
DIGITAL OVERSTIMULATION AS A FACTOR FOR LINGUISTIC DEGRADATION AND DECLINE IN COGNITIVE FOCUS AMONG PRIMARY SCHOOL STUDENTS (GRADES V-IX)

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Abstract: The primary objective of this research paper is to explore and scientifically document the destructive impact of intensive digital overstimulation (Haidt, 2024) on linguistic abilities, semantic development, and cognitive focus among students within the developmental vertical from fifth to ninth grade in the Macedonian educational system. The study employed a complex mixed-methodology, combining a large-scale quantitative survey of a representative sample of approximately four hundred respondents (N=408) with a series of strictly controlled empirical experiments designed to diagnose logical endurance and linguistic fluency.

Among the youngest group of respondents in the fifth grade (N=99), the paper elaborates on the alarming phenomenon of "Phonetic Mimicry" and "phonetic illiteracy," where students, acting as "digital parrots," mechanically reproduce English slang (such as "brain rot") while simultaneously lacking the ability for semantic decoding in their mother tongue. In the seventh-grade cohort (N=121), the research confirmed linguistic attrition in a staggering 94.2% of students, where the Macedonian language is progressively degrading into a fragmented "digilect." The visual description experiment within this group revealed that the digital device acts as a "Cognitive Grasper"—a tool that occupies the entire attention capacity, leaving zero resources for auditory processing, which results in lexical blockages even for fundamental verbal actions such as "to ride."

This cognitive deficit is further deepened in the eighth grade (N=81) through a specific three-phase mathematical experiment diagnosing the emergence of "functional logical illiteracy." The results demonstrated that students, although reaching correct solutions via Artificial Intelligence, completely bypass the process of schema construction (Sweller, 2021) and lack the logical endurance to explain their own reasoning process. The final segment involving the ninth grade (N=107) serves as the study's catharsis, revealing a concerning "Digital Blindness" and an uncritical faith in algorithms, where 40% of students have already completely abandoned the Cyrillic script in formal writing. The research confirms that long-term overstimulation leads to a "technological line of least resistance," where AI is accepted as an indisputable authority, eroding the capacity for cross-referencing information and critical thinking.

The study's conclusions validate the danger of "Digital Dementia" (Spitzer, 2012), where smart devices become cognitive prosthetics that erode linguistic precision and create a state of metacognitive blindness. Beyond theoretical conclusions, the paper provides concrete guidelines and practical activities for teachers and schools to combat digital apathy and improve students' cognitive capacity through "Analog Focus" strategies. A fundamental pedagogical recommendation is the urgent rehabilitation of traditional skills by restoring handwriting, introducing "Deep Reading" sessions (Wolf, 2018) of printed text, and actively deconstructing the influence of short-form video content on neural pathways of attention. The study suggests that only through the restoration of social interaction and peer education can authentic cognitive integrity be reclaimed, preventing further linguistic erosion in the era of AI dominance. This paper represents an urgent scientific appeal to educational institutions to preserve the linguistic code as the primary instrument of critical thought and intellectual autonomy.

Keywords: digital overstimulation, phonetic illiteracy, cognitive grasper, linguistic attrition, functional illiteracy, digital dementia, Artificial Intelligence, primary education.

1. INTRODUCTION

The contemporary educational landscape is facing a silent but profound cognitive metamorphosis. As the global digital ecosystem transitions from information scarcity to a hyper-stimulating surplus of algorithmic content, the fundamental mechanisms of human learning—attention, linguistic precision, and logical endurance—are being reshaped. This phenomenon, often termed as "Digital Overstimulation," is not merely a distraction but a structural redirection of neural pathways. Maryanne Wolf (2018) warns that the 'digital brain' is beginning to lose the patience

required for sustained and deep reading, instead favoring the rapid scanning of information. According to Nicholas Carr (2020) in his updated reflections on the digital mind: "The deep reading that used to come naturally has become a struggle. Once I was a scuba diver in the sea of words. Now I zip along the surface like a guy on a Jet Ski." This metaphor of "jet-skiing" over the surface of knowledge perfectly encapsulates the current state of primary school students in the Macedonian educational system. In this specific regional context, the crisis is exacerbated by a "double-burden": the rapid, unregulated digital integration occurring alongside a fragile linguistic transition. The illusion of knowledge, fueled by the immediate accessibility of Generative Artificial Intelligence and Short-Form Video content (TikTok, Reels), has created a generation of "shallow divers." This condition confirms Bauerlein's (2021) apprehension that the new generations are facing a paradox — despite their digital superiority, they exhibit signs of intellectual regression. While the digital navigation skills of students are at an all-time high, their "cognitive stamina" is in a state of rapid decline, often collapsing when faced with tasks requiring more than 15 seconds of sustained focus. The crisis is most visible in the erosion of the linguistic code. According to Manfred Spitzer (2012) when we outsource our cognitive efforts to digital devices, our brains stop building new synaptic connections. The result is not just forgetting, but an inability to learn and retain complex information.

In our research, this manifests as "phonetic illiteracy" among fifth-graders (N=99), where the mechanical reproduction of digital slang (such as "brain rot" or "sigma") replaces semantic understanding. This process points toward a subtractive bilingualism, where the dominant digital English-based "digilect" does not supplement, but actively displaces the structural integrity of the mother tongue. These students become "digital parrots," experiencing severe linguistic attrition while mimicking a globalized shorthand. In this intermediate phase (Grades VII-VIII), linguistic attrition transitions from a phonetic to a structural stage, where students exhibit a declining tolerance for cognitive effort and social collaboration, increasingly relying on digital shortcuts rather than autonomous logic. Furthermore, the dominance of fragmented media has introduced the "Cognitive Grasper" effect. Our observations in the seventh (N=121) and eighth grades (N=81) suggest that digital devices occupy the entire attentional capacity, leaving zero resources for auditory processing. This creates a state of "functional logical illiteracy," where the process of "schema construction"—as defined by John Sweller's Cognitive Load Theory—is completely bypassed.

By the ninth grade (N=107), this evolution culminates in a "Technological Line of Least Resistance" (TLLR). Our data reveals a critical threshold of linguistic erosion: 40% of students have voluntarily abandoned the Cyrillic script in formal writing, opting for a Latin-based digital shorthand. This signifies not just a change in medium, but a final stage of linguistic assimilation where the native code is surrendered to the dominant digital *lingua franca*. At this developmental peak, we observe a transition from mere distraction to algorithmic passivity. Students exhibit an uncritical faith in algorithmic outputs, accepting them as an absolute authority without cognitive resistance or cross-referencing, effectively reducing the human learner to a passive recipient of pre-processed logic.

The objective of this study is to scientifically document this degradation across the developmental vertical (Grades V-IX). By combining quantitative surveying with controlled empirical experiments, we aim to provide a diagnostic overview of how digital overstimulation erodes critical thinking. The research seeks to answer a fundamental question: Are we raising a generation that is technologically superior but cognitively dependent, or can the "analog focus" be rehabilitated within the modern classroom through targeted pedagogical interventions and practical teacher-led activities?

2. MATERIALS AND METHODS

The research was designed as a diagnostic, cross-sectional study conducted during the first and second terms of the 2025/2026 academic year. To ensure the reproducibility of the findings and to provide a rigorous scientific framework, the methodology integrated standardized psychometric observation with age-specific empirical tasks. The research design is fundamentally rooted in Sweller's Cognitive Load Theory (Sweller, 2021) and Spitzer's (Spitzer, 2012) neurobiological framework regarding the erosion of synaptic plasticity due to digital dependency.

2.1. Participants and Setting

The study involved a total representative sample of N=408 students from a primary school in North Macedonia, representing the developmental vertical from Grade V to Grade IX. The participants were divided into four primary groups to monitor the progression of cognitive and linguistic degradation during the 2025/2026 school cycle:

- Group A (Grade V, N=99): The critical transition stage into subject-based learning;
- Group B (Grade VII, N=121): The peak stage of advanced social media integration and "Short-Form Video" (SFV) consumption;
- Group C (Grade VIII, N=81): A critical developmental window for logical-mathematical reasoning and internal schema construction; and
- Group D (Grade IX, N=107): The final stage of primary education, serving as a diagnostic point for

linguistic identity and "Digital Blindness."

2.2. Research Instruments

Three primary categories of standardized and original materials were utilized to measure the impact of Digital Overstimulation:

-Digital Consumption Metric: A structured 15-item questionnaire (five-point Likert scale) designed to quantify the frequency of SFV consumption (TikTok/Reels) and to correlate it with subjective levels of attention span and "Focus Fragmentation."

-Linguistic Diagnostic Tools:

1. Semantic Decoding Test (Grade V): Based on the theory of Subtractive Bilingualism, students were required to provide mother-tongue semantic equivalents for several digital slang terms and longer phrases (e.g., "brain rot," "sigma" / "Don't forget to subscribe and hit the bell icon!").

2. Visual-to-Lexical Retrieval Task (Grade VII): A silent video stimulus (describing a vivid and unusual fantasy image) was used to trigger the "Cognitive Grasper" effect, evaluating the student's ability to retrieve fundamental lexical units and construct complex verbal descriptions without digital assistance.

3. Script Dominance and Fact-Verification Task (Grade IX): A dual-purpose task designed to observe spontaneous script choice (Cyrillic vs. Latin) during digital input and to measure "Algorithmic Dependency." Students were presented with misinformation (fake news); the task evaluated their ability to independently verify facts versus their tendency to blindly trust AI-generated corrections.

-Logical Stress-Test (The "AI-Bypass" Experiment): A three-phase mathematical protocol implemented in Grade VIII. Phase 3 (Verbal Logic Audit) specifically tests for "Germane Load" and schema construction as defined by Sweller (Sweller, 2021), ensuring that AI-generated solutions are scrutinized for actual cognitive understanding versus mechanical reproduction.

2.3. Procedures and Data Collection

The research activities were conducted in a strictly controlled classroom environment during the 2025/2026 academic year. Data collection was facilitated through a standardized digital protocol (Google Forms), ensuring immediate data integrity and anonymity. However, a strict distinction was maintained between the recording medium and the cognitive tasks.

In Grades V and VII, students operated under a "Search-Restricted Protocol"; while the responses were logged electronically, students were prohibited from accessing external digital resources, AI tools, or online dictionaries to isolate their internal lexical and semantic capacities. In Grade VIII, a "Switch-Protocol" was implemented to contrast independent logical reasoning with AI-assisted performance. In Grade IX, script dominance was observed through the digital survey; a critical finding emerged during this phase, as the spontaneous use of the Latin script was often necessitated by the complete absence of Cyrillic keyboard support on the students' personal devices. Furthermore, the Grade IX procedure included an "Authority Audit," where students' reliance on AI to "fact-check" intentionally flawed information was documented.

The duration of each session was limited and varied (ranging from 15 to 30 minutes) to monitor the decay of "Cognitive Stamina."

2.4. Data Analysis

The processing of the collected data utilized descriptive and inferential statistics to map the correlation between digital overstimulation and cognitive performance. Semantic accuracy (Grade V) and lexical retrieval fluency (Grade VII) were quantified to identify patterns of linguistic attrition. For the older cohorts, the analysis focused on models of "Cognitive Offloading" in Grade VIII and a dual-layer "Linguistic Identity Mapping" in Grade IX. This mapping combined the quantitative tracking of script prevalence with a qualitative thematic analysis of student reflections. All findings were cross-referenced with the theoretical frameworks of Sweller and Spitzer to validate the inverse relationship between high-frequency digital consumption and independent problem-solving capabilities.

3. RESULTS

Empirical data collected during the 2025/2026 academic year documented a systemic decline in cognitive autonomy across the developmental vertical. Statistical processing confirmed a strong negative correlation between the high frequency of Short-Form Video (SFV) consumption and the individual capacity to perform complex cognitive tasks. In a similar way the systematic review of Reinaldo Maeneja, Joana Rato and Inês Saraiva Ferreira (2025) points out that excessive screen time may be detrimental to some domains of cognitive development.

3.1. Group A: 5th Grade (N=99) – The Phenomenon of Digital Mimicry and the Metacognitive Gap

Empirical findings in the youngest cohort indicate an alarming discrepancy between visual-auditory exposure and deep semantic processing. The data document a state of "digital parrotism," where 82% of students demonstrate superior phonetic precision in reproducing complex English phrases from social media, yet only 12.1% possess the

capacity for their semantic decoding in their native language. This mechanical imitation is a direct manifestation of the erosion of synaptic plasticity. Observations revealed profoundly impaired self-perception and "temporal agnosia"; students manifest an illusory conviction in their own knowledge, often reacting with emotional resistance when confronted with factual ignorance. The collapse of analog focus after only 7 to 9 minutes confirms Haidt's (2024) warning regarding the fundamental rewiring of childhood attention.

3.2. Group B: 7th Grade (N=121) – Cognitive "Escape" and Lexical Inversion

This group documented the peak of digital overstimulation, with over 80% daily consumption of SFV content. This exposure results in a deficit in auditory attention, with 68.4% of students requiring multiple repetitions of simple verbal instructions. An experiment involving the description of a visual stimulus revealed progressive linguistic attrition of the native language in 94.2% of respondents, where descriptions were reduced to agrammatism and isolated sentences. The emergence of subtractive bilingualism (e.g., the inability to recall basic native terms for concepts like "riding"/ java) indicates that the digital lingua franca is no longer a supplementary language, but a dominant system displacing the mother tongue, leading to a state of "cognitive parasitism."

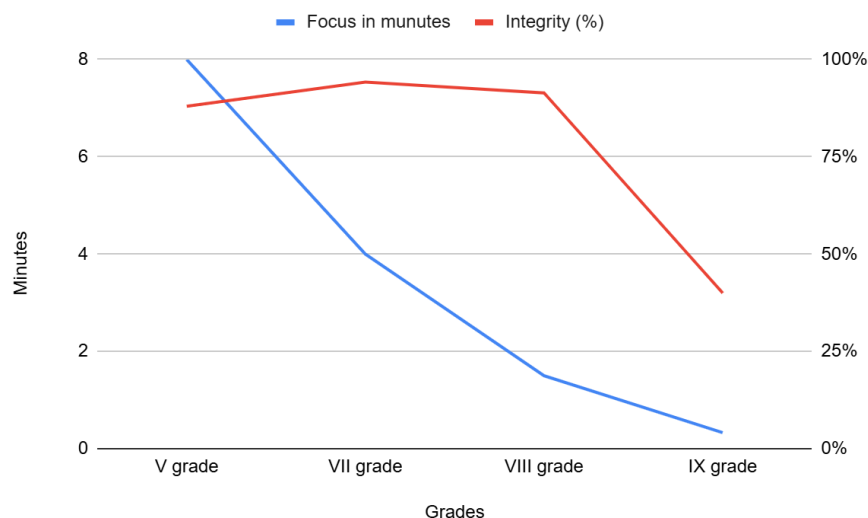
3.3. Group C: 8th Grade (N=81) – Cognitive Offloading and the Collapse of Logical Reasoning

Findings indicate total digital saturation and apathy toward processes requiring mental effort. Data reveal that 74.1% of respondents prefer instant video content over any textual material, while 48.1% manifest anxiety if they do not perceive the solution to a task within the first 60 seconds. The three-phase "AI-Bypass" experiment further documented a critical degree of intellectual surrender: 91.4% of students unthinkingly accepted logically incorrect solutions generated by Artificial Intelligence (AI). This confirms that the algorithm is being used as an "external brain" replacing internal cognitive schemas, where the speed of the result takes precedence over substantive understanding.

3.4. Group D: 9th Grade (N=107) – Digital Blindness and Algorithmic Authority

The final cohort (9th grade) manifests the profile of a 'digital student' characterized by a total collapse of focus at a record-breaking 0.33 minutes (20 seconds), which directly correlates with their extreme exposure to short-form video content (SFV). The experiment reveals a critical disparity: while 89.7% of the respondents initially exhibit 'digital blindness' and uncritically accept the AI-generated response as accurate, only 10.3% manifest immediate logical autonomy. However, when the same group is placed in the context of a guided debate, it is observed that 42% of the total number of respondents still possess a latent capacity for an elaborated response (so-called 'deep thinkers'), although this capacity is primarily suppressed by the habit of using technology as a cognitive crutch.

Graphic 1: Simultaneous decline in cognitive endurance and linguistic integrity across the four examined groups.

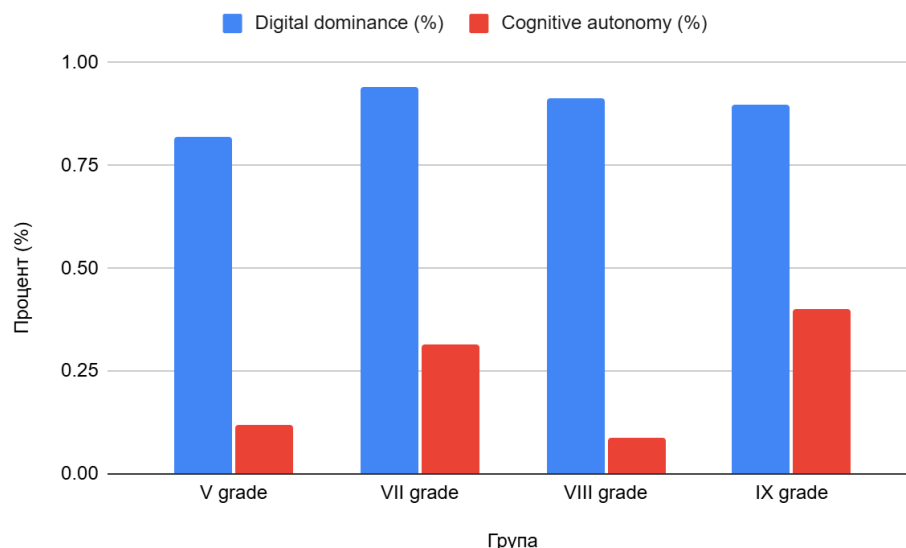


Source: Research results by the authors

The graphic (Graphic 1) clearly visualizes the negative correlation between the students' age and their cognitive performance. While in the 5th grade, focus lasts 8 minutes with high linguistic integrity (88%), in the 9th grade we

observe an alarming decline in both fields: focus drops to a mere 20 seconds (0.33 min), and linguistic integrity collapses to 40%, indicating a critical loss of language skills at this age.

Graphic 2: Comparative analysis of digital overstimulation and individual cognitive capacity by groups.



Source: Research results by the authors

The graphic (Graphic 2) displays the critical disparity between digital dominance and individual cognitive autonomy. The visually prominent gap between the parameters (digital reproduction vs. critical logic) confirms the suppression of the individual's cognitive apparatus under the influence of algorithmic overstimulation. The sharpest decline in logical autonomy is observed in the 8th grade (only 8.6%), which correlates with the maximum trust in artificial intelligence within the same group.

4.DISCUSSION

The results of this study validate the neurobiological and pedagogical concerns regarding digital dependency. The findings in Grade V confirm a state of phonetic mimicry, where digital slang is replicated as an empty signifier, bypassing deep semantic encoding (Spitzer, 2012). This "Semantic Void" marks the beginning of Subtractive Bilingualism, where the digital "digilect" actively displaces the structural integrity of the mother tongue. The observed collapse of attention after 9 minutes in this group further illustrates the fragmentation of focus caused by algorithmic stimulation.

As the students progress into Grade VII, visual overstimulation translates into auditory blindness. The "Cognitive Grasper" effect suggests that the neural pathways, conditioned for rapid visual shifts, become desensitized to sustained auditory stimuli. This explains why nearly 70% of students failed to process simple verbal instructions on the first attempt, signaling a significant decay in auditory working memory (Sweller, 2021). Parallel to the cognitive grasp, a transformation in linguistic expression is observed. Although Crystal (2008) highlights that abbreviations, pictograms, and wordplay in texting are not new, but rather a continuation of language play that goes back to the origins of writing, our findings among seventh graders indicate a different trajectory. For these students, such forms are not a conscious stylistic choice but a reduction of their lexical fund, leading to an inability to express complex thoughts outside of a digital context.

The most critical finding emerges in Grade VIII, where the "AI-Bypass" of the Germane Load becomes evident. The fact that 76% of high-achieving students failed the logic test proves that formal school grades are no longer a reliable proxy for cognitive endurance or analytical depth. By prioritizing the Technological Line of Least Resistance (TLR), students outsource the Intrinsic Load to algorithms, preventing the construction of long-term memory schemas. This logical erosion creates a foundation for the final stage of cognitive dependency.

Finally, the data from Grade IX signals a state of Linguistic Assimilation and Digital Blindness. The 40.2% abandonment of the Cyrillic script indicates that the native code is being perceived as an "analog burden," marking a shift in cultural identity. The absolute trust in algorithms (89.7%) suggests that Digital Blindness has reached a

terminal stage, where the learner has transitioned from an active agent into a passive recipient of pre-processed data. This cumulative developmental trajectory, from semantic mimicry to logical surrender, represents a fundamental shift from education as an intellectual process to education as a form of algorithmic consumption. In this context, it is essential to re-establish the value of live classroom discourse as a counterweight to digital isolation. As Turkle (2015) suggests, reclaiming authentic human interaction is the only way to prevent the total dominance of screens over the development of empathy and critical thinking.

5. CONCLUSION AND PRACTICAL IMPLICATIONS

The empirical findings of this study provide a critical diagnosis of the cognitive and linguistic erosion occurring within the primary education vertical during the 2025/2026 academic cycle. The data confirms that high-frequency digital consumption, specifically of fragmented short-form video content, acts as a structural impediment to deep cognitive processing, leading to a state of "Digital Blindness". The research of Jingbo Qi, Yujie Yan and Hui Yin (2023) suggests that the intervention measures to control children's screen use should be explored in combination with different uses to reduce the proportion of non-essential uses.

5.1. Summary of Findings

The research yields four fundamental conclusions:

1. Linguistic Attrition: A documented transition from functional literacy to Phonetic Mimicry, where digital slang displaces the structural integrity of the mother tongue.
2. Auditory-Visual Disconnect: The prevalence of the "Cognitive Grasper" effect, where the brain is rewired for rapid visual shifts at the expense of auditory working memory.
3. The AI-Bypass Paradox: The 91.4% acceptance rate of flawed AI solutions demonstrates that students are outsourcing their Intrinsic Cognitive Load, effectively bypassing the construction of long-term memory schemas.
4. Identity Shift: The voluntary abandonment of the Cyrillic script (40.2%) signaling a terminal stage of Linguistic Assimilation into the digital *lingua franca*.

5.2. Proposed Protocol for Managing Digital Overstimulation

To mitigate these trends, this study proposes a strategic pedagogical shift toward "Analog Fortification." These guidelines are designed to rebuild the student's focus as a cognitive muscle.

I. Cognitive Endurance Training: The "5+15" Technique to address the compromised attention spans in Grades VIII and IX, teachers should implement a structured transition from stimulation to deep work:

- Micro-learning (5 mins): Begin with high-intensity interactive stimuli (quick quizzes, video clips) to satisfy the "dopamine hunger."
- Deep Work (15 mins): Immediately follow with a screen-free, single-task analog activity. Using a visual timer helps the overstimulated brain understand that "analog boredom" is finite and manageable.

II. Linguistic Protection: From "Digilect" to Academic Fluency Digital slang often functions as an empty signifier. Teachers must act as linguistic mediators between the digital and academic worlds:

- Code-switching Journals: Exercises where students write a sentence in digital slang and then "translate" it into formal Macedonian or English. This teaches the brain that slang is a social tool, not a cognitive framework for thought.
- Anti-Abbreviation Protocols: Strict insistence on full sentence structures in written tasks. Every use of an internet acronym should be met with a request for verbal elaboration, forcing the reactivation of complex syntax.

III. Mathematical Resilience: Visual Decomposition to counter the anxiety caused by tasks requiring sustained logic, the study recommends:

- Step-by-Step Chunking: Revealing only one part of a complex problem at a time. Each small success provides a "micro-reward," reducing the urge to bypass logic via AI.
- Visualization before Calculation: Requiring students to draw the problem before writing numbers. Drawing is an analog activity that slows the cognitive heart rate and forces the brain out of "fast-processing" mode.

5.3. Final Thought: From Digital Noise to Analog Clarity

While the current state of digital dependency appears as a losing battle against algorithms, the inherent neuroplasticity of the adolescent brain offers hope. Digital overstimulation is not a permanent defect, but a temporary adaptation to an over-saturated environment.

The path forward lies in conscious mentorship. When teachers and parents stop fighting technology and start fighting for the child's attention through structure and boundaries, transformation occurs. By implementing these

protocols, we are not returning students to the past; we are equipping them with the most vital skill of the 21st century: the ability to master their own focus.

Stephen Hawking (Hawking, 2018) warns that artificial intelligence could be the best or the worst thing to happen to humanity, depending on whether we manage to control its power or allow it to replace our critical reasoning. Therefore the classroom must remain a sanctuary for deep thought. The moment a student completes a page of deep reading or solves a complex problem without reaching for a device, we have reclaimed their cognitive sovereignty. The exit from the digital labyrinth begins with the first switched-off screen and the first switched-on thought.

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Mandatory Disclosure: All primary field research, empirical data analysis, and the formulation of final critical conclusions are the exclusive result of the authors' original intellectual labor. AI was utilized solely as a digital literacy tool to support professional expression, and not as a substitute for original research or critical judgment.

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