

FOSTERING EVIDENCE-BASED AND AI-AWARE INDEPENDENT THINKING IN PRIMARY SCHOOL LEARNERS

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Abstract: This article reconceptualizes independent thinking in primary education for a learning environment increasingly shaped by digital information and generative artificial intelligence. Rather than treating independence as individual task completion, the paper defines it as the learner’s capacity to frame a question, make an initial judgement, seek and compare evidence, monitor the quality of reasoning, and revise a conclusion when new information appears. Particular attention is given to age-appropriate source checking, metacognitive routines, human agency in the use of AI-generated information, and formative assessment of reasoning. A practical VERIFY cycle - Voice an initial idea, Examine the source, Relate evidence, Identify uncertainty, Form a revised judgement, Yield a reflection - is proposed as a classroom model for grades 1–4. The article argues that digital and AI tools can support inquiry only when pupils retain responsibility for questioning, verification and final judgement. Practical examples for mathematics, reading, science and language lessons are provided.

Keywords: independent thinking, primary school, evidence-based reasoning, metacognition, AI literacy, human agency, source verification, formative assessment

Introduction

Independent thinking in the primary grades is often associated with a child completing an exercise without adult assistance. Such a definition is too narrow for contemporary education. A pupil may work alone and still reproduce a memorized procedure, while another pupil may ask a productive question, compare two explanations and revise an earlier answer with evidence. The second case demonstrates a deeper form of independence because the learner assumes intellectual responsibility for the route from question to conclusion.

The information environment in which children learn has also changed. Search engines, video platforms and generative AI can produce immediate explanations, examples and answers. Consequently, the educational problem is no longer limited to helping pupils obtain information. Children increasingly need age-appropriate habits for deciding what deserves trust, what requires checking, what remains uncertain and what must be explained in their own words. UNESCO’s AI Competency Framework for Students emphasizes a human-centred approach, critical judgement, ethical use and human accountability when learners interact with AI systems (UNESCO, 2024). These ideas make independent thinking a question of agency as well as cognition.

Main Part

1. From “Working Alone” to Intellectual Agency

In this article, independent thinking is understood as intellectual agency: the learner participates actively in defining a problem, choosing a strategy, checking information and taking responsibility for a reasoned conclusion. Four observable actions are especially useful in primary education: generating an initial idea, giving a reason for it, testing the idea against evidence, and changing it when the evidence requires revision. This definition avoids equating independence with

stubbornness. A child who never changes an answer is not necessarily thinking independently; the stronger indicator is the ability to explain why an answer should be retained or revised.

Age-appropriate intellectual agency can be developed with concrete contrasts. In mathematics, the teacher may show two worked solutions and ask pupils to locate the step where they begin to differ. In reading, pupils may compare two interpretations of a character’s action and point to sentences that support each interpretation. In science, children may predict which material will absorb more water, record observations, and then compare the prediction with the result. The recurring pattern is judgement followed by verification.

2. A VERIFY Cycle for Primary-School Reasoning

To translate independent thinking into classroom practice, this article proposes a six-step VERIFY cycle. V - Voice an initial idea: the pupil states what he or she currently thinks. E - Examine the source: the learner identifies where the information came from - a text, observation, peer, teacher, website or AI tool. R - Relate evidence: the learner connects a fact, example, calculation or observation to the claim. I - Identify uncertainty: the pupil marks what is not yet known or what needs checking. F - Form a revised judgement: the learner keeps, modifies or rejects the initial idea. Y - Yield a reflection: the pupil briefly explains what changed in the reasoning process.

The cycle is intentionally simple enough to be represented with icons or sentence starters. Younger pupils may use “I think... / I saw... / My evidence is... / I am not sure about... / Now I think...”. Older primary pupils can record the same process in a short reasoning log. The purpose is not to add a complicated procedure to every task, but to make invisible thinking visible at selected moments. Over time, external prompts can be reduced as pupils internalize the sequence.

3. Metacognitive Control: Knowing When to Continue, Check, or Change

Independent thinking depends on more than knowledge of a subject; it also requires monitoring one’s own approach. Metacognition involves awareness and regulation of cognitive activity (Flavell, 1979). In practical primary-school terms, this means that pupils learn to pause before acting, notice whether a strategy is working, and evaluate the quality of an answer after completing a task. These actions can be taught explicitly rather than expected to emerge automatically.

A short three-moment routine can be embedded across subjects. Before work, pupils identify the goal and select a possible strategy. During work, they ask whether the strategy is producing useful information. After work, they check the answer against the task and identify one reason for confidence or doubt. The routine is particularly valuable when a task has more than one possible route, because pupils must compare not only answers but also the efficiency and reliability of strategies.

4. Independent Thinking When Information Is Generated by AI

Generative AI creates a distinctive educational challenge because fluent language can make an answer appear authoritative even when it is incomplete, unsuitable for the learner’s age, or factually wrong. Primary pupils therefore need a simple principle: a generated answer is information to examine, not a conclusion to borrow. UNESCO’s framework places human agency and critical engagement at the centre of student AI competency and stresses that learners should understand, apply and eventually create with AI while maintaining ethical and human-centred judgement (UNESCO, 2024).

An age-appropriate activity can use a teacher-prepared AI response rather than unrestricted independent access. For example, pupils receive a short paragraph about an animal or natural phenomenon. They underline claims that can be checked in the textbook, circle statements that need

another source, and place a question mark beside unclear information. They then write a corrected two-sentence explanation in their own words. In this design, AI is not the authority and not the author of the pupil’s final response; it becomes an object for critical examination.

5. Designing Evidence-Rich Tasks Across the Curriculum

Tasks develop independence when they contain a genuine decision point. A mathematics task can ask pupils to choose between two solution strategies and justify the more transparent route. A reading task can require them to distinguish a statement explicitly supported by the text from an inference. A language task can present two versions of a sentence and ask which communicates the intended meaning more precisely. A science task can begin with competing predictions and require observation before a conclusion is accepted.

The teacher can strengthen these tasks by varying the evidence available. Sometimes all necessary information should be present in one text; at other times pupils should compare a diagram and a paragraph, an observation and a claim, or two short sources that do not completely agree. Such variation teaches an important intellectual habit: confidence should depend on the quality of evidence rather than on how quickly an answer appears.

6. Formative Assessment of Reasoning

If assessment rewards only the final correct answer, pupils may learn that the path to the answer is invisible and unimportant. Assessment for independent thinking should therefore capture selected features of reasoning. A compact classroom rubric can examine four indicators: the pupil states a relevant idea, gives supporting evidence, recognizes uncertainty or an alternative, and explains a final judgement. These indicators can be observed in oral discussion, notebooks, exit tickets and short inquiry tasks without turning every activity into a formal test.

Feedback should describe the next reasoning move rather than merely label performance. Comments such as “show the evidence for this sentence,” “compare your first and second strategy,” or “what would make you change this conclusion?” direct attention to thinking processes. Peer feedback can use the same language, provided that pupils are taught to challenge ideas respectfully rather than evaluate classmates personally. This keeps the classroom psychologically safe while increasing intellectual accountability.

7. Conditions, Risks, and Pedagogical Boundaries

Digital innovation does not automatically produce independent thinkers. Independence may actually decrease when pupils routinely accept the first search result, copy generated text, or use automated tools before attempting a problem. The same risk exists in non-digital lessons when teachers explain every step, correct answers immediately, or permit only one rehearsed method. The common problem is premature transfer of intellectual responsibility away from the learner.

A sustainable approach therefore uses technology selectively. The teacher decides when a digital or AI tool adds a meaningful comparison, simulation, feedback opportunity or source for evaluation, and when paper, manipulatives, observation or discussion is more appropriate. For younger children especially, safeguarding, privacy, developmental suitability and teacher mediation must remain central. The goal is not early dependence on AI; it is the gradual formation of judgement that remains useful regardless of which technology is available.

Conclusion

Independent thinking in primary education can be strengthened by shifting attention from solitary task completion to evidence-based intellectual agency. In the contemporary information environment, pupils need repeated opportunities to make an initial judgement, identify the source of information, connect claims with evidence, acknowledge uncertainty, revise conclusions and reflect on the reasoning process. The proposed VERIFY cycle provides one practical way to organize these

actions without separating thinking skills from subject learning. Metacognitive routines and carefully mediated AI examples can further develop pupils’ capacity to monitor their own strategies and question apparently convincing information. The teacher’s task is therefore not to remove guidance, but to design guidance that progressively transfers responsibility for questioning, verification and judgement to the learner. Such an approach prepares primary pupils not merely to produce answers, but to understand why an answer deserves to be accepted.

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