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REVIEW

Scrolling Less, Learning More: Nudging Strategies to Reclaim Students' Attention from Social Media Distractions in the Age of TikTok: A Scoping Review

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ABSTRACT: Background: The pervasive use of short-form video platforms such as TikTok has introduced unprecedented challenges to student attention, cognitive self-regulation, and academic performance. Recent interest has grown around "nudging" strategies, or non-coercive behavioral interventions, to help students regain control over their digital habits in educational settings. This review aims to (1) synthesize recent empirical evidence on the attentional and academic impact of problematic social media use (particularly TikTok) among students, (2) identify and classify nudging strategies that mitigate these effects, and (3) evaluate their relative effectiveness and practical application in educational contexts. **Methods:** A scoping review was conducted on studies published between 2020 and 2024. Search terms included combinations of "social media", "attention", "nudge", and "academic performance" across databases such as Scopus and Web of Science. Of 142 records identified, 15 studies met eligibility criteria, including 7 empirical interventions using nudging techniques. Data extraction focused on intervention type, theoretical rationale, outcomes, and focus gain. **Results:** Across interventions, temporal/commitment nudges improved attendance and on-task engagement, with grade gains for goal-setting in one classroom experiment. Environmental nudges that reduce cue salience (e.g., notification filtering, grayscale) and choice-based bundles of micro-strategies reduced screen time/problematic use and improved sleep in a randomized trial; grayscale also reduced daily phone use in experimental tests, though some users disliked its aesthetics. Cognitive/reflective supports were qualitatively associated with better management of checking urges. Observational and longitudinal studies clarified mechanisms and correlates, informing what nudges should target. Multi-component, autonomy-preserving designs showed the most consistent benefits. **Conclusions:** Nudging strategies offer a promising path to reclaim student attention in the digital age. Educators and technologists should prioritize adaptive, customizable, and ethically designed interventions to promote intentional engagement and digital well-being. Future studies should explore long-term efficacy, personalization through Artificial Intelligence, and cultural variability in nudge receptivity.

KEYWORDS: Nudging; attention; social media; TikTok; academic performance; distraction

1 Introduction

Over the past decade, digital media platforms have reshaped how students engage with learning, with notable implications for sustained attention and self-regulated study. The exponential rise of short-form video applications like TikTok has introduced new challenges to sustained attention, self-regulated learning, and academic performance. While the educational potential of social media has been explored in certain contexts [1], increasing concern surrounds its capacity to fragment attention and encourage compulsive usage, especially during study periods [2,3].

TikTok's unique combination of endless scrolling, highly personalized algorithmic feeds, and emotionally engaging content produces a powerful cognitive lure, engaging reward-sensitivity mechanisms in ways that can resemble patterns observed in behavioral addictions [4,5]. Unlike earlier platforms, TikTok's design exploits attentional vulnerabilities more efficiently, fostering compulsive checking behaviors, distorted time perception, and decreased tolerance for boredom [6,7]. These mechanisms are particularly disruptive in educational contexts where sustained, deliberate cognitive effort is essential.

Numerous studies have linked high-frequency TikTok or Instagram use to negative academic outcomes, including lower Grade Point Average (GPA), increased procrastination, and reduced metacognitive awareness [8,9]. Some of these effects are mediated by emotional factors such as boredom, distress intolerance, or Fear of Missing Out (FoMO) [3,10], while others result from direct attentional interference. In either case, the result is a net loss in students' ability to control their study environments and focus on long-term goals. The psychological mechanisms underpinning Problematic Social Media Use (PSMU), and particularly Problematic TikTok Use (PTU), have been studied extensively. Brand et al.'s [5] Interaction of Person-Affect-Cognition-Execution (I-PACE) model provides a compelling framework, positing that the interaction of affective, cognitive, and executive function deficits—amplified by personalized digital affordances—leads to addictive patterns of engagement. According to this model, environmental triggers like social notifications or trending video content elicit affective responses (curiosity, anxiety, FoMO), which then activate maladaptive cognitive schemas and executive function lapses, culminating in compulsive behavior. The fast-feedback structure of TikTok fits this model almost perfectly.

Furthermore, the cognitive impact of these platforms is not confined to users with diagnosed attention disorders. Recent studies suggest that even neurotypical users exhibit temporary attention deficit hyperactivity disorder (ADHD)-like symptoms, including heightened distractibility, impulsivity, and mental fatigue, following prolonged exposure to high-stimulus digital environments [11,12]. This has led some scholars to caution against medicalizing attention difficulties without first examining their digital roots [13,14]. In parallel, there has been growing interest in the use of "nudging" strategies—light-touch behavioral interventions based on insights from behavioral economics and cognitive psychology—to steer users toward healthier digital habits without resorting to coercion or bans [13,15]. Nudging is particularly relevant in educational settings, where autonomy and engagement are pedagogical imperatives. Nudges can take various forms, including digital timers, visual friction (e.g., grayscale filters), social accountability prompts, or structured reflection. Several empirical studies have tested such interventions with promising results [7,16,17].

Despite this emerging literature, systematic reviews connecting the effects of social media on students' attention with nudging-based intervention frameworks remain scarce. Most existing studies either address the cognitive or behavioral dimensions of PTU in isolation or test nudging strategies in broader contexts without focusing specifically on education. Moreover, while the efficacy of individual nudges (e.g., Pomodoro timers or lockout apps) has been studied, less attention has been given to how these tools interact with different psychological profiles or learning environments.

1.1 Theoretical Underpinnings

The theoretical framework for this review combines perspectives from self-regulated learning [17], behavioral economics [15], and digital addiction studies [5]. Self-regulated learning emphasizes the cyclical process of setting goals, monitoring progress, and adjusting strategies—all of which require sustained attention and executive control. Social media platforms, by contrast, promote reactive rather than reflective engagement, undermining students' ability to self-regulate.

Following Thaler and Sunstein, a "nudge" is any aspect of the choice architecture that predictably alters behavior without forbidding options or significantly changing economic incentives; it preserves autonomy while steering decisions toward long-term goals [13,15]. In educational contexts, nudges operate by modulating salience (e.g., notification filtering), defaults (e.g., distraction-free modes on by default), friction and micro-delays (e.g., brief confirmation prompts before opening TikTok), feedback (e.g., usage dashboards), and goal scaffolding (e.g., Pomodoro cycles embedded in Learning Management System).

Theoretically, nudges leverage dual-process models of cognition by interrupting automatic, cue-driven responses and re-engaging reflective control; they can be mapped onto self-regulated learning cycles (goal setting → monitoring → strategic adjustment) and, in parallel, counteract I-PACE pathways by reducing affective triggers and executive depletion [5,17].

Practical exemplars used in this review's evidence base include: (a) temporal nudges (Pomodoro timers, scheduled lockouts, time-on-task dashboards); (b) environmental nudges (grayscale mode, notification filters, distraction-free configurations); (c) cognitive nudges (commitment prompts, intention journaling, self-monitoring micro-surveys); and (d) social nudges (peer accountability, visibility of focus behaviors). To maintain ethical integrity, educational nudges should be transparent, opt-out, and autonomy-supportive, avoiding manipulative design while maximizing informed choice [13,14].

Nudging operates in the space between autonomy and structure. It does not seek to remove choice but to shape the "choice architecture" so that students are more likely to act in accordance with long-term goals [13]. This makes it ideally suited for interventions in educational settings, where outright prohibition may be impractical or counterproductive.

1.2 Importance and Relevance

This study is particularly timely given the persistent digital immersion of students following the COVID-19 pandemic. Remote learning intensified reliance on personal devices, while also blurring the boundaries between educational and entertainment applications. As digital dependency increases, so too does the urgency of designing scalable, ethically sound, and pedagogically valid interventions to foster attention and deep learning.

Moreover, the growing body of literature on the neurocognitive consequences of algorithmically curated media [2,18] suggests that these challenges will not disappear with platform changes. On the contrary, new iterations of short-form media are likely to intensify the very mechanisms (dopaminergic feedback loops, time distortion, and information overload) that threaten students' cognitive stability.

This review also responds to a wider call within mental health promotion to address digital risks in youth populations not only through clinical or therapeutic means but via preventive, environmental, and educational interventions [10,19]. Nudging offers one such preventive approach—one that can be integrated seamlessly into digital infrastructures or classroom practices without infringing on autonomy.

1.3 Study Objectives

This review aims to: (1) synthesize recent empirical evidence on the attentional and academic impact of problematic short-form social media use (with a focus on TikTok) among students; (2) identify and classify nudging strategies (temporal, environmental, cognitive, and social) that mitigate these effects; (3) evaluate their relative effectiveness, acceptability, and feasibility in educational contexts (secondary, undergraduate, postgraduate); and (4) derive practical implementation guidelines and ethical considerations for educators and platform designers.

2 Methods

This review adopts a structured narrative approach to synthesize empirical research on the impact of social media distractions, particularly TikTok, on student attention and to evaluate the effectiveness of nudging-based interventions implemented in educational contexts. A scoping review approach was selected because the review questions are broad and mapping-oriented, aiming to chart the range, nature, and recency of evidence, to classify diverse nudging strategies (temporal, environmental, cognitive, social), and to summarize effectiveness, acceptability, and feasibility across heterogeneous educational settings; the underlying diversity of designs, measures, and outcomes precludes a single commensurate effect size and prioritizes concept and gap mapping over pooled estimates. While the review process was informed by the PRISMA-ScR guidance to ensure methodological transparency and reproducibility [19], not all items from the PRISMA-ScR checklist (Supplementary Material S1) were fulfilled. No protocol was preregistered for this scoping review.

2.1 Eligibility Criteria

Studies were considered eligible if they met the following inclusion criteria:

- **Publication period**: Between 01 January 2020 and 31 December 2024.
- **Population**: Students at any level of formal education (secondary, undergraduate, or postgraduate).
- **Focus**: Examination of social media use (specifically TikTok, Instagram, or related platforms) and its effects on attention, focus, or academic performance.
- **Intervention**: Use of nudging strategies based on behavioral economics or cognitive psychology aimed at reducing digital distraction or promoting academic self-regulation.
- **Outcomes**: Empirical reporting of attentional metrics (e.g., time-on-task, sustained attention), academic outcomes (e.g., GPA, quiz performance), or self-reported indicators (e.g., focus, control, digital fatigue).
- **Study type**: Experimental, quasi-experimental, or mixed-methods research with clearly described procedures and findings.
- **Language and format**: Published in English in peer-reviewed journals or conference proceedings.

Studies were excluded if they:

- Focused exclusively on clinical populations (e.g., ADHD) without generalizing to the broader student population.
- Addressed social media use without reference to distraction or attention.
- Described interventions without a nudging component (e.g., full app blocks or enforced bans).
- Lacked empirical data (e.g., conceptual papers, opinion pieces, or theoretical frameworks without testing).

2.2 Search Strategy and Data Sources

A multi-database search was conducted across Scopus and Web of Science. These multidisciplinary indexes provide broad, cross-disciplinary coverage and support reproducible queries and transparent deduplication across publishers. The search combined key terms across three conceptual categories:

1. Platform-related: “TikTok”, “Instagram”, “short-form video”, “social media”.

2. Cognitive outcomes: “attention”, “focus”, “distraction”, “academic performance”.
3. Intervention strategies: “nudge”, “nudging”, “behavioral intervention”, “choice architecture”, “self-regulated learning”.

Boolean operators (AND, OR) were used to refine search combinations (e.g., “TikTok AND attention AND nudge AND students”). The search was limited to publications from 2020 onward to ensure relevance to recent digital environments and educational contexts shaped by the post-pandemic learning shift.

Additionally, the reference lists of selected studies—especially those found in Barton et al. [8] and Yao et al. [9]—were manually screened to capture relevant secondary sources cited therein. This snowball method ensured coverage of foundational models such as the I-PACE framework [5], early empirical work on reward sensitivity and distraction [4], and nudging principles rooted in behavioral science [13,14].

2.3 Study Selection

The initial search yielded 142 unique studies after duplicate removal. Following title and abstract screening, 52 full-text articles were reviewed for eligibility. A total of 15 studies met all inclusion criteria, of which 7 included original empirical data on nudging interventions directly targeting attention and academic outcomes in student populations (Fig. 1). These 7 studies were retained for detailed analysis and synthesis.

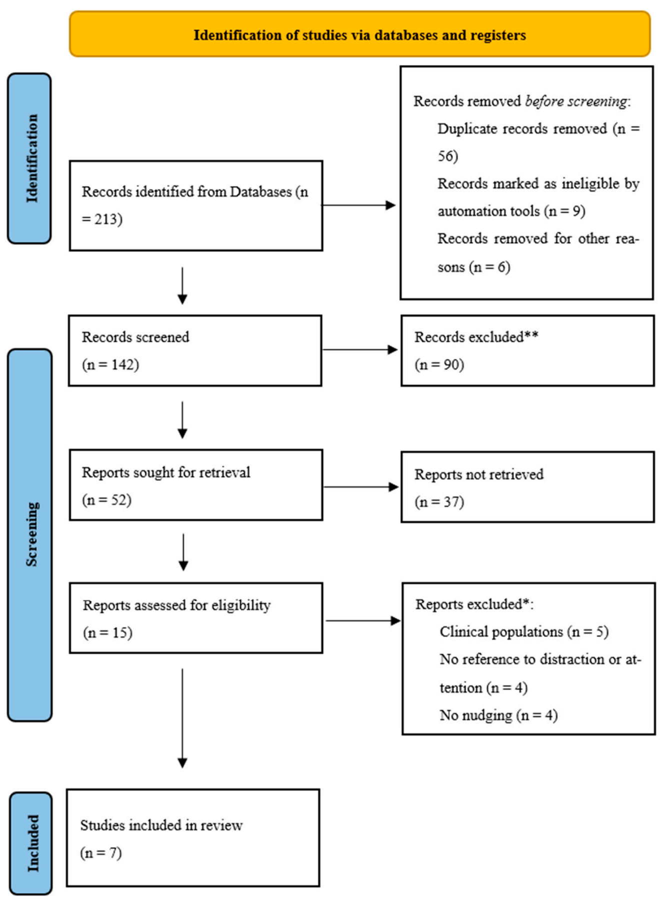

Figure 1: PRISMA flow diagram of this study. Note: *Some of the excluded records did not comply with two or more eligibility criteria. **Off-topic exposure/platform (e.g., general smartphone use, gaming, non-short-form SNS); ineligible study type (reviews, editorials, protocols, abstracts without data); non-nudge or non-educational interventions; Some of the excluded records did not comply with two or more eligibility criteria.

2.4 Data Extraction and Coding

A standardized data extraction template was used to code each of the 7 included studies. The following variables were extracted:

- Citation: First author, year of publication.
- Country: Geographical context of the study.
- Population characteristics: Sample size, age range, and educational level.
- Research design: Type of empirical approach (e.g., randomized controlled trial, pre-post design, mixed methods).
- Platform context: Specific digital environment addressed (e.g., TikTok, general social media use, smartphone multitasking).
- Type of nudge: Intervention categorized into:
  - *Temporal*: Scheduled lockouts, usage timers, Pomodoro cycles.
  - *Environmental*: Grayscale filters, reduced notification settings, distraction-free modes.
  - *Cognitive*: Commitment contracts, self-monitoring, and intention journaling.
  - *Social*: Peer comparison, accountability prompts, digital pledges.
- Theoretical rationale: Mention of psychological mechanisms (e.g., reward sensitivity, FoMO, time distortion, executive control depletion).
- Primary outcomes: Quantitative or qualitative measures of focus, attention duration, time-on-task, academic performance (e.g., GPA, test scores), or self-regulated behavior.
- Focus gain: When reported, the effect size or standardized measure of attentional improvement or academic enhancement attributable to the intervention.
- User feedback: Qualitative data on perceived usefulness, difficulty, or motivation linked to the intervention.

Data were coded independently by two researchers, with a subset being double-coded to ensure reliability (Cohen's $\kappa = 0.87$). Disagreements were resolved through discussion and re-review of source texts. This codebook was then used as the basis for the thematic synthesis steps described in Section 2.5 Data Synthesis.

2.5 Risk of Bias in Included Studies

To assess the methodological quality of the seven studies included in this review, we employed the JBI Critical Appraisal Checklists [20] according to each study design. The assessments were conducted by a single reviewer. To mitigate single-reviewer bias, we applied a prespecified checklist with explicit decision rules, recorded justifications per domain, and adopted a conservative policy (downgrading when information was insufficient). A peer-debriefing session was used to audit borderline cases before finalizing judgments.

All studies were retained for synthesis, although varying levels of bias were detected. Common limitations included the reliance on self-reported outcomes and limited transparency regarding confounder adjustment or randomization procedures. While the included studies provide valuable insight into the effectiveness of nudging strategies, caution should be exercised when generalizing the findings.

2.6 Data Synthesis

Due to the heterogeneity of outcome measures and study designs, a thematic synthesis approach was employed. Thematic synthesis proceeded in six steps: (i) unitizing, extracting meaning units on nudge type, implementation, context, mechanisms, moderators, and outcomes; (ii) first-cycle open coding, piloting labels and inclusion rules; (iii) codebook construction, defining codes with decision rules and examples; (iv) second-cycle focused/axial coding, clustering codes into mechanism-oriented families (attentional capture/time distortion; habit-loop disruption; autonomy/reactance; motivational scaffolding); (v) theme generation, consolidating families into higher-order themes that link mechanisms to design levers and observed outcomes; and (vi) credibility checks, using investigator triangulation via peer-debrief, searching for negative cases before finalizing themes, and maintaining an audit trail of codebook revisions. Studies were grouped by type of nudging strategy and dominant cognitive mechanism targeted. Patterns in effectiveness, user engagement, and contextual adaptability were identified across groups. Quantitative improvements in attentional performance (e.g., time-on-task, reduction in distraction frequency) were reported as percentage gains or time increments when available. Qualitative themes included student-reported shifts in self-awareness, autonomy, or digital control.

3 Results

The final selection of seven studies spans qualitative design work, observational analyses, field experiments, and a randomized controlled trial (RCT) examining nudging strategies to mitigate social-media-related distraction in educational settings (Table 1). Although platforms and populations varied, a common pattern emerges: intervention studies, including reminder-based, goal-setting/planning, display-salience, and choice-based micro-strategy nudges—reported improvements in on-task engagement or adjacent behavioral proxies (e.g., class attendance, study behaviors, reduced screen time, better sleep) [10–12,16]. Non-intervention studies contribute theoretical and mechanistic context by linking social media use with attention/motivation (survey) or by clarifying cognitive–affective pathways (longitudinal mediation) [8,9], while qualitative design evidence documents user-validated coping prompts that resemble cognitive nudges [3]. Below we synthesize findings by nudge family: temporal, environmental, cognitive, and social.

3.1 Temporal Nudges: Structuring Time to Preempt Distraction

Temporal nudges in this corpus primarily take the form of timely reminders and planning/goal-setting prompts. In a quasi-natural experiment, personalized reminder emails after missed tutorials increased subsequent tutorial attendance, and instrumental-variable analyses indicated that higher attendance predicted higher final grades [10]. In three classroom field experiments, goal-setting and planning prompts improved self-reported planning and increased active engagement behaviors (e.g., number of questions asked), with the goal-setting nudge also improving course grades; a simple checklist showed no reliable advantage [11].

Although the RCT of choice-based micro-strategies was not a "timer-only" intervention, the bundle allowed participants to select time-structuring tools (e.g., app limits/timers) alongside other micro-nudges; this reduced problematic smartphone use and screen time and improved sleep relative to control, consistent with the idea that self-selected temporal controls can curb off-task digital behavior without provoking reactance [12]. Overall, temporal nudges proved effective when they reduced present-bias frictions and translated intentions into concrete, scheduled actions, while preserving user autonomy through tailoring or low-friction prompts [10–12].

Table 1: Empirical studies (2020–2024) on nudging strategies to reduce student distraction from social media.

Citation	Country	Sample	Design	Platform	Nudge Type	Theoretical Rationale	Outcome	Focus Gain/Distraction Explained	User Feedback
Alutaybi et al. [3], 2020	UK & Qatar	N = 30 adults with self-reported FoMO	Focus groups + diary study (evaluation of FoMO-R)	Social media (general)	Cognitive & environmental (auto-reply, filtering, status, self-talk booklets; literacy)	FoMO; self-discrepancy; socio-technical coping	Participants reported better FoMO management; method accepted	Qualitative reduction of FoMO and related distraction	Positive toward reflective/self-talk materials.
Barton et al. [8], 2021	USA	N = 659 undergrad/grad	Cross-sectional survey	Social media (general)	Environmental (distraction blockers), social (peer visibility)	Motivated strategies for learning questionnaire (MSLQ); executive control	Higher general use and lower attention/motivation linked to lower GPA	Describes distraction pathways; no nudge effect size	-
Wickord & Quaiser-Pohl [16], 2023	Germany	~N = 92 completers (university sample)	Experimental (grayscale vs. control)	Smartphone (general)	Environmental (grayscale mode)	Salience reduction; reward sensitivity	↓ Daily smartphone use time with grayscale vs. control	Focus gained via reduced salience; fewer distraction checks	Some dislike of grayscale aesthetics reported in discussion.
Cortinhas et al. [10], 2022	UK	~N = 407 year-2 students (two sections)	Quasi-natural experiment (personalized reminder emails after missed tutorials)	Email/LMS context	Temporal & social (personalized reminders)	Present-bias; intention–action gap; EAST	↑ Tutorial attendance; 2SLS shows attendance → ↑ final grade	Indirect focus gain via higher in-class engagement	Generally positive; diminishing returns over term noted.
Weijers et al. [11], 2023	Netherlands	Exp1 n = 95; Exp2 n = 148; Exp3 n = 162 (tertiary students)	Three classroom field experiments	Classroom/LMS	Cognitive (goal-setting); environmental (checklist); temporal/planning booth	Self-regulated learning (Zimmerman); dual-process nudging	Goal-setting ↑ grades & questions; planning ↑ self-reported planning; checklist ns	Gains in active engagement; addresses distraction by structuring behavior	Mostly positive; simple nudges acceptable to students/teachers.

Table 1: *Cont.*

Citation	Country	Sample	Design	Platform	Nudge Type	Theoretical Rationale	Outcome	Focus Gain/Distraction Explained	User Feedback
Olson et al. [12], 2023	Canada	Study 1: N = 51; Study 2 (RCT): N = 70	Pre–post + RCT vs. control	Smartphone (general)	Suite of micro-strategies (notifications filtering, grayscale, app friction, timers)	Self-control/choice architecture; dual-process	↓ Problematic use & screen time; ↑ sleep vs. control	Practical focus gains via reduced time-on-phone	Generally favorable; brief, acceptable program. (SpringerLink).
Yao et al. [9], 2023	China	N = 822 TikTok users (2-wave)	Longitudinal mediation	TikTok	Cognitive (commitment prompts)	Distress intolerance & boredom proneness mediate psychopathology → PTU	Distress intolerance mediated T1 symptoms → T2 PTU	Explains distraction via intolerance to distress; no nudge	-

3.2 Environmental Nudges: Altering the Digital Context

Environmental nudges modify the salience and interruptiveness of the digital environment. Two verified interventions emphasize salience dampening: a controlled experiment showed that setting the smartphone display to grayscale reduced daily smartphone use time versus color, aligning with accounts that desaturated interfaces blunt reward-cue reactivity [16]; in the RCT, many participants chose environmental micro-strategies such as disabling non-essential notifications and grayscale, and the choice-based bundle led to lower screen time and problematic use and better sleep versus monitoring-only control [12].

Acceptability data suggest that aesthetics can be a trade-off, some users dislike grayscale, but choice and flexibility mitigate reactance by letting individuals adopt only the environmental changes they are willing to keep [12,16]. Taken together, environmental nudges were most promising when implemented as lightweight, user-configurable adjustments that make distracting cues less salient rather than imposing rigid lockouts.

3.3 Cognitive Nudges: Leveraging Self-Regulation and Reflection

Cognitive nudges were present in most studies, either on their own or layered with temporal/environmental tools. These interventions aim to heighten metacognitive awareness and intentional action, for example through reflective self-talk scripts, brief goal-setting prompts, or lightweight self-monitoring, so that students interrupt automatic checking habits and translate intentions into study behavior.

In qualitative design work, Alutaybi et al. [3] introduced the FoMO-R method (self-talk scripts, expectation-management and literacy materials), and participants reported better management of FoMO and fewer pressure-driven urges to check social media, indicating that reflection-oriented prompts can reduce distraction triggers without heavy restrictions. In three classroom field experiments, Weijers et al. [11] showed that goal-setting and planning prompts increased active engagement (e.g., more student questions) and, for the goal-setting nudge, improved grades, consistent with cognitive scaffolds that help students implement intentions during learning tasks. In a randomized trial, Olson et al. [12] allowed students to choose among micro-strategies (e.g., disabling non-essential notifications, grayscale, app limits/timers); this choice-based bundle reduced problematic smartphone use and screen time and improved sleep versus control, an indirect but meaningful attentional benefit when cognitive self-regulation tools are user-selected rather than imposed. Finally, while not an intervention, Yao et al. [9] identified distress intolerance and boredom proneness as mechanisms linking depressive/anxious symptoms to later PTU; these cognitive-affective pathways clarify the targets that cognitive nudges (e.g., intention setting, reflective prompts) are designed to address.

3.4 Social Nudges: Accountability and Peer Dynamics

Within this corpus, "social" mechanisms appear chiefly as commitment-style prompts and personalized reminders rather than peer ranking. In three classroom field experiments, Weijers et al. [11] found that a goal-setting/commitment prompt increased active engagement (e.g., more student questions) and, when framed as explicit goals, also improved course grades, indicating that light-touch commitments can translate intentions into learning behaviors.

In a quasi-natural experiment, Cortinhas [10] reported that personalized reminder emails after missed tutorials increased subsequent attendance, and instrumental-variable analyses linked higher attendance to higher final grades, consistent with social accountability cues delivered at the right time. By contrast, Barton et al. [8] is an observational study that does not test a social nudge (no blockers/peer-visibility intervention); it instead documents associations between social-media use, attention/motivation, and GPA.

Overall, the evidence suggests that low-friction commitment/reminder nudges can bolster persistence and in-class engagement, whereas stronger competitive features (e.g., peer ranking) are not represented in the verified set and should be evaluated cautiously in future work.

3.5 Focus Gain across Studies

Across the seven verified studies, nudging interventions improved attention-adjacent behavioral outcomes, but metrics were heterogeneous and not directly poolable. Specifically, temporal/commitment nudges increased attendance and active engagement (and, in one case, grades) [10,11]; environmental/choice-based nudges reduced screen time and problematic use and improved sleep [12], and grayscale reduced daily smartphone use time in experimental tests [16]; cognitive/reflective prompts were qualitatively associated with better FoMO management and fewer checking urges [3]. Two papers provide contextual, non-intervention evidence: Barton et al. [8] (links between social-media use, attention/motivation, and GPA) and Yao et al. [9] (longitudinal mechanisms, distress intolerance and boredom proneness, predicting later PTU). Given these different outcome scales (attendance, engagement behaviors, grades, screen time, sleep, qualitative coping), we summarize effects by category and study, noting that temporal/commitment and cognitive prompts show consistent positive patterns, while environmental nudges are effective but sometimes less preferred (e.g., grayscale aesthetics), and social/competitive ranking remains untested in the verified set.

4 Discussion

This review integrates two strands often treated separately: digital distraction/attention harms and behavioral "nudging" interventions, within educational settings. By mapping concrete nudge families to underlying mechanisms of choice architecture, salience reduction (e.g., grayscale, notification filtering), timely prompts and planning/goal scaffolds (e.g., reminders, goal-setting/commitment), and reflection-oriented supports (e.g., self-talk scripts, literacy materials), we offer a practitioner-ready framework that complements prior work on digital self-regulation and algorithmic engagement. Unlike broad digital-wellbeing surveys, our synthesis concentrates on interventions actionable in classrooms and learning platforms and, where relevant, on short-form video use (e.g., TikTok), clarifying when and why specific nudges succeed or fall short.

Positioned within the wider nudging literature, our pattern of findings fits the view that choice-architecture interventions typically yield small-to-moderate average effects with substantial heterogeneity across settings and outcomes [21,22]. Narrowing the lens to student attention, time-structuring/commitment nudges (personalized reminders; classroom goal-setting and planning prompts) showed consistent improvements in attendance and on-task engagement—sometimes extending to course grades—in quasi-experimental and field-experimental designs [10,11]. Importantly, a RCT in smartphone self-regulation indicates that user-selected, multi-strategy packages (e.g., disabling non-essential notifications, grayscale, app limits/timers) are both feasible and effective in reducing problematic use and screen time while improving sleep, supporting our recommendation to combine nudges while preserving autonomy [12]. Environmental salience-reduction nudges are effective but may be less preferred by some students (e.g., aesthetic objections to grayscale), underscoring the value of choice and tailoring [12,16].

The growing ubiquity of TikTok, Instagram, and YouTube Shorts has reconfigured how students interact with digital content, leveraging social and reward cues (e.g., FoMO) that can exacerbate checking and derail study intentions [3]. Converging evidence in this review shows that nudges can counter these pressures along multiple pathways: reminders and commitments increased attendance and active engagement [10,11];

choice-based micro-strategies reduced screen time/problematic use and improved sleep, an indirect but meaningful attentional benefit [12]; and grayscale reduced daily phone use in experimental tests [16]. Observational and longitudinal studies sharpen the theoretical picture: heavier social-media use relates to lower attention/motivation and GPA [8], and distress intolerance/boredom proneness help explain why psychopathology symptoms forecast later PTU [9]. Together, qualitative design evidence [3], mechanistic longitudinal results [9], and field-tested nudges [10–12,16] indicate that students often recognize the problem yet lack low-friction, sustainable strategies to act on that insight—precisely the space where scalable, classroom-ready nudges can help.

4.1 Understanding the Psychological Terrain: Why Nudges Work

Digital platforms thrive by exploiting attentional and motivational systems. As Brand et al. [5] argue, the I-PACE framework explains how individual vulnerabilities (e.g., limited self-regulation) interact with affective and cognitive responses to trigger habitual, cue-driven use. In this context, nudging functions as a soft, choice-preserving intervention: it neither restricts options nor imposes penalties, but subtly reshapes salience, timing, or decision structure to support more desirable behaviors [23].

Temporal scaffolds illustrate this logic. Pomodoro-style timers segment study time into short, focused intervals with brief breaks, helping to prevent mental fatigue and reduce the pull of quick distractions (as time-structuring nudges [23]). Usage dashboards and time-awareness tools act as feedback nudges that counter time-distortion tendencies documented in prior work (e.g., Wu et al. [6]) by making past behavior salient [24]. Consistent with this mechanism, an RCT in smartphone self-regulation showed that user-selected self-monitoring tools (e.g., app limits/timers) embedded within a choice-based bundle can reduce screen time and problematic use while improving sleep [12].

Equally important are cognitive nudges that heighten metacognitive awareness—brief reflection or intention prompts, self-monitoring, or literacy materials that help students interrupt automatic checking and act on study intentions. These techniques align with self-regulated learning theory [24]. In classroom field experiments, goal-setting/planning prompts increased on-task engagement and, for goal-setting, improved course grades [11]; in higher-education field settings, personalized commitment/reminder prompts boosted tutorial attendance, with downstream gains in performance [10]. Together, these findings suggest that lightweight, autonomy-preserving cognitive cues can translate intentions into action without heavy restrictions.

A mechanism-based account helps explain when and for whom specific nudges work. Neurocognitive evidence indicates that social-media distractors impair accuracy on attention tasks while modulating nodes of the default-mode and higher-visual networks; critically, trait FoMO intensifies these neural–behavioral disruptions [25]. In parallel, attention control moderates downstream outcomes of social-media use, with lower inhibitory control linked to worse affective consequences under heavier use [26]. These pathways predict that nudges which reduce cue salience (e.g., notification filtering, grayscale; see [12,16]) or introduce brief, autonomy-preserving micro-delays at app entry [12] should be especially effective for high-FoMO or low-attention-control profiles, whereas stand-alone informational prompts are unlikely to override entrenched cue–response loops.

4.2 Combining Nudges for Greater Impact

While many studies test a single lever, converging evidence and theory suggest that multi-layered, choice-preserving interventions are more effective than one-off measures. Mechanistically, this is consistent with findings that multitasking and fast-switching contexts engage reward circuitry and reinforce cue-response loops, implying that effective interventions should reshape multiple points in the decision process rather than only block access [4]. In practice, this means pairing temporal structure (timely reminders, app-limits/timers) with cognitive scaffolds (brief planning/goal prompts, reflective cues) and light environmental changes (notification filtering, grayscale) [23].

Empirically, the RCT shows that when learners can choose and tailor micro-strategies (e.g., notification filtering, grayscale, timers), outcomes improve relative to monitoring-only control—consistent with lower reactance and better adherence over time [12,23]. In classroom field experiments, goal-setting and planning prompts increased on-task engagement and, for goal-setting, improved grades—effects that complement temporal structuring [11]. In a quasi-natural HE setting, personalized reminder emails after missed tutorials increased subsequent attendance, with instrumental-variable analyses linking attendance to higher final grades [10]. Together, these results indicate that layering is beneficial when coupled with autonomy, rather than enforced lockouts.

Design guidance follows: combine brief intention prompts at study entry with timely reminders around course milestones, and offer an opt-in "menu" of environmental tweaks (notification filtering, grayscale) and time-tools (timers/app limits) [23]. Given meta-analytic cautions about publication bias, context dependence, and implementation details attenuating average effects [21,22], multi-component designs should emphasize lightweight personalization and transparent defaults, not one-size-fits-all prescriptions.

4.3 Individual Differences and Ethical Friction

Nudge effects vary across learners and contexts. In classroom experiments, goal-setting/commitment prompts were both feasible and acceptable, whereas a simple checklist yielded limited added value [11]. In experimental work on salience reduction, grayscale reliably reduced daily phone use yet some participants disliked the aesthetics, underscoring a trade-off between efficacy and acceptability [16]. Consistent with this, choice-based bundles in the RCT performed well—participants selected strategies they were willing to keep using, which likely reduced reactance and sustained adherence [12]. More broadly, evidence favors autonomy-supportive over controlling contexts for durable self-regulation [27]; acceptability in digital-learning settings tends to be highest when interventions are transparent and support autonomy [28].

Accordingly, we advocate adaptive nudging: begin with low-friction, opt-out defaults; escalate only if distraction persists; and always provide clear disclosures ("what this nudge does and how to turn it off") plus reversible settings [13]. Finally, nudges should be complemented by boosting—competence-building in self-control and decision skills—so that learners can sustain attention beyond the immediate choice environment [29]. In practice, educational platforms should expose opt-in configurations where students select from a menu of attention-support strategies (timers, reminders, brief reflective prompts, ambient adjustments), positioning educators as choice architects and facilitators rather than enforcers.

4.4 Attention, Motivation and Academic Outcomes

Across the verified studies, a consistent lesson emerges: raising attention alone is rarely sufficient unless interventions also address motivation and the perceived value of the task. In a large cross-sectional sample, Barton et al. [8] showed that students' motivational and attentional scores, as measured through MSLQ-related constructs, were jointly associated with academic performance (GPA), underscoring that attentional control and motivational quality move together rather than in isolation. Field experiments point in the same direction: goal-setting and planning prompts increased active engagement and—in the goal-setting condition—improved course grades in classroom settings (Weijers et al. [11]), while personalized reminder emails boosted attendance, which in turn predicted higher final grades in higher education

(Cortinhas [10]). Taken together, these results indicate that nudges work best when they not only reduce distraction but also reconnect learners to purpose, making study actions feel instrumentally worthwhile and personally endorsed.

Mechanistic evidence complements this picture. Yao et al. [9] showed that boredom proneness and distress intolerance mediate links from depressive/anxious symptoms to later PTU, suggesting that when tasks feel aversive or meaningless, distraction functions as escape. In such cases, nudges must go beyond interruption; they should elevate task value and lower affective barriers so that focused behavior is both feasible and motivationally attractive. Practical, classroom-ready examples include:

- **Value-framed prompts** and **commitment** cues that remind students why a specific session matters now (e.g., short-term milestone + long-term payoff), aligning with the attendance/engagement gains reported in [10,11].
- **Micro-goal setting** with quick progress check-ins (e.g., "set one concrete target for the next 20 min"), which supported stronger engagement and grade gains in [11].
- **Light time-structuring plus reflection** (a one-minute intention prompt before study + a timer/app-limit), which complements autonomy-preserving, choice-based micro-strategies that reduced screen time and problematic use in the RCT ([12]).
- **Low-friction environmental tweaks** (e.g., disabling non-essential notifications, grayscale) to dampen cue salience and make on-task choices easier to maintain once motivation has been activated ([12,16]).

In short, attention-support nudges are most effective when they co-produce motivation—by clarifying goals, surfacing value, and reducing affective friction—so that sustained focus becomes the path of least resistance rather than a willpower battle.

4.5 A Note on TikTok and the Visual Attention Economy

TikTok warrants special attention because of its infinite-scroll, fast-paced, algorithmically personalized feed, which can amplify cue–response loops and erode sustained attention. Mechanistically, this aligns with evidence that fast, rewarding streams heighten salience and shorten decision cycles [4]. In our corpus, PTU is prospectively linked to cognitive–affective mechanisms (e.g., distress intolerance, boredom proneness) that help explain why brief, highly rewarding clips can displace goal-directed study behaviors [9]. Unlike platforms that periodically require effortful input (posting/commenting), TikTok supports effortless passive consumption, making passivity a default and raising the bar for interventions.

Accordingly, classroom-ready designs should intercept scrolling at natural decision points without heavy-handed lockouts. Friction nudges—micro-delays, soft confirmation prompts, or brief intention checks at app entry—can create just enough pause to restore intentional control while preserving autonomy [12]. At the same time, higher-education reviews indicate that instructor-led, well-scaffolded uses of TikTok (e.g., microlearning, discipline-specific explainers) can boost motivation and engagement when bounded by clear time structures and reflective prompts [30]. This duality underpins our recommendation to bound rather than ban: pair time-structuring (timers/reminders) and reflection cues with any educational use so potential benefits are realized without sacrificing sustained focus.

4.6 Implications for Educators and Policymakers

The practical applications of this review are far-reaching. Teachers and educational technologists can integrate nudging principles into digital learning environments, assignment structures, and classroom routines. For example:

- Embedding digital timers or focus contracts in online assignments.
- Using peer reflection boards where students share strategies to stay on task.
- Offering guided checklists before using school-issued devices: "Why are you opening this app? For how long?"

From a policy perspective, schools might consider guidelines that regulate non-educational app use during instructional time, while providing students with tools for attention regulation, such as access to structured study apps or digital minimalism resources.

At the systemic level, integrating nudging principles into curriculum design—e.g., through dedicated modules on digital self-regulation—could foster meta-awareness from an early age. Just as students are taught study skills or time management, they could learn to apply nudging tools proactively.

4.7 Limitations and Future Directions

While the results of this review are promising, several limitations must be acknowledged. First, the number of studies meeting strict inclusion criteria was modest (n = 7), and most were conducted in specific educational or cultural contexts (e.g., university settings in Western or East Asian countries). Generalizability to younger students, low-resource settings, or neurodiverse populations remains unclear. In addition, our search strategy was limited to Scopus and Web of Science Core Collection to preserve a reproducible, cross-publisher search and deduplication workflow; this choice may omit records primarily indexed in discipline-specific databases (e.g., PsycINFO, ERIC) and could be addressed in future updates.

Second, many studies relied on self-reported outcomes, which are subject to biases. Future research should incorporate objective attention metrics, such as eye-tracking, screen activity logs, or performance-based indicators.

Third, few studies examined long-term retention of the behavioral effects. It is unclear whether the focus gains observed persist beyond the intervention period or whether students revert to old habits without reinforcement.

On the other hand, the studies reviewed offer strong initial evidence that nudging interventions can effectively improve student attention and reduce digital distraction in educational contexts. However, to strengthen both theoretical understanding and practical implementation, future research should address several key gaps.

The long-term effectiveness of nudging strategies remains uncertain. Most interventions measured outcomes immediately after implementation, leaving open the question of whether behavioral changes are sustained over time. Longitudinal studies are needed to assess whether students internalize the benefits of nudging or revert to previous distraction patterns once the intervention is removed. There is considerable potential in designing combinatorial interventions that strategically layer different types of nudges—temporal, environmental, cognitive, and social—in a complementary manner. As this review suggests, multi-modal approaches may yield synergistic effects, particularly when time-structuring tools are integrated with reflective or motivational prompts. Experimental comparisons between single-type and multi-type nudges could clarify which combinations are most effective for specific student profiles.

Emerging technologies offer new opportunities for adaptive nudging systems that tailor interventions in real time. Machine learning algorithms, for example, could analyze usage patterns, attention metrics, and contextual cues to deliver personalized nudges that are dynamically adjusted to each learner's behavior. These systems could help mitigate intervention fatigue and increase receptivity by avoiding repetitive or ill-timed prompts.

Finally, future studies should investigate how cultural and demographic factors influence the perception and impact of nudges. Cultural values, norms around technology use, and educational expectations may affect students' responsiveness to certain nudging strategies. Cross-cultural comparisons and inclusive sampling designs will be essential to ensure that digital well-being interventions are equitable, effective, and contextually appropriate across diverse learning environments. To strengthen causal inference and comparability, future studies should also pre-register analytic plans, report objective attention metrics alongside self-reports, and routinely adjust for publication bias in syntheses. Head-to-head trials that contrast single-lever vs. layered nudges, and nudging vs. boosting packages, would clarify which combinations produce durable gains in real classrooms.

5 Conclusions

In an attention-scarce digital environment, educators need scalable ways to help students stay on task amid social-media distractions. This scoping synthesis shows that nudging strategies—deployed in classrooms and learning platforms—offer practical gains when they (i) reduce cue salience, (ii) structure time at the moment of choice, and (iii) support metacognitive reflection without removing choice. Across the seven studies reviewed (2020–2024), intervention evidence indicates that temporal/commitment nudges (timely reminders; goal-setting/planning prompts) improve attendance and active engagement, sometimes extending to course grades [10,11]; choice-based bundles of micro-strategies (e.g., notifications filtering, timers, grayscale) reduce problematic use and screen time and improve sleep—an indirect but meaningful attentional benefit [12]; and grayscale reduces daily phone use in experimental tests, with some acceptability trade-offs [16]. Qualitative design work clarifies how reflection-oriented prompts can mitigate FoMO-driven checking [3], while observational/longitudinal findings identify attention/motivation links and mediating mechanisms (distress intolerance, boredom proneness) that nudges can target [8,9].

For practice, we recommend embedding nudges as a coherent ecosystem, not isolated tools: brief intention prompts at study entry, timely reminders around course milestones, and opt-in menus of light environmental adjustments (notification filtering, grayscale) and time-tools (timers/app limits), all transparent, reversible, and autonomy-supportive [11,12,16]. Future work should test durability, personalization, and combinations of levers using longitudinal designs and real-time behavioral analytics, and examine contextual moderators (course climate, learner profiles, culture). In short, reclaiming attention is less about restriction and more about empowerment: well-designed nudges help students make better moment-to-moment choices—measurably and educationally meaningfully—without undermining their agency.

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