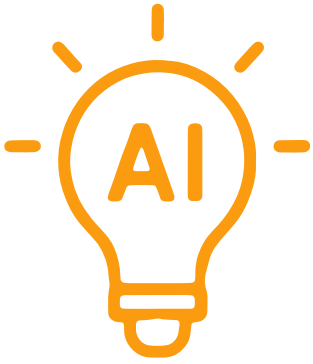
For example, collecting more information about students may improve personalisation while reducing privacy. Allowing an algorithm to apply the same criteria to everyone may increase consistency while reducing the possibility of considering individual circumstances.

Students therefore have to consider not only which values matter, but also how competing values should be balanced.

5 Introduce AI as a critical partner

Only after students have developed their own analysis do they consult a generative AI system.

This sequencing is important. If AI is introduced at the beginning, students may adopt its framing of the problem before they have developed their own questions and perspectives. By introducing AI later, students have something against which they can evaluate the AI response.



They can ask AI to:

- *identify stakeholders they may have overlooked;*
- *suggest arguments for and against using the system;*
- *identify possible short- and long-term consequences;*
- *argue from a particular stakeholder perspective;*
- *identify weaknesses in the group's reasoning;*
- *challenge the group's current position;*
- *suggest safeguards that could reduce identified risks.*

Students compare the AI response with their own analysis and categorise its contributions:

Something AI added
Something we already considered
Something we disagree with
Something AI overlooked

Students should be encouraged to question the AI response rather than treating it as authoritative. Does the response assume that certain values are more important than others? Does it represent all stakeholders equally? Are its suggested consequences realistic? What information would be needed to verify its claims?

AI therefore functions as a sparring partner, not as an ethical authority or decision-maker. The students remain responsible for evaluating arguments and reaching their own judgement.

6 Make the ethical judgement

Groups now return to the central question:

Should the AI system be used?

At this stage, a simple yes or no is insufficient. Students must formulate the conditions under which they believe the system's use would be ethically acceptable.

For example:
The school may use the system to provide recommendations, but AI should not make the final decision. Teachers must be able to override recommendations, students should be informed about the data used, and students should be able to challenge a decision.

Students should support their judgement by explaining:

- *which stakeholders they have considered;*
- *which values they have prioritised;*
- *which consequences influenced their decision;*
- *which risks they believe require safeguards;*
- *who should remain responsible for the final decision.*

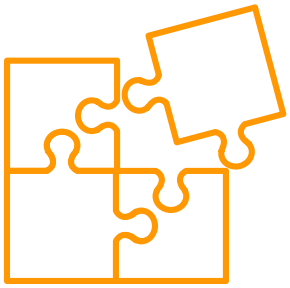
This moves students from simply evaluating technology towards designing conditions for responsible use.
The question is no longer only Should we use AI? It becomes: How could this technology be used in a way that protects the people affected by it?

7 Challenge the judgement

Another group receives the proposed decision and acts as a critical friend.

They identify:

- *one strength in the proposed solution;*
- *one possible unintended consequence;*
- *one stakeholder who may still be disadvantaged;*
- *one assumption that should be questioned;*
- *one question the group has not yet answered.*



The original group then decides whether its judgement should be revised.
The purpose is not to defeat another group's argument. Instead, students experience ethical judgement as something that should be capable of responding to criticism and new perspectives.

A strong ethical judgement is therefore not necessarily one that remains unchanged. It is one that can explain why particular arguments have been accepted, rejected or given greater weight.

8 Return to the first judgement

Students return to their individual answer from Phase 1.
They complete:



My first judgement was...
My judgement now is...
The most important thing that changed or strengthened my reasoning was...
A perspective I had not considered at the beginning was...
One question I still have is...

Students can then compare their first and final reasoning.
A changed opinion is not automatically evidence of learning. Likewise, maintaining the original position is not evidence of a lack of learning.
The important question is whether the student's reasoning has become more developed.

A student may begin and end with the position that the school should use the AI system, but initially justify this because AI can analyse many students quickly. After the activity, the student may still support its use but only if teachers retain final responsibility, students can challenge decisions and the system's recommendations are regularly evaluated for unfair outcomes.

The conclusion has remained similar, but the ethical reasoning has become substantially more sophisticated.

Teacher perspective and assessment

The teacher should primarily assess the quality of the reasoning process, not the position students ultimately take.

Signs of developing ethical judgement may include that students:



- *move beyond their own immediate perspective;*
- *recognise that several stakeholders may be affected differently;*
- *distinguish between what technology can do and what it should do;*
- *identify tensions between legitimate values;*
- *consider unintended and longer-term consequences;*
- *recognise uncertainty or missing information;*
- *respond meaningfully to counterarguments;*
- *suggest safeguards rather than relying on simple acceptance or rejection;*
- *explain why human oversight or responsibility is necessary in particular parts of the decision-making process.*

The activity therefore makes ethical judgement observable as a competence. Students are not merely asked whether AI is good or bad. They practise analysing a situation in which technology, people, values and consequences interact.

The central educational outcome is the development of students' ability to make informed, reasoned and revisable judgements about AI-supported decisions. This also reinforces a broader principle of AI literacy: AI can contribute information, perspectives and recommendations, but responsibility for ethical judgement cannot simply be delegated to the technology.

6.2.2. Classroom activities

Activity 1: The Ethical AI Detective

Purpose: Students investigate AI situations by searching for ethical issues rather than being told in advance what the problem is.

The activity develops the first parts of the progression:

Identify → Analyse → Consider perspectives

Duration: 30–45 minutes.

Preparation

Prepare four to six short AI cases.

For example:

Case A: A student uploads a photograph of classmates to an AI tool and asks it to create a funny picture.

Case B: A teacher uses AI to provide initial feedback on student assignments.

Case C: An AI system recommends videos based on everything a child previously watched.

Case D: A company uses AI to select candidates for job interviews.

Case E: Students use generative AI to improve the language of an assignment.

The cases should contain different degrees of ethical complexity. Avoid making every case obviously problematic.

The investigation

Students become Ethical AI Detectives.

For each case, they investigate four lenses:

- *PRIVACY: What information is being collected or shared?*
- *FAIRNESS: Could people be treated differently or disadvantaged?*
- *TRANSPARENCY: Do people understand how or why the AI produced its result?*
- *RESPONSIBILITY: Who is responsible for what happens?*
- *Students should not merely tick boxes. They must identify evidence from the case.*

They then add a fifth category:

- *MISSING INFORMATION: What would they need to know before they could make a responsible judgement?*

This is important because ethical judgement also involves recognising when there is insufficient information to decide.

Ethical risk line

Groups place the cases on a continuum:

Low concern ←——————————→ High concern

They must explain their placement.

Different groups will probably rank some cases differently. These disagreements become material for classroom discussion.

The teacher asks:

Why did the same information lead to different judgements?

This allows students to recognise that ethical disagreement can arise because people prioritise different values rather than because one person has simply misunderstood the case.

Extension

Allow students to modify one condition in a case.
For example:

What if the photograph were uploaded with everyone's permission?
What if the teacher checked every AI-generated feedback message?

Students then decide whether the ethical judgement changes.
The activity therefore progresses from identifying ethical problems to understanding which conditions affect ethical acceptability.

Activity 2: Who Should Decide?

Purpose: Students investigate the relationship between AI advice and human decision-making and make their ethical reasoning physically and socially visible.

Duration: 30–45 minutes.

Preparation: Place three signs in different areas of the classroom

AI SHOULD DECIDE
HUMAN SHOULD DECIDE
AI AND HUMAN SHOULD DECIDE TOGETHER

Present a series of situations.
For example:

- *choosing which film to recommend;*
- *correcting spelling;*
- *evaluating a school assignment;*
- *deciding who receives additional teaching support;*
- *selecting a candidate for a job interview;*
- *deciding whether content should be removed from social media;*
- *determining whether someone should receive medical treatment.*

Step 1 – Choose
Students physically position themselves according to their judgement.
They should initially make the choice without discussing it.

Step 2 – Justify
Ask students from different positions: *Why are you standing here?*

Students must give a reason rather than simply express a preference.

Step 3 – Challenge
Students may ask questions across positions.

The teacher can introduce additional information:
The AI is correct 95% of the time.
Does anyone move?
Nobody can explain how the AI reaches the decision.
Does anyone move?
A human always makes the final decision.
Does anyone move?
People can appeal against the decision.
Does anyone move?

The activity demonstrates that ethical judgement is conditional. A small change in transparency, accuracy, consequences or human control can legitimately change a judgement.

Step 4 – Meta-reflection

Finish by asking:

Which information made you change your position?
Which decisions were easiest?
Which were hardest?
Are there decisions AI should never make alone? Why?

The purpose is not to create a class consensus. The purpose is to make the reasoning behind different positions visible.

6.2.3. Teaching strategies for Ethical Judgement with AI

The findings suggest that ethical judgement is highly dependent on how learning situations are designed. It does not emerge reliably from ordinary interaction with AI. Teachers therefore need strategies that deliberately interrupt routine use and create occasions for judgement.

The comparative classroom data identifies several didactic conditions that make competences more visible: the sequencing of AI use, open rather than closed tasks, requirements for explanation and justification, deliberate teacher intervention, and comparison between students' own responses and AI-generated responses.
Five strategies are particularly relevant.

1. Create productive ethical friction

Not every problematic AI response should immediately be corrected by the teacher. When safe and appropriate, an unexpected, stereotypical, oversimplified or questionable response can become the starting point for investigation.

Use:

Encounter → Pause → Question → Discuss → Reconsider

The teacher might ask:

What made you react?
Where exactly is the problem?
Who could be affected?
Is the problem with the answer, the system, the way we used it – or several of these?

The comparative observations show that moments of surprise, disagreement and perceived AI bias can function as catalysts for critical thinking and ethical reflection.

2. Delay AI

Students should sometimes develop their own judgement before consulting AI.
A useful sequence is:

Human first → AI second → Comparison third

Students formulate their initial position, ask AI to analyse the same dilemma and then compare the two.
This prevents AI from defining the problem before students have had an opportunity to think independently.

The method also makes AI's influence visible. Students can ask:

Did AI introduce an important perspective?
Did it change our position?

Did we accept an argument because it was good – or because AI presented it confidently?

This reflects the broader WP2 principle of using AI as a scaffold rather than a substitute for human thinking.

3. Change one variable

Ethical reasoning becomes deeper when students discover what their judgement depends on.
Take the same dilemma and alter one condition:

AI decides → AI recommends
No explanation → explanation available
No appeal → possibility of appeal
Anonymous data → identifiable personal data
Low consequences → serious consequences

Students decide whether the change affects their judgement and explain why.
This helps students move beyond fixed statements such as "AI should never…" or "AI is fine if…" towards more nuanced conditional reasoning.

4. Make perspectives collide

Assign groups different stakeholders.
Instead of asking everyone:

"What is the ethical solution?"
ask:
"What might this situation look like from your stakeholder's perspective?"

Groups then negotiate a shared solution.
This forces students to recognise that responsible decisions may require balancing legitimate but competing interests.

The comparative BrAIn findings indicate that ethical judgement and communication become particularly visible in dialogic formats involving discussion, debate and collective negotiation.

5. Move from judgement to redesign

Ethical education should not end with students identifying what is wrong.
Ask:

"How could we make this use of AI more responsible?"

Students might propose:

- *human oversight;*
- *informed consent;*
- *transparency requirements;*
- *an appeal procedure;*
- *limits on data collection;*
- *independent verification;*
- *age restrictions;*
- *alternative non-AI options.*

Students thereby move from ethical criticism to responsible innovation.

This connects ethical judgement directly with problem-solving and creativity and reflects the WP2 progression from ethical reflection towards designing AI solutions that balance technological possibilities with responsibility.

6.2.4. Case Studies or Best Practices

One of the strongest practical findings from the BrAIn comparative analysis is that the most valuable ethical learning moments are not always planned in advance. Sometimes the AI creates the teaching opportunity.

Classroom observations showed that students reacted strongly when AI outputs appeared biased, simplified, factually inconsistent or otherwise conflicted with their expectations. In Danish observations in particular, perceived bias or inconsistency generated surprise, curiosity and immediate questioning of AI authority.
The important pedagogical finding is that surprise alone does not constitute learning.

The teacher's intervention determines whether the class simply dismisses the answer as “AI being wrong” or transforms the incident into ethical inquiry.



Step 1 – Stop

When a questionable output appears, pause normal task progression.
Do not immediately provide the interpretation.
Ask:

“What did you notice?”

Students first identify the issue themselves.



Step 2 – Make the reaction explicit

Students may initially respond emotionally:

“That's unfair.”
“That's weird.”
“AI can't say that.”

The teacher accepts the reaction as a starting point but moves towards reasoning:

“What exactly makes it unfair?”

This distinction is important.
Ethical intuition can initiate inquiry, but ethical judgement requires the student to articulate the basis of the judgement.



Step 3 – Investigate

The class investigates the output.
Questions can include:

What assumptions does the response appear to make?
Which people or perspectives are represented?
Who is missing?
Could the consequences differ between groups?

Step 4 – Introduce alternative perspectives

Students identify relevant stakeholders and explore how each might understand the situation.

AI can now be used to suggest additional perspectives, but students evaluate whether these representations are reasonable.
The important distinction remains:

AI generates perspectives; students evaluate them.

Step 5 – Make a judgement

Students decide:

Is the output ethically problematic?
Why?
How serious is the problem?
What should happen next?

Different groups may reach different conclusions.
The teacher evaluates the quality of their reasoning rather than whether they reproduce a predetermined answer.

Step 6 – Redesign

The activity should not finish with:

"AI was biased."
Students instead ask:
"What could we change?"

They might rewrite the prompt, propose rules for human oversight, identify data that should not be used, suggest an appeal process or create criteria for evaluating future outputs.
This transforms criticism into agency.

Step 7 – Generalise

Finally, students move beyond the specific example.
Ask:

"What have we learned from this case that we could use the next time we work with AI?"

Students formulate a general principle.
For example:

An AI recommendation should not be accepted simply because it sounds confident.
or:
If an AI decision affects people significantly, they should be able to understand and challenge it.

The class gradually develops a shared ethical code for AI use.
This connects directly with the teaching sequence, which contains both explicit work with ethical dilemmas and the subsequent development of an ethical code.

The best-practice model can therefore be summarised as:

Unexpected output → Reaction → Investigation → Perspectives → Judgement → Redesign → Principle

The important point is that the problematic AI output is not itself the learning activity.

The learning occurs through the pedagogically structured reflection that follows it.

6.2.5. References

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6.3. Problem Solving

6.3.1. Lesson plans

Lesson plan 1: From a task to a workable plan

Age group: 9–12 years
Duration: 45 minutes
Subjects: Any subject, using a topic recently studied
Materials: Paper, pencils and relevant classroom notes or textbooks
Problem-solving focus: Breaking a task into manageable steps, organising their order and checking that the task is complete

Learning objectives

By the end of the lesson, pupils should be able to:

- Break a larger task into specific actions.
- Recognise which actions depend on earlier steps.
- Follow a plan and adjust it when something is missing.
- Use a focused AI hint while remaining responsible for completing the task.

The task

The teacher presents:
"Each pair will prepare a four-question quiz about a topic recently studied. Another pair should be able to complete it without asking its creators for instructions. The quiz needs four questions, a separate answer key and short instructions explaining what to do. Before writing the quiz, plan the steps needed to make it ready."

The teacher selects a familiar topic, such as fractions, the water cycle or a book studied in class. Pupils use existing classroom materials, keeping the preparation manageable.

Lesson procedure

1. Understand the goal — 5 minutes
Pairs discuss what needs to be ready before another pair can use their quiz.
The teacher records three requirements:

- Four questions connected to the chosen topic.
- A separate answer key for checking responses.
- Instructions explaining how to complete the quiz.

The teacher asks:
"Would writing four questions be enough to finish the whole task? What else needs to happen?"

This helps pupils recognise the smaller tasks within the overall goal.

2. Make a plan — 8 minutes
Before creating the quiz, pairs write a short list of actions in the order they intend to follow. They use specific actions, such as "select four ideas from the topic", rather than broad instructions such as "make the quiz".

The teacher asks:
"What needs to be decided first?"
"Which step needs something from an earlier step?"

Teacher reference: A workable plan could be:

1. Select four ideas to include.
2. Write a question about each idea.
3. Prepare the answer key.
4. Write instructions that match the questions.
5. Check that the quiz is ready for another pair.

This example is for teacher guidance. Pupils develop their own plans, and other workable sequences are acceptable.

3. Follow the plan — 12 minutes
Pairs create their quizzes, keeping their plans beside them. They tick completed actions and add or change a step if necessary.

The teacher asks pupils who become stuck to identify the difficulty:
"Which step is causing a problem?"
"What is needed to continue?"

For example, a pair may discover that a question has two possible answers or that the instructions do not explain whether pupils should select an option or write a response. They decide what needs adjusting before continuing.

4. Use AI for focused support — 5 minutes

Pairs first try to resolve their difficulty themselves. Where assistance is still needed, the teacher provides a short, checked AI hint.

A teacher-mediated request could be:

"A pair has written four quiz questions but is unsure what to do next. The task also requires a separate answer key and short instructions. Ask one guiding question to help pupils identify an unfinished step. Do not write the missing parts for them."

A possible hint is:

"What will another pair need to complete the quiz and check its answers?"

Pupils decide which action the hint suggests and complete it themselves. Pairs who do not need assistance continue checking their work.

5. Test and improve — 10 minutes

Pairs exchange quizzes, keeping the answer keys until the questions have been attempted. The receiving pair tries to complete the quiz and identifies any practical difficulty, such as missing instructions, unclear numbering or a question that cannot be answered as written. The answer key is then shared to check responses.

The creators make one useful revision where needed and update their plan if it omitted an important action.

The teacher asks:

"What did the test reveal?"

"Which change made the quiz easier to use?"

6. Reflect — 5 minutes

Pupils complete:

"Breaking the task into steps helped us..."

"We needed to complete ____ before we could ____."

"One step we added or changed was ____ because ____."

If AI assistance was used, pupils also explain what the hint helped them notice and what they did themselves afterwards.

What the teacher looks for

The teacher observes whether pupils identify manageable actions, explain their order, use the plan during the task and make a change connected to an actual difficulty. The quality of the planning and adjustment is the main focus of assessment.

Adaptation

For younger pupils, the quiz can include two questions about a familiar topic, using pictures or simple answer choices. The teacher provides action cards, such as choose the topic, make the questions, prepare the answers and try the quiz. Pairs arrange the cards, explain what needs to happen first and turn over each card when that step is complete. Questions and instructions can be given orally to reduce the writing needed. For older or more confident pupils, pairs create their own steps and decide which actions can be shared between partners and which depend on earlier work.

Lesson plan 2: Will the solution work?

Age group: 8–12 years
Duration: 35 minutes
Subjects: Mathematics or cross-curricular learning
Materials: Six paper rectangles measuring 10 × 8 cm per pair, a ruler and paper with a 30 × 20 cm display area marked on it
Problem-solving focus: Trying a solution, checking it against conditions and adapting it

Learning objectives

Pupils learn to test an arrangement, identify why it works or does not work and make a suitable adjustment. AI offers a hint after pupils have attempted the task.

The task

The teacher presents:
"Six picture cards need to fit inside a display area. All cards must be included, without overlapping or extending beyond the boundary. How could they be arranged?"

Lesson procedure

1. Try an arrangement — 10 minutes

Pairs arrange the six rectangles inside the 30 × 20 cm area. They can turn and move the cards. They check that all six fit and explain their arrangement.

Teacher reference: Two rows of three cards, each positioned 10 cm wide and 8 cm high, occupy 30 × 16 cm.

2. Change the available space — 8 minutes

The teacher reduces the display area to 25 × 20 cm.
Pairs test their previous arrangement and try an adjustment.
The teacher asks:
"What prevents the first arrangement from fitting?"
"What could change while keeping all six cards?"

3. Offer a hint if needed — 5 minutes

After pupils have tried, the teacher shares a checked AI hint with pairs needing support:
"What happens to a card's width and height when it is turned?"
Pupils choose and test their next action. Other pairs continue independently.

Teacher reference: Turning each card so it is 8 cm wide and 10 cm high allows three cards across and two rows, occupying 24 × 20 cm.

4. Check and explain — 7 minutes
Pairs use the ruler to check their revised arrangement against the boundary.
They complete:
"Our first arrangement…"
"We changed…"
"The new arrangement fits because…"

5. Reflect — 5 minutes
The teacher asks:
"Why was it useful to test the arrangement?"
"How did a hint help without completing the task?"

AI preparation
The teacher can prepare a hint using:
"Give one short hint for pupils arranging six 10 × 8 cm cards inside a 25 × 20 cm area. The cards must not overlap. Encourage pupils to consider turning the cards without giving the final arrangement."

Adaptation and assessment
Younger pupils can check by placing and turning the cards. Older pupils can predict the dimensions before testing.
The teacher observes whether pupils try an arrangement, identify the difficulty and verify their adjustment.

6.3.2. Classroom activities

Activity 1: What information is missing?

Age group: 7–12 years
Duration: 20 minutes
Materials: A problem displayed on the board, paper and pencils
Problem-solving focus: Identifying the information needed before choosing a solution
Purpose: Pupils learn to recognise when a problem does not contain enough information. They practise asking a useful question before accepting or acting on a suggested solution.

The situation

The teacher presents:
"A pupil wants to organise books on a shelf. An AI suggestion says: 'Put ten books on each shelf.' What would the pupil need to find out before trying this?"
The suggestion is a teacher-created example for discussion. It is not presented as a response obtained from a particular tool.

Classroom steps

1

Identifying what is unknown (5 minutes)
Pairs discuss what they would need to know. Possible questions include:

- How many books are there?
- How many shelves are available?
- How much space does each shelf have?
- Are the books the same size?

The teacher records the questions and asks pupils to explain how an answer would affect the arrangement.

2

Providing the information (5 minutes)
The teacher supplies a simple model:
"There are 18 books and two shelves. Each shelf has room for up to ten of these books. The books are the same size."
For this exercise, shelf capacity is given, so pupils do not need to measure the books. Pupils decide on an arrangement and record it. Nine books on each shelf works. Ten on one and eight on the other also works.

3

Checking the solution (5 minutes)
Pupils check that all 18 books have a place and neither shelf contains more than ten.
The teacher asks:
"Which information helped us decide whether the arrangement would work?"

4

Changing one condition (5 minutes)

The teacher changes the number of books to 23. Pupils recognise that the two shelves hold only 20 books altogether. Rearranging cannot create room for all 23 under the stated conditions. They explain the difficulty and suggest what would need to change, such as making another suitable space available.

AI preparation

The teacher can use AI to prepare similar situations:

"Prepare three short situations for primary pupils in which an organising suggestion cannot be applied until missing information is obtained. Use familiar examples involving storage, time or materials. Provide the situation and two useful questions, without a completed solution."

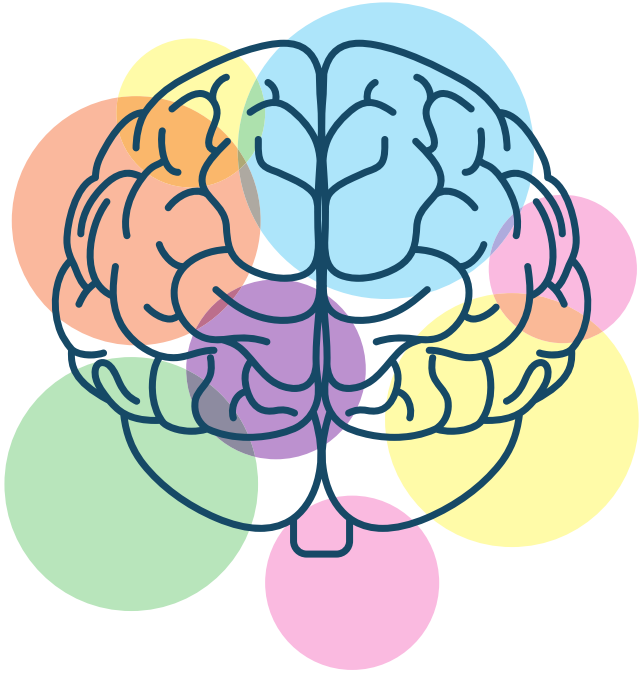
The teacher checks that the missing information genuinely affects the decision.

What the teacher looks for

Pupils should identify a relevant missing fact, explain why it matters and use the supplied information to choose and check an arrangement.

For younger pupils, drawings of books and shelves can replace written calculations. Older pupils can formulate a request for help:

"There are 23 books, but the two shelves hold only 20. Help me identify what needs to change before I can organise them."



Activity 2: Find the problem, choose a change

Age group: 9–12 years
Duration: 25–30 minutes
Materials: A daily routine displayed or printed, paper and pencils
Problem-solving focus: Finding gaps in a plan, organising necessary actions and adapting to a change

Purpose

Pupils examine a whole-day routine and improve the part that causes difficulties. They account for necessary tasks, preserve fixed commitments and check whether their changes work.

The situation

The teacher presents a fictional example:
"A pupil arrives home from school at 16:00 and leaves for sports practice at 17:00. During that hour, the pupil needs to complete homework, have a snack and pack the sports bag. However, the current routine includes only free time and homework, so packing is rushed and equipment is sometimes forgotten. The daily routine below shows the whole day. What could change so that everything is ready before departure?"

7:00 – 7:45	Morning routine: getting dressed, breakfast, brushing teeth
7:45 – 8:15	Travelling to school
8:15 – 15:30	School, including lunch and breaks
15:30 – 16:00	Travelling home
16:00 – 17:00	Homework and free time
17:00 – 18:30	Sports practice, including travel there and back
18:30 – 19:30	Showering, changing and dinner
19:30 – 20:15	Free time
20:15–21:00	Preparing school materials for the next day, getting ready for bed and reading

Classroom steps

1

Examining the whole day (5 minutes)

Pairs read the routine and locate the difficulties.

The teacher asks:

- "Where is time allocated for the snack?"
- "When are the sports materials packed and checked?"
- "Which part of the day could be adjusted?"

Pupils identify that the afternoon includes homework but leaves no time for the other two required actions.

2

Revising the afternoon (10 minutes)

Pairs revise the period between 16:00 and 17:00. They include every required action and keep as much free time as possible.

They explain how checking the bag could help prevent forgotten equipment.

3

Testing a change (7 minutes)

The teacher introduces a complication: *"The journey home takes longer today. The pupil arrives at 16:15 but still needs to leave at 17:00."*

Pupils adapt their plan. There are now 45 minutes available, leaving five minutes of free time after the required tasks. They check that their revision does not overlap with travel to sports practice.

4

Recording the learning (3 minutes)

Each pupil completes:

- "The original routine was missing..."
- "Our first adjustment was..."
- "When less time was available, we..."
- "Our revised plan works because..."

AI preparation

The teacher can use AI to prepare a focused hint:

"Prepare one short hint for pupils aged 9–12 examining a fictional daily routine. The pupil arrives home at 16:25 and leaves at 17:00. Homework takes twenty uninterrupted minutes, a snack takes ten minutes, and packing the sports bag takes ten minutes. There is free time during the previous evening. Help pupils consider whether a preparation task could happen earlier without providing the revised routine."

What the teacher looks for

The teacher observes whether pupils:

- Identify omitted tasks.
- Distinguish fixed commitments from flexible actions.
- Include realistic time for preparation.
- Adapt the plan when less time is available.
- Recognise how an earlier action can prevent a later difficulty.

6.3.3. Teaching strategies for Problem Solving with AI

AI can support problem solving by explaining an unfamiliar step, helping organise information or offering a hint when pupils become stuck. However, completing a task with AI assistance does not necessarily mean that pupils understand the solution or can use the same approach independently. Pupils need opportunities to identify what a problem requires, try an approach, notice difficulties and make adjustments. When AI provides the whole solution from the beginning, these opportunities can be lost.

The following strategies follow the "Brain First, AI Second" principle. Pupils begin by considering the task and using their own knowledge to make an initial attempt. If support is needed, AI can offer focused help, such as a question that draws attention to a missing action or an explanation of a difficult step. Pupils then decide what to do, carry out the next action and check whether it helps solve the problem. The teacher supports this process by giving pupils time to think and asking them to explain their decisions.

These strategies can be used across subjects and in everyday tasks, from solving a mathematics problem to organising materials, planning homework or investigating why something has not worked. They can also be practised through teacher-selected AI hints or printed examples. The aim is to help pupils use assistance purposefully while developing the confidence and skills to solve problems themselves, both in the classroom and beyond school.

ESTABLISHING A PUPIL-LED STARTING POINT



Before introducing AI, the teacher asks pupils to identify the goal, relevant information and conditions. Pupils make an initial attempt using calculations, drawings, objects or a short plan.
A useful question is:
"What can be worked out with the information already available?"
This gives pupils a starting point and helps the teacher see where support is needed.

INTRODUCING AI FOR AN IDENTIFIED NEED

After pupils explain where they are stuck, the teacher selects an AI hint or explanation that addresses that difficulty. For example:
"We have tried... We need help understanding... Give us one hint without completing the task."
AI assistance is optional. Pupils who are progressing can continue independently, while others may benefit from teacher guidance or practical materials.



RETURNING THE NEXT ACTION TO PUPILS



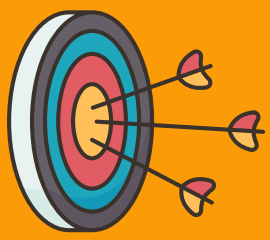
After receiving assistance, pupils decide what to do with it and carry out the next step themselves.
The teacher could ask:
"What does this help us notice, and what will we do next?"
Pupils might organise information, measure something, revise a sequence or test a different method. The teacher checks that they understand why the action is useful.

CHECKING AND REVISING THROUGH PUPILS' OWN WORK

Pupils assess the result against the original goal and conditions. They use a calculation, observation or practical test to establish whether it works.
If a difficulty remains, pupils first explain what happened and suggest a change. Further AI assistance can provide a focused question where needed. Pupils choose the adjustment and test again.



FINISHING WITH INDEPENDENT APPLICATION



The teacher gives a short related task or asks pupils to explain how they would use the method again. Pupils begin with their own reasoning and identify any support they still need.

6.3.4. Case Studies or Best Practices

Case study: Making the steps of a problem visible

Location: San Juan, Puerto Rico
Educational setting: Mathematics, Grades 6–8
Initiative: Estudia Khanmigo pilot, reported in 2024

The classroom challenge

As pupils encounter problems involving several steps, they may struggle to identify where to begin or how one action connects with the next.
The Estudia Khanmigo pilot explored AI tutoring in two schools. Khanmigo was designed to guide pupils through mathematical reasoning with questions and explanations. A Grade 6 teacher reported that it helped introduce pupils to problems requiring several steps. Teachers valued the attention given to the process of solving a problem.
Some regular users described the explanations as helpful for understanding problems step by step. However, teachers also reported that some pupils became impatient when the tool guided them instead of immediately providing an answer.
These observations show that pupils may need help understanding how to use guided assistance. The pilot provides classroom experiences rather than proof that AI caused lasting improvements in problem-solving ability.

Teachers can pause after a hint or explanation and ask pupils to identify the next action they will take. Pupils then carry out that action and check whether it helps them make progress. Useful questions include:

- “What does this hint help us notice?”
- “What can we do next?”
- “How will we check whether that step works?”

This approach can be used across different classroom tasks. It helps teachers see whether pupils understand and apply the assistance they receive.

Relevance to BrAIn

The case offers a practical lesson: assistance becomes useful when pupils connect it with their own next action. Teachers can encourage pupils to describe the step they are struggling with, use a question or explanation to continue and check what they have accomplished. These habits can also support homework and personal projects beyond school. The approach can be practised with teacher-selected, printed examples. Its educational value lies in helping pupils understand and carry out a process, rather than in requiring access to a particular tool.

6.3.5. References

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6.4. Creativity

6.4.1. Lesson plans

Lesson plan 1: One Object, Many Possibilities

Focus: Generating several original ideas before being exposed to AI-generated suggestions.
Duration: 35–45 minutes
Group setting: Individual work, small groups and whole-class discussion

Learning objectives

By the end of the lesson, students should be able to:

- generate more than one possible idea from the same starting point;
- use imagination to move beyond the most obvious answer;
- compare their own ideas with suggestions produced by AI;
- modify or combine ideas rather than simply copying them;
- explain why they chose their final idea.

The task

The teacher presents an everyday object, such as a cardboard box, plastic bottle, paper cup or wooden spoon, and asks:
"What different things could this object become?"

Pupils first develop their own ideas without seeing any AI-generated suggestions. Later, the teacher introduces three previously prepared AI ideas. Pupils compare them with their own and create a final idea that changes, combines or develops what they have seen.

The aim is not to decide whether pupils or AI are more creative, but to encourage pupils to generate possibilities and remain responsible for the final creative decision.



Lesson procedure

1. Generate first ideas — 7 minutes
The teacher shows the selected object and asks:

"What could this become?"
"Can you think of something completely different?"

Pupils individually draw or write at least three possible uses or transformations.
At this stage, the teacher does not evaluate whether ideas are realistic. The purpose is to encourage variety and imagination.

2. Share different possibilities — 7 minutes
Pupils work in small groups and compare their ideas. Each group identifies:

- One idea several pupils had.
- One idea that surprised them.
- One idea that nobody else in the group had considered.



The teacher can ask:

"Why did this idea surprise you?"
"Can two ideas be combined?"

This helps pupils recognise that creativity can involve seeing possibilities that other people initially overlook.

3. Introduce AI-generated ideas — 5 minutes
The teacher presents three simple suggestions prepared with an approved AI tool before the lesson. For example, for a cardboard box:

- A robot.
- A miniature house.
- A treasure chest.

The teacher asks:

"Did AI suggest something we had already thought of?"
"Did we have ideas that AI did not suggest?"
"Which suggestion could be improved?"

The AI suggestions are treated as additional material for thinking, not as model answers.

4. Transform an idea — 10 minutes
Each pupil chooses one idea. It may come from their own first ideas, a classmate or one of the AI suggestions.
They must change it in a meaningful way.

The teacher can offer prompts such as:

- *"Could it have another purpose?"*
- *"Could two ideas be combined?"*
- *"Could it help someone?"*
- *"Could you make it more environmentally friendly?"*
- *"What could you add from your own experience?"*

For example, an AI suggestion of a cardboard robot might become a recycling robot that collects litter from the school playground.
Pupils draw their final creation.

5. Explain the creative choice — 8 minutes
Pupils present their final idea to a partner or small group. They briefly explain:

"My first idea was..."
"Then I saw/heard..."
"I changed it by..."
"The part I added myself was..."

The emphasis is on how the idea developed, rather than on the quality of the drawing.

6. Reflect — 5 minutes
The teacher leads a short discussion:

"Was your final idea the same as your first idea?"
"Did someone else's idea help you?"
"Did AI suggest anything useful?"
"What did you change yourself?"
"Why is changing an idea different from simply copying it?"

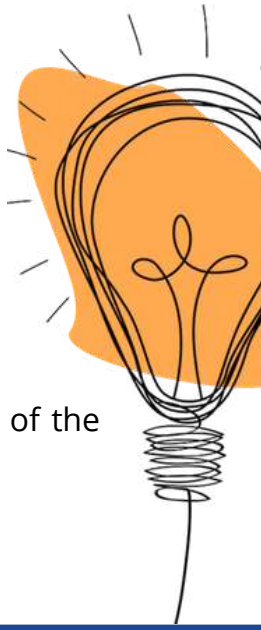
The class concludes that ideas can come from different sources, but pupils remain responsible for deciding how to develop them.

What the teacher looks for

The teacher observes whether pupils:

- Generate several possibilities before seeing AI suggestions.
- Move beyond the most obvious idea.
- Listen to and build on other people's ideas.
- Transform rather than simply reproduce a suggestion.
- Explain what they personally contributed.
- Show willingness to experiment with unusual possibilities.

The main focus of assessment is the creative process, not the artistic quality of the final product.



Lesson plan 2: The Creative Remix Challenge

Focus: Developing original solutions through experimentation, collaboration, unexpected constraints and meaningful transformation of AI-generated ideas
Duration: 50–60 minutes
Group setting: Small groups, individual idea generation and whole-class gallery walk

Learning objectives

By the end of the lesson, students should be able to:

- Generate different solutions to an open-ended challenge.
- Develop ideas collaboratively and build on the contributions of others.
- Respond creatively to unexpected constraints.
- Use an AI-generated suggestion as inspiration rather than as a finished solution.
- Modify and improve an initial idea through experimentation.
- Explain how their final solution developed.

The task

Pupils work in small teams on a short design challenge.
Each team receives a Challenge Card, for example:

- Create something that makes the school playground more enjoyable.
- Design a way to reduce waste in the classroom.
- Invent something that helps pupils organise their school day.
- Create a new space where pupils can read, relax or work together.
- Design something that helps people and nature share the same space.

Teams must create a solution, but during the activity they will receive additional conditions that require them to rethink and adapt their original idea.

The aim is to experience creativity as a process of developing, testing and changing ideas, rather than trying to find one perfect answer immediately.



Lesson procedure

1. Creative warm-up — 5 minutes
Teams receive their Challenge Card. Each pupil quickly sketches or writes one possible solution individually. After two or three minutes, the group shares all proposals. At this stage, ideas are collected without deciding which is best.

Each group then chooses elements from at least two different ideas to create its first shared concept. This ensures that the starting point already involves combination and collaboration.



2. Build the first concept — 10 minutes
Teams develop their initial solution. They can produce:

- a sketch;
- a simple model;
- a storyboard;
- a labelled diagram;
- or another quick visual representation.

The prototype does not need to be polished. It only needs to make the main idea understandable. Each team identifies:

- what problem it solves;
- who would use it;
- what makes it different from an obvious solution.

3. The surprise constraint — 7 minutes
Each group receives a random Constraint Card. Possible constraints include:

- It must use mainly recycled materials.
- It must also be useful for younger children.
- It cannot use electricity.
- It must fit into a very small space.
- It must work outdoors.
- It must be accessible to someone with reduced mobility.
- It must serve two different purposes.

Teams now have to adapt their proposal without abandoning the original challenge. The purpose of the constraint is to disrupt the first solution and encourage pupils to reconsider assumptions, combine ideas and explore alternatives.

4. AI creative wildcard — 8 minutes

Once teams have already developed and adapted their own solution, AI is introduced.

Using an approved tool, or a suggestion prepared beforehand, each group receives one unexpected alternative idea, feature or perspective related to its challenge. For example, AI might suggest:

- a different user;
- an unusual material;
- an additional function;
- an alternative location;
- a completely different approach.

Teams do not have to accept the suggestion. They choose one of three options:
USE IT – include the suggestion because it improves the design.
CHANGE IT – adapt part of the suggestion.
REJECT IT – decide that it does not improve the solution and explain why.

This gives pupils control over the creative decision instead of positioning AI as the authority.

5. Remix and prototype — 12 minutes

Teams redesign their concept. The new version should show a meaningful development from the first prototype. They may:

- combine their original idea with part of the AI suggestion;
- solve a weakness identified by the constraint;
- introduce a new feature;
- simplify the solution;
- adapt it for a different user;
- reject the AI suggestion and develop a stronger alternative.

Teams prepare a final sketch or model. They keep both the first and final versions so that the development of the idea remains visible.

6. Creative gallery walk — 8 minutes

The final designs are displayed around the classroom. Groups move around the room and observe the solutions created by others. Each team leaves short feedback for another group under two headings:
Something creative we noticed and *One possibility you could explore further.*

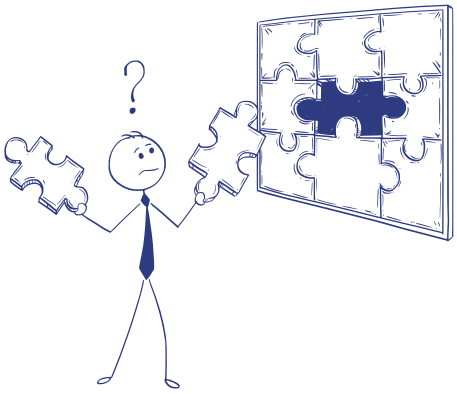
The purpose is not to rank the projects, but to expose pupils to different ways of responding to the same type of challenge.

7. Reflection — 5 minutes

Each group briefly records:

Our idea changed most when…
The constraint made us…
AI suggested…
We decided to use / change / reject it because…
The most original part of our final solution came from…

This reflection helps pupils recognise creativity as a process of choices, revisions and contributions from different sources.



What the teacher looks for

The teacher observes whether pupils:

- contribute their own ideas before AI is introduced;
- build on ideas proposed by other group members;
- respond flexibly when new constraints appear;
- move beyond their first solution;
- evaluate rather than automatically accept an AI suggestion;
- make meaningful changes between the first and final prototype;
- explain why they used, changed or rejected particular ideas;
- demonstrate ownership of the final solution.

The main focus is not the technical quality of the prototype but the development of the creative process.

Adaptation for different learners

For students who need additional support, teachers can reduce the degree of openness by limiting the number of options, using visual examples, assigning clear group roles, or providing a partially developed idea that pupils can modify. AI outputs may also be prepared and selected by the teacher in advance, allowing students to focus on comparison, adaptation and creative decision-making rather than on generating prompts.

Students who need a greater challenge can work with multiple or conflicting constraints, redesign their solution for a different user or context, or compare several possible solutions before defending the most original and appropriate one.

6.4.2. Classroom activities

Activity 1: Give the AI Idea a Makeover

Age group: 8–12 years
Duration: 20 minutes
Materials: One teacher-prepared AI-generated idea displayed on the board, paper, pencils and optional drawing materials
Creativity focus: Transforming an existing idea by changing its purpose, users, context or characteristics
Purpose: Pupils learn that creativity does not always require starting from nothing. They practise identifying weaknesses or unexplored possibilities in an existing proposal and making meaningful changes that give the idea greater originality or value.

The situation

The teacher presents a deliberately simple AI-generated proposal connected to school life. For example:

"Create a reading corner in the school with bookshelves, chairs and posters."

The AI proposal is presented as unfinished creative material, not as a model solution. The class challenge is: How could we transform this ordinary idea into something much more interesting, useful or distinctive?

Classroom steps

1

Inspect the original idea (4 minutes)

Small groups examine the proposal and identify what is already included. They also identify something that seems predictable, missing or insufficiently developed. Each group chooses one aspect it wants to transform.

2

Draw a transformation card (4 minutes)

Each group receives one random transformation condition, for example:

- Change the users: make it suitable for different age groups.
- Change the place: move it somewhere unexpected.
- Add another purpose: make it useful for two activities.
- Make it sustainable: reduce waste or use recycled materials.
- Improve accessibility: make sure different learners can use it.
- Add something surprising: introduce a feature people would not normally expect.

The random condition prevents all groups from following the same creative direction.

Redesign the idea (7 minutes)
Groups create a quick sketch or description of their redesigned version. They are free to change other aspects as well, but their final idea must clearly demonstrate how the original proposal has been transformed.

The focus is not on producing a polished drawing but on making meaningful creative decisions.

Mini creative showcase (5 minutes)
Groups display their solutions. Pupils briefly observe how the same original AI idea has developed into several very different proposals.
Each group identifies one feature from another team's design that demonstrates an approach different from its own. The class can then consider how a single starting point produced many possible outcomes.

AI preparation

The teacher can use AI to prepare suitable starting ideas:
“Create four simple and deliberately conventional ideas for improving a primary school. Each idea should be one or two sentences long and leave plenty of room for pupils aged 8–12 to modify, expand or redesign it. Do not make the ideas highly original or provide finished solutions.”

The teacher checks that the proposals are sufficiently simple. If the AI output is already highly elaborate, pupils will have less space to transform it creatively.

What the teacher looks for

Pupils should make changes that affect the idea itself rather than simply decorate the original proposal. Teachers can observe whether groups introduce a new purpose, perspective, user or condition and whether they can explain how their version differs from the starting point.

For pupils who need additional support, the transformation can focus on one clearly defined aspect, such as changing the user or location. More confident pupils can receive two transformation conditions simultaneously and develop a solution that satisfies both.

Activity 2: What Else Could It Be?

Age group: 6–10 years
Duration: 15–20 minutes
Materials: One familiar everyday object or picture, paper and pencils, and two or three teacher-prepared AI-generated suggestions.
Creativity focus: Generating multiple possibilities from the same starting point and moving beyond the most obvious idea.
Purpose: Pupils practise divergent thinking by producing several possible uses or transformations for an ordinary object. They then compare their ideas with additional AI-generated suggestions and develop a new possibility of their own.

The situation

The teacher presents an everyday object, such as a cardboard tube, paperclip, empty box, plastic bottle or piece of string.

Pupils are challenged to imagine different things the object could become or different purposes it could serve.

The activity begins without AI so that pupils' own imagination provides the starting point.

Classroom steps

1

Generate possibilities (5 minutes)
Individually, pupils sketch or write as many different possibilities as they can for the selected object.

The focus is on quantity and variety rather than feasibility. At this stage, ideas are not ranked or corrected. Pupils are encouraged to move beyond the object's normal purpose.

2

Combine ideas (5 minutes)
Pupils work in pairs and compare their proposals. Each pair selects two ideas and combines elements from both to create a third possibility.

For example, a cardboard tube imagined as a telescope and as an animal shelter might inspire a small observation station for studying insects. This introduces the idea that creativity can also emerge from connecting existing possibilities in new ways.

Compare with AI suggestions (5 minutes)

The teacher reveals two or three AI-generated ideas prepared beforehand. Pairs identify:

- one idea similar to something they already imagined;
- one suggestion they had not considered;
- one class idea that does not appear among the AI suggestions.

Pupils then decide whether any AI suggestion could help them improve or extend their own idea.

Create one final variation (5 minutes)

Each pair creates one additional possibility that is different from both its original ideas and the AI examples.

They briefly explain what makes the new idea different.

AI preparation

The teacher can use AI before the lesson to generate additional possibilities:
"Suggest five unusual but age-appropriate alternative uses for a cardboard tube for pupils aged 6–10. Keep each suggestion to one sentence and include different types of ideas. Do not explain which idea is best."

The teacher selects only two or three suggestions, ensuring that pupils first have sufficient time to develop their own possibilities.

What the teacher looks for

Pupils should generate more than one possibility, move beyond the object's usual function and show an ability to combine or extend ideas rather than simply repeat suggestions.

For younger pupils, drawing, gestures or physical demonstration can replace written descriptions. Older pupils can be challenged to create possibilities that meet an additional requirement, such as being useful, sustainable or helpful to another person.

6.4.3. Teaching strategies for Creativity with AI

The following strategies can be used across subjects. As in the Critical Thinking chapter, they are not intended as one fixed methodology but as reusable classroom principles.

Teaching strategies for Creativity with AI	
Give students thinking time before AI	Ask learners to sketch, brainstorm or discuss their own possibilities before showing them AI-generated alternatives.
Ask for several possibilities	Replace tasks such as “Find the solution” with “Find three different possibilities”. This encourages divergent thinking.
Use AI as creative material, not as the final creator	Ask AI for alternatives, unusual constraints, questions or examples that students must subsequently evaluate and transform.
Require meaningful transformation	Students should combine, adapt, personalise or improve AI-generated material rather than simply select an output.
Introduce creative constraints	Limit materials, change the audience, add a sustainability condition or introduce an unexpected rule. Constraints can stimulate new approaches.
Value unusual ideas	Avoid rewarding only realistic or polished answers. Create classroom conditions where experimentation and unconventional ideas are safe.
Ask students to explain creative choices	Questions such as “Why did you change this?” and “What makes this idea yours?” reveal the thinking behind the product.

Teaching strategies for Creativity with AI	
Document the process	Use drafts, sketches, rejected ideas and short reflection notes so that creativity is not assessed only through the final product.
Keep human collaboration central	Group brainstorming, peer feedback and shared design tasks expose students to perspectives that AI cannot replace as social learning experiences.

These strategies are consistent with the OECD's view of creativity as something that can be made visible across ordinary curriculum subjects. The OECD's classroom-friendly framework highlights inquiring, imagining, doing and reflecting as complementary dimensions of creative learning rather than treating creativity as artistic talent alone.

If AI can generate the entire product and the student only needs to copy or select it, the task offers limited creative practice.

If students must generate alternatives, compare possibilities, transform ideas and justify their choices, AI can become part of a genuinely creative learning experience.



6.4.4. Case Studies or Best Practices

Case study: Making creativity visible in everyday learning

Location: International – schools in 11 countries, including Spain, France, Hungary, the Netherlands, Slovakia, the United Kingdom and others
Educational setting: Primary and secondary education
Initiative: OECD CERI project Fostering Students' Creativity and Critical Thinking, implemented between 2015 and 2019

The classroom challenge

Creativity is widely recognised as an important educational goal, but teachers may find it difficult to translate it into everyday classroom practice or to identify what creative learning actually looks like across different subjects.

To address this challenge, the OECD Centre for Educational Research and Innovation worked with networks of schools and teachers in 11 countries to develop and test practical resources for fostering creativity and critical thinking. These included classroom-friendly rubrics, lesson plans and criteria for redesigning ordinary learning activities. Teachers implemented the approaches in primary and secondary classrooms, documented their experiences and provided feedback on their usefulness.

A central idea was that creativity should not be restricted to Art or special projects. Teachers were encouraged to create opportunities within normal subject teaching for pupils to explore possibilities, produce original responses, experiment with different approaches and reflect on their ideas.

The initiative also highlighted the importance of the classroom environment. Pupils are more likely to express unusual ideas when mistakes are accepted as part of learning and when they feel safe taking intellectual risks. The OECD therefore identified teacher attitudes and an open, non-threatening classroom climate as important conditions for creative thinking.

In practice, teachers can adapt ordinary tasks so that pupils do not simply reproduce a predefined answer. They may ask learners to propose several possible solutions, redesign an existing idea, explore an alternative perspective or explain how an initial proposal changed during the activity.

With AI-supported learning, the same principle can be extended further. AI may provide additional ideas or perspectives, but pupils should remain responsible for deciding whether those suggestions are useful and for developing the final creative response.

Relevance to BrAIn

The case provides an important lesson for BrAIn: creativity can be deliberately integrated into normal classroom activities without requiring a separate subject or sophisticated technology.

AI can become one additional source of ideas, but its educational value depends on what pupils are asked to do afterwards. Teachers can use AI-generated suggestions as material for comparison, adaptation or improvement while ensuring that pupils continue to generate ideas, make choices and explain their own creative contribution.

The approach is therefore transferable across subjects and can also be implemented with teacher-prepared or printed AI examples. Its value lies primarily in making the creative process visible and keeping pupils actively responsible for developing ideas, rather than in access to a particular AI tool.



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6.5. Communication

6.5.1. Lesson plans

Lesson plan 1: Say It in Your Own Words

Focus: Independent expression and personal communication
Duration: 45–60 minutes
Group setting: Individual work, pairs and whole-class discussion

Learning objectives

By the end of the lesson, students should be able to:

- explain information using their own words;
- distinguish between understanding information and simply reproducing a well-written answer;
- organise and communicate ideas independently;
- respond to follow-up questions about their own explanation;
- reflect on why personal expression remains important in an AI-influenced environment.

Rationale

Students may increasingly encounter AI-generated summaries, explanations and ready-made responses outside school. While these can appear clear and sophisticated, using ready-made formulations does not necessarily require the student to understand or communicate the information independently.

This lesson therefore shifts attention from the quality of a finished answer to the student's ability to understand, reformulate and communicate meaning.
Activity procedure

Lesson procedure

1 Understand

The teacher provides students with a short age-appropriate text connected to a subject they are currently studying.
Students read the text individually.
They are then asked to put the text away.



2 Explain

Without looking at the original text, each student writes three to five sentences answering:
"How would you explain this to a classmate who has never learned about it before?"

The purpose is not grammatical perfection. Students should communicate what they understood using their own language.



3 Tell a partner

Students explain the same idea orally to a partner without reading their written response.
The listening student may ask one or two clarification questions.

For example:

- "What do you mean by that?"
- "Why does that happen?"
- "Can you give me an example?"
- "Can you explain that in another way?"

This introduces an important element that prepared or AI-generated responses cannot fully replicate: responding to another person in real time.

Switch roles
Students exchange roles and repeat the activity.

Whole-class reflection
The teacher facilitates a short discussion:

- Was writing or explaining the idea aloud easier?
- What happened when your partner asked an unexpected question?
- Did you have to change the way you explained something?
- How can you tell whether someone genuinely understands what they are explaining?
- If a tool produced a perfect explanation for you, would that automatically mean that you could explain it yourself?

The final question introduces AI literacy without requiring students to use AI during the lesson.

Teacher observation

During the activity, teachers can observe whether students can:

- communicate the main idea independently;
- explain rather than repeat information;
- adapt an explanation when the listener does not understand;
- respond spontaneously to questions;
- use examples to clarify meaning;
- listen and respond appropriately.

The emphasis should be on communication and understanding rather than grammatical perfection.

Lesson plan 2: Listen, Respond, Connect

Focus: Active listening, spontaneous communication and perspective-taking
Duration: 45–60 minutes
Group setting: Pairs, small groups and whole-class discussion

Learning objectives

By the end of the lesson, students should be able to:

- listen actively to another person;
- identify the main idea in someone else's message;
- ask relevant follow-up questions;
- respond spontaneously and appropriately;
- adapt their communication based on another person's reaction;
- recognise why human interaction remains essential in an AI-influenced environment.

Rationale

Communication is not only about producing clear messages. It also involves listening, interpreting meaning, responding to others and adapting communication in real time.

These skills are especially important in an environment where students may increasingly rely on AI-generated responses outside the classroom. AI can produce polished language, but it does not replace the human experience of managing misunderstanding, emotion, disagreement, or spontaneous interaction.

This lesson therefore focuses on communication abilities that are developed primarily through direct human interaction.

Lesson procedure

1 Pair discussion

Students work in pairs. The teacher gives each pair a simple discussion topic, for example:

- What makes a good friend?
- Should homework always be required?
- What makes teamwork successful?
- What is one change that would improve our school?

Student A speaks for one minute while Student B listens without interrupting.

2 Listen and summarize.

Student B must summarize what Student A said in one or two sentences.
The speaker then confirms whether the summary was accurate.
If not, the speaker explains what was misunderstood.
This encourages students to focus not only on preparing their own response but also on genuinely listening.

3 Ask a follow-up question

The listener asks one question connected directly to what the speaker said.

Examples include:

- "Why do you think that?"
- "Can you give an example?"
- "What would happen if...?"
- "Do you think everyone would agree?"

The question should build on the conversation rather than introduce a completely new topic.

4 Respond and adapt

Student A answers the question.
The listener may then ask for clarification if something is unclear.
Students switch roles and repeat the process.





5 Small-group challenge

Two pairs join together.
Each student briefly shares one idea they heard from their partner rather than repeating their own opinion.

The group then discusses:
What makes you feel that another person has really listened to you?

This shifts attention from simply speaking to the quality of interaction.

6 Whole-class reflection

The teacher can use questions such as:

- Was it difficult to listen without preparing your own answer?
- What helped you understand your partner?
- Did you ever have to change the way you explained something?
- What happens when someone misunderstands you?
- Why is responding to another person different from receiving a ready-made answer?
- Which parts of this activity require human interaction?

The teacher may then connect the discussion to students' wider digital experiences by explaining that technologies can help generate messages, but listening, interpretation and real-time interaction still require human communication skills.



Teacher observation

Teachers can observe whether students are able to:

- maintain attention while another person speaks;
- identify the main message accurately;
- ask relevant follow-up questions;
- respond to what was actually said;
- clarify misunderstandings;
- adapt explanations when necessary;
- communicate respectfully during disagreement.

Adaptation for different learners

For students who need additional support, teachers may provide sentence starters such as:

- “What I heard you say was…”
- “Do you mean that…?”
- “Can you explain more about…?”
- “I agree/disagree because…”

Students who need a greater challenge can be asked to summarise a viewpoint they disagree with accurately before giving their own response.

Key message for students

Good communication is not only about saying the right words. It is also about listening, understanding and responding to another person.

6.5.2. Classroom activities

Activity 1: Explain It Without Reading

Purpose: Strengthen independent expression and understanding.
Suggested duration: 10–15 minutes

Students read a short piece of information connected to the lesson. The text is then removed, and students explain the main idea to a partner using their own words.

The partner may ask one clarification question, such as:

- "Can you explain that differently?"
- "What is the most important point?"
- "Can you give an example?"

The activity helps teachers distinguish between students who can reproduce information and students who can actually communicate their understanding.

Activity 2: Listen – Summarise – Respond

Purpose: Develop active listening and meaningful dialogue.
Suggested duration: 10–15 minutes

Students work in pairs. One student speaks for approximately one minute on a simple topic or question. The second student listens without interrupting.

The listener then:

1. summarises the speaker's main point;
2. asks one relevant follow-up question;
3. responds to the answer.

Students then switch roles.

Activity 3: One Idea, Three Audiences

Purpose: Practise adapting communication to context and audience.
Suggested duration: 15–20 minutes

Students receive one simple topic, for example:
"Why is sleep important?"
They explain the same idea in three different ways:

- to a younger child;
- to a classmate;
- to a teacher or another adult.

Students compare how vocabulary, detail and tone change depending on the audience.

6.5.3. Teaching strategies for Communication with AI

Teaching strategies for Communication with AI	
Ask students to explain, not only answer	Encourage students to explain how they reached an idea or conclusion. Follow-up questions such as “Why?”, “How do you know?” or “Can you explain it differently?” help teachers assess actual understanding and communication ability.
Include regular oral communication	Presentations, pair discussions, debates and short verbal explanations give students opportunities to communicate without relying on prepared or automatically generated wording.
Use peer-to-peer dialogue	Students should regularly discuss ideas with classmates, ask questions, respond to different viewpoints and clarify misunderstandings. This strengthens communication as an interactive process.
Practise active listening	Ask students to summarize another person’s viewpoint before sharing their own. This encourages attention, understanding, and respectful interaction.
Protect students’ personal voice	Encourage students to express ideas in language that reflects their own understanding and experience. Communication should not be evaluated only according to how polished or sophisticated it sounds.
Use peer-to-peer dialogue	Students should regularly discuss ideas with classmates, ask questions, respond to different viewpoints and clarify misunderstandings. This strengthens communication as an interactive process.
Practise active listening	Ask students to summarise another person’s viewpoint before sharing their own. This encourages attention, understanding and respectful interaction.
Protect students’ personal voice	Encourage students to express ideas in language that reflects their own understanding and experience. Communication should not be evaluated only according to how polished or sophisticated it sounds.
Assess the process, not only the final product	A well-written assignment does not necessarily show strong Communication skills. Teachers can combine written work with short oral explanations, reflection questions or follow-up discussions.

Teaching strategies for Communication with AI	
Use spontaneous questions	Asking students unexpected but relevant questions encourages them to organise and communicate their thoughts independently rather than reproduce a prepared response.
Create regular opportunities for independent writing	Short classroom writing tasks can help students practise structuring ideas, selecting vocabulary and communicating meaning without automated assistance.
Encourage clarification and reformulation	When a message is unclear, instead of immediately correcting the student, teachers can ask: “Can you say that another way?” or “What do you mean by…?” This develops flexibility in communication.
Discuss AI influence openly	Students can reflect on how using AI outside school may influence the way they write or express themselves. The aim is not to discourage technology use completely, but to help students recognise the importance of continuing to practise communication independently.
Use collaborative problem-solving	Group tasks where students must explain ideas, negotiate roles and reach a shared decision create natural opportunities to practise communication.
Maintain AI-free communication spaces	Some classroom activities should intentionally require direct human interaction and independent communication. This helps preserve confidence, spontaneity and interpersonal skills.
Maintain AI-free communication spaces	A useful principle for teachers is: If students can explain it, discuss it, adapt it and respond to questions about it in their own words, they are demonstrating Communication skills.

6.5.4. Case Studies or Best Practices

Denmark: Protecting Independent Communication in an AI-Influenced School Environment

A useful Danish example comes from the national recommendations issued by the Danish Ministry of Children and Education for the use of generative AI in primary and lower-secondary schools.

In the 2025 recommendations for Folkeskolen, schools are encouraged to use generative AI only when it has a clear academic, didactic, and pedagogical purpose. Schools are also expected to discuss with students how, when, and why generative AI may be used.

Importantly for Communication, the Danish guidance explicitly stresses that students must continue learning to formulate themselves independently, both orally and in writing. This recognises a central challenge also addressed by BrAIn: students may increasingly have access to technology capable of generating polished texts and answers, while still needing to develop their own ability to explain, discuss and communicate independently.

This principle can be translated into classroom practice through several approaches:

Preserve independent oral expression.	Students should regularly explain ideas, defend opinions and answer follow-up questions in their own words.
Combine written work with dialogue.	Teachers can ask students to discuss or orally explain submitted work, helping verify both understanding and ownership.
Maintain activities with and without digital support.	Danish recommendations for education increasingly emphasise the importance of deliberately considering when technology is appropriate and when independent work is educationally more valuable.
Discuss responsible AI use openly.	Rather than focusing only on prohibition, teachers can help students understand why independent writing, speaking and interaction remain important.
Create common expectations.	Danish guidance emphasises that schools should establish shared rules and a common direction so that individual teachers are not left alone to decide how AI should influence learning activities.

Another relevant aspect of the Danish approach is assessment. Current Danish guidance for primary-school examinations restricts the use of generative AI and highlights the difficulty of determining whether an AI-supported product represents a student's independent performance. This reinforces the importance of assessing not only polished final products, but also students' ability to explain, communicate and demonstrate understanding independently.

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