3.4.3 Open ended enquiry

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

Open ended enquiry means that students formulate their own research question and discover in their own way how to answer it. The teacher guides them in this process but deliberately leaves room for their own input and creativity, with an emphasis on curiosity, self-discovery and critical thinking. Rather than giving answers, the teacher stimulates the thinking process by asking focused questions and creating a stimulating learning environment. This can be done with concrete material as well as with theoretical concepts.

Skill focus

Primary Skill Focus

- Critical thinking

Complementary/Secondary Skill Focus

- Curiosity, sense of wonder
- Connectedness

Age group	Student number	Duration
6 -10 years old	Whole class working in pairs or small groups	30-45 minutes

Proposed step by step implementation of the learning activity

1. **Start with a stimulating topic:** Choose a topic/theme or an object that sparks curiosity and is relevant to the children.
2. **Let the children think of questions:** Encourage them to formulate their own research questions and learn what makes a good question.
3. **Hypothesise:** Encourage children to make predictions and give reasons for them.
4. **Plan and carry out the investigation:** Let them experiment, observe and collect results independently (or in groups).
5. **Reflect during and after the investigation:** Discuss and share findings and encourage children to think critically about what they have discovered and how they know it. Together with the pupils, draw conclusions that clarify the central learning points.

Indoor/Outdoor Classroom layout notes

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

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How does this learning activity develop this particular skill?

1. Start with a stimulating topic
   - Critical thinking starts with curiosity.
   - A relevant and engaging topic motivates pupils to ask questions and think beyond the superficial.
   - They learn that learning starts with wonder and daring to ask questions.
2. Let children come up with questions
   - Formulating questions themselves = practising critical thinking.
   - Students learn:
     - What makes a good question (open, investigable, relevant)
     - How to guide their own thought process
   - This promotes self-reflection, analysis and problem-oriented thinking.
3. Formulate hypotheses
   - Predicting and substantiating stimulates logical reasoning.
   - Pupils must:
     - Make an assessment
     - Substantiate that assessment with arguments
   - This requires conscious thinking, reasoning and evaluation of knowledge.
4. Planning and conducting research
   - Independent research strengthens critical thinking because pupils:
     - Collect data
     - Make observations
     - Interpret results
   - They learn to look critically: What do I really see? What does that mean?
5. Reflecting during and after the research
   - Reflection is at the heart of critical thinking.
   - By discussing together:
     - What have we discovered?
     - How do we know that?
     - What does this mean for our hypothesis?
   - Pupils learn to evaluate their own thought processes and draw conclusions based on evidence.

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

As a result of completing this task, students will develop critical thinking and curiosity by:
Developing critical thinking skills, including:

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- Analysing situations and problems to better understand what is happening and why.
- Using logical reasoning and evidence to support predictions or conclusions.
- Distinguishing between facts and opinions by critically evaluating the reliability of information.
- Evaluating their approach and results and reflecting on areas for improvement.
- Exploring alternative perspectives and considering different possible solutions.

Fostering curiosity, including:

- Asking open, thoughtful, and inquisitive questions.
- Learning through exploration by experimenting, observing, and discovering new things.
- Using curiosity to inspire creative problem-solving approaches and research methods.
- Developing intrinsic motivation by directing and taking ownership of their own learning.
- Cultivating a sense of wonder and interest in how the world around them works.

Suggested use, and practical subject-related examples

Teachers can use the Open-ended enquiry-technique throughout different subjects in the following ways:

1. **Introduce a broad topic:** Choose a topic that matches their interests, such as nature, technology or everyday life. For example, "How does a rainbow work?", "Why do some objects float?" or "What can you do with different blocks of wood?
2. **Encourage questioning:** Let the children think of questions about the topic. Use prompts such as
   - 'What do you want to know about this?
   - ‘What do you think would happen if…?
   - What can you do with it?
3. **Make a choice:** Help the children to choose a research question that is feasible and concrete, for example:
   - 'How can we make a rainbow?
   - Which materials sink in water, and which don't?
   - How can we build something?
4. **Planning the research**
   - Let the children work out for themselves how to answer their question:
   - For younger children: Give simple choices (experiment, observe, draw).
   - For older children: Encourage their own experiments or data collection.
5. **Experiment and discover:** Let the children carry out their plans. Examples:
   - Make a rainbow with a glass of water and a mirror.
   - Test different objects in water to see what floats.
   - Build a tower with different types of blocks and on different surfaces.
6. **Reflect and share:** Let the children share their findings:
   - Draw pictures, make diagrams or give oral presentations.
   - Discuss what they have learned and how they know, using pictures or designs they have made.

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Materials and tools needed for implementation

The choice of materials depends largely on the subject. Centrally, it can be said that open ended materials should be used.

Definition of open-ended materials:

Open-ended materials are objects or tools that have no specific purpose or fixed outcome. They can be used in a variety of ways and encourage creativity, imagination and problem solving. Examples include building blocks, natural materials (such as stones, branches or sand) or art materials such as paint and clay.

Use open-ended materials:

- Free play: Children are free to experiment and express their ideas without restrictions.
- Problem solving: They can use the materials to find solutions to self-imposed or given challenges.
- Creativity and imagination: The open-ended nature of the materials encourages children to think of new applications or constructions.
- Collaboration and communication: In group activities, these materials help to brainstorm and share ideas.
- Motor development: Manipulating open-ended materials helps develop fine and gross motor skills.
- Supporting inquiry-based learning: The materials provide opportunities for experimentation, making connections and understanding concepts.

The use of open-ended materials in the classroom promotes a learning environment where curiosity, autonomy and creativity are central. They are particularly suitable for topics that provide space for exploration and investigation, as in open-ended inquiry.

- Writing tools: Pens, pencils, or digital devices for individual reflection and note-taking.
- Paper or whiteboards: For students to jot down their thoughts, share ideas, or create diagrams.
- Prompt cards or questions: Printed or projected prompts related to the topic or subject
- Timer or clock: To manage the time allocated for each phase of the activity.
- Flipchart or projector: For presenting group ideas during the whole-class sharing phase.

Optional: -Markers or sticky notes for students to visually organize and display their thoughts

Guiding questions

Example on topic: 'Why does ice melt faster in the sun than in the shade?

1. Ask questions: The children think of questions such as 'What will happen if we cover the ice with something?
2. Hypothesis: 'I think the ice melts less quickly with a cloth over it.
3. Research: Let the children test different materials (cloth, paper, plastic).
4. Reflection: Discuss:
    - 'Which materials worked best?
    - 'Why do you think this happened?
    - 'How can we improve our experiment?

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Tips and Tricks for dealing with challenges

- **Challenge:** Children do not know how to formulate a clear research question.
  Tip: Helping children to ask good questions
  - Use tools such as question starters ('Why...', 'How...', 'What happens if...') or provide examples of good questions.
  - Let the children draw or write their questions in their own words before you help them to refine them.
- **Challenge:** Children may be overwhelmed by too many choices or easily distracted.
  Tip: Provide enough structure within freedom
  - Provide a clear roadmap (e.g. 1. develop question, 2. make plan, 3. implement, 4. reflect).
  - Use visual aids such as pictograms or a step-by-step poster in the classroom.
- **Challenge:** In groups, some children take the lead while others are less involved.
  Tip: Encouraging cooperation without dominance
  - Assign roles within the study (e.g. materials manager, note-taker, presenter) to encourage equal participation.
  - Ask the children to reflect on their collaboration ("What went well? What can we do better?").
- **Challenge:** Children get frustrated when their investigation fails or has an unexpected outcome.
  Tip: Encourage perseverance
  - Normalise mistakes and emphasise that this is an important part of the learning process.
  - Ask questions such as: What can we learn from this?" or "What could we try differently?
- **Challenge:** The tendency to give answers or direct the children too much.
  Tip: Guide without directing
  - Ask deeper questions rather than offering solutions, e.g.: 'How can you work this out?' or 'What do you think this means?
  - Show that you are curious and don't know the answer, so that the children feel free to experiment.
- **Challenge:** Lack of inspiration or limited opportunities in the classroom.
  Tip: Use a variety of materials and resources
  - Provide a collection of open-ended materials (building blocks, recycled materials, natural materials) and simple tools (magnifying glasses, water bowls, measuring tapes).
  - Introduce new materials step by step to stimulate curiosity and avoid chaos.
- **Challenge:** Research takes longer than planned or children lose focus.
  Tip: Keep time and expectations realistic
  - Break the process down into smaller, manageable steps with clear time limits.
  - Allow time at the end of each session to reflect on what they have achieved and what the next step is.
- **Challenge:** Some children may feel insecure about sharing their ideas or results.
  Tip: Creating a safe learning environment
  - Praise their efforts, regardless of the outcome, and emphasise that every contribution is valuable.
  - Let children share in small groups before presenting to the whole class.

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Difficulty level tailoring

Teachers can tailor this learning activity to three difficulty levels to meet students' needs.

- **Beginner learners (6-7 years old)**: the emphasis is on asking simple questions and providing strong guidance from the teacher.
- **Advanced learners (8-9 years old):** they are given more freedom to investigate, collaborate in groups, and experiment with various materials.
- **Expert learners (9–10 years old):** they work more independently, formulate complex questions, and critically analyse their findings.

Throughout this progression, the teacher gradually reduces direct instruction, allowing for increased independence, reflection, and creativity. This approach ensures that open inquiry evolves alongside the child's development.

Debriefing and Reflection questions

1. Questions about the process of research
   - What was your research question, and why did you choose this question?
   - How did you decide how you would approach the research?
   - What worked well in your approach? - What did you encounter, and how did you solve it?
   - What would you do differently next time to make your research even better?
2. Questions about the results
   - What did you discover?
   - Was this what you expected? Why or why not?
   - How can you be sure your results are correct?
   - Can you explain your results to others? How would you do that?
   - What new questions have arisen from your research?
3. Questions to stimulate critical thinking
   - Why do you think your experiment worked this way?
   - What could be other ways to answer your question?
   - What did you learn that you can use in other situations?
   - How do your findings affect how you think about the topic?
   - What information or materials could have helped you better?
4. Questions on cooperation (if applicable)
   - How did you work together as a group?
   - What went well in the collaboration?
   - How did you resolve differences in ideas?
   - What can you do next time to improve cooperation?
5. Questions to stimulate curiosity and motivation
   - What did you like best about the research? Why?
   - What new things would you still like to explore?
   - What did you learn about yourself during this investigation?
   - How can you link this research to something outside the classroom, for example at home or in nature?

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