

Parental Smartphone Phubbing During School-Related Activities: An Integrated Developmental Framework Linking Attachment Security, Emotional Regulation, and Academic Engagement

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Abstract

Smartphones are now embedded in family, educational, and occupational routines, yet their interpersonal costs are not adequately captured by screen-time measures alone. This conceptual article examines parental smartphone phubbing during school-related parent-child interactions and develops an integrated developmental explanation of how repeated attentional interruptions may become educationally meaningful. Drawing on a critical interpretive and integrative synthesis of scholarship on digital parenting, technoference, attachment, emotion regulation, academic engagement, self-determination, bioecological development, and family systems, the article positions caregiver responsiveness as the proximal mechanism connecting parental digital distraction with children's developmental experiences. The proposed framework suggests a sequence in which recurrent parental phubbing may reduce perceived caregiver responsiveness, contribute to less secure expectations of caregiver availability, constrain opportunities for interpersonal co-regulation, and, in turn, weaken behavioural, emotional, and cognitive engagement with learning. The model does not treat smartphones as inherently harmful and does not claim empirically established causality. Instead, it identifies relational interruption, developmental accumulation, and contextual moderation as the conditions under which device use may acquire psychological significance. School-related interactions are highlighted as a distinctive context because homework, examination preparation, academic problem solving, and discussions of school experiences simultaneously involve cognitive scaffolding and emotional support. The framework integrates six complementary theoretical traditions and extends prior work by linking

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family digital behaviour to educational engagement through a coherent developmental cascade. Implications are developed for research design, parent education, school counselling, educational psychology, and culturally responsive work in India. A staged agenda for longitudinal, dyadic, observational, and intervention research is proposed to test the model.

Keywords: Parental Phubbing | Technoference | Digital Parenting | Caregiver Responsiveness | Attachment Security | Emotional Regulation

I. INTRODUCTION

Smartphones have become infrastructural to contemporary family life. Parents use them to coordinate work, communicate with schools, manage finances, obtain information, maintain relationships, and organise everyday routines. Their value is therefore not in question. The more difficult developmental issue concerns what happens when a device repeatedly enters moments in which a child is seeking attention, reassurance, explanation, or shared problem solving. Research on parental mobile-device use has increasingly moved from counting exposure towards examining the quality of interaction that is interrupted by technology (Kildare & Middlemiss, 2017; Modecki et al., 2022; Radesky et al., 2014). This shift is important because a parent can be physically present while psychologically unavailable, and a short interruption can have a different meaning depending on whether it occurs during casual co-presence or during a moment of distress, uncertainty, or learning.

The term phubbing, derived from “phone” and “snubbing,” describes the diversion of attention from an interaction partner to a smartphone (Chotpitayasunondh & Douglas, 2016, 2018). Within families, parental phubbing is closely related to technoference: technology-based interruptions that intrude upon interpersonal exchanges and alter communication or relationship quality (McDaniel & Coyne, 2016). Parental phubbing is not synonymous with

neglect, hostility, or problematic smartphone use. Much of it is ordinary, unintentional, and socially normalised. The developmental concern is therefore not that every glance at a phone is harmful, but that repeated patterns of attentional fragmentation may alter children's experience of caregiver availability. Studies have associated parental technoference or phubbing with behavioural difficulties, depressive symptoms, problematic mobile-phone use, academic burnout, and other indicators of adjustment, although much of this evidence remains cross-sectional and context-specific (He et al., 2022; Jiang et al., 2023; McDaniel & Radesky, 2018a, 2018b; Wang et al., 2020; Xie et al., 2019).

A particularly underdeveloped context is the school-related interaction between parent and child. Homework assistance, examination preparation, reading, project work, conversations about classroom experiences, and discussions following academic setbacks are not merely instructional episodes. They are relational encounters in which children may seek encouragement, emotional containment, feedback, and help in interpreting success and failure. Parental involvement is associated with learning motivation, self-efficacy, persistence, and engagement, but the quality of that involvement matters alongside its frequency (Fredricks et al., 2004; Shao & Kang, 2022). A parent who remains attentive while a child struggles with a task may provide both cognitive scaffolding and co-regulation. A parent who repeatedly shifts attention to a device may still provide correct

academic advice while communicating a less coherent signal of availability.

Existing scholarship provides important pieces of this problem but not yet a sufficiently integrated explanation. Attachment research explains how repeated experiences of responsiveness shape expectations of caregiver availability (Ainsworth, 1979; Bowlby, 1988; Sroufe, 2005). Emotion-regulation research explains how children acquire regulatory capacities through social interaction and co-regulation (Gross, 1998, 2015; Kopp, 1989). Engagement research distinguishes behavioural, emotional, and cognitive participation in learning (Fredricks et al., 2004). Self-Determination Theory clarifies how relatedness, competence, and autonomy support motivation (Ryan & Deci, 2017). Bioecological and family-systems perspectives show why these processes must be understood within nested and reciprocal contexts rather than as linear effects of a device (Bronfenbrenner & Morris, 2006; Cox & Paley, 1997). Yet these literatures are often mobilised separately.

This article develops an integrated conceptual framework linking parental smartphone phubbing during school-related activities with caregiver responsiveness, attachment security, emotional regulation, and academic engagement. Its central argument is relational rather than technological: repeated smartphone interruptions become developmentally relevant when they alter the child's experience of caregiver responsiveness during interactions that carry emotional or educational significance. The framework further proposes that the consequences of such interruptions are unlikely to be immediate, uniform, or deterministic. They may accumulate through repeated interactions, operate through multiple psychological mechanisms, and vary according to child temperament, parental stress, family functioning, digital literacy, school climate, social support, socioeconomic conditions, and cultural norms. The purpose is therefore to specify a testable developmental architecture, not to

label ordinary smartphone use as intrinsically harmful.

II. FROM DIGITAL PARENTING TO RELATIONAL INTERRUPTION

Digital parenting has often been discussed in terms of mediation: how parents regulate children's access to devices, set rules, co-use media, monitor online activity, or model digital behaviour. Modecki et al. (2022) showed that the construct is multidimensional and has been measured inconsistently, underscoring the need to distinguish what parents do with children's technology from what parents' own technology use does to interaction. This distinction is conceptually consequential. A parent may enforce excellent screen-time rules yet remain frequently distracted by work messages; conversely, a parent may use a smartphone extensively while preserving high-quality responsiveness during emotionally important exchanges. Device duration alone cannot resolve this difference.

Observational work provided early evidence that caregiver mobile-device use can reorganise face-to-face interaction. Radesky et al. (2014) documented patterns of caregiver device absorption during meals, and Radesky et al. (2015) examined maternal device use during structured parent-child interaction. These studies did not establish a universal developmental effect, but they helped redirect attention to micro-level interactional processes. Kildare and Middlemiss (2017), reviewing the literature on parental mobile-device use, similarly highlighted potential implications for responsiveness and interaction quality. The construct of technofence sharpened this relational focus by identifying technology as an interruption to an ongoing interpersonal system rather than simply as exposure (McDaniel & Coyne, 2016; McDaniel & Radesky, 2018a).

This framing helps avoid technological determinism. Smartphones are tools embedded in work-family boundaries, educational communication, health management, and social support. A notification answered during homework may be an unavoidable employment demand; a device may also be used to clarify a

school concept, contact a teacher, or access an educational resource. What matters theoretically is whether the device facilitates the shared task or displaces the child's bid for attention. The same duration of use can therefore have different relational meanings. An educational search conducted jointly with a child may increase engagement, whereas unrelated scrolling during a child's disclosure of academic anxiety may fragment the interaction. The proposed framework treats relational displacement, not smartphone exposure per se, as the proximal phenomenon requiring explanation.

The child's interpretation is central. Attachment perspectives emphasise that developmental meaning emerges from repeated experience of whether a caregiver is accessible and responsive when needed (Ainsworth & Bowlby, 1991; Bowlby, 1988). Parents may experience a ten-second device check as trivial because they understand its purpose and expected duration. A child, especially during frustration or uncertainty, may experience the same interruption as a break in shared attention. Neither interpretation should be assumed a priori. The theoretical task is to explain when repeated mismatches between parental intention and child perception become consequential and how those perceptions connect to later emotional and educational processes.

Empirical findings are consistent with the need for such a mechanism-based account. McDaniel and Radesky (2018a) linked technoference with child behaviour problems, while their longitudinal work showed reciprocal associations among parent technology use, parenting stress, and child behaviour (McDaniel & Radesky, 2018b). Xie et al. (2019) reported links between parental phubbing and adolescent mobile-phone addiction involving parent-child attachment. Wang et al. (2020) connected parental phubbing with depressive symptoms under varying levels of self-esteem and social support. He et al. (2022) identified parent-child attachment and ego depletion as mediating processes in the association between parental phubbing and learning burnout. Jiang et al. (2023) reported associations with academic burnout

through social anxiety and self-control. These studies differ in samples, measures, outcomes, and cultural settings, but collectively suggest that the explanatory pathway is unlikely to be a simple direct effect.

III. THEORETICAL ARCHITECTURE OF THE FRAMEWORK

3.1 Caregiver responsiveness and attachment security

Caregiver responsiveness is positioned as the first psychological mechanism in the model. Responsiveness refers to timely, contingent, and emotionally appropriate reactions to a child's signals and needs. It is not identical to constant availability. Developmentally supportive caregiving permits boundaries, delay, and parental autonomy; what matters is the child's experience of sufficiently predictable and meaningful response across time. Classic attachment scholarship places sensitivity and responsiveness at the centre of the child's emerging confidence in caregiver accessibility (Ainsworth, 1979; Ainsworth & Bowlby, 1991). Sroufe's (2005) longitudinal account further emphasises attachment as an organising developmental history rather than a momentary state.

School-related interactions are especially useful for examining responsiveness because they generate repeated, observable bids for support. A child who cannot solve a mathematics problem may request clarification; an adolescent awaiting examination results may seek reassurance; a student describing peer conflict at school may need emotional validation before advice. In each instance, the parent's response can regulate both the immediate task and the relationship. Smartphone phubbing may matter when it repeatedly interrupts the contingency between the child's bid and the caregiver's response. The relevant mechanism is therefore not the device itself but a pattern of delayed, fragmented, or emotionally thinned responsiveness.

The model does not propose that phubbing automatically produces insecure attachment. Attachment is shaped by a much broader history of caregiving, and secure relationships are likely to tolerate ordinary interruptions. Instead, the

proposition is probabilistic: persistent smartphone-mediated disruption during salient interactions may contribute to children's expectations that caregiver attention is less predictable. This claim is compatible with evidence linking parental phubbing to attachment-related processes (He et al., 2022; Xie et al., 2019) while remaining appropriately cautious about causality.

3.2 Attachment security and emotional regulation

Attachment security provides a relational foundation for emotion regulation because caregivers initially help children manage arousal before increasingly independent regulation becomes possible. Kopp (1989) described regulation as developing through changing capacities and social supports, while Gross (1998, 2015) conceptualised emotion regulation as processes that shape which emotions arise, when they occur, and how they are experienced or expressed. Secure expectations of caregiver availability can support exploration, help-seeking, and recovery from distress; inconsistent access to co-regulation may make emotionally demanding situations more difficult to navigate.

Academic life supplies frequent regulatory demands. Children must tolerate errors, delay gratification, persist through difficult tasks, cope with evaluation, respond to teacher feedback, and manage comparison with peers. A parent's role is not to remove these emotions but to help the child interpret and regulate them. Reassurance, reframing, calm problem solving, and encouragement can convert frustration into persistence. If digital interruption repeatedly truncates these exchanges, the child may receive fewer opportunities to observe or practise adaptive regulation within a supportive relationship. Liu et al. (2024), examining parental phubbing, parent-child conflict, and children's media use, provides contemporary evidence that emotion regulation can meaningfully condition technology-related family processes.

The developmental sequence therefore moves from relational availability to regulatory opportunity. This is not a claim that attachment is the sole determinant of emotion regulation; temperament, neurodevelopment, peer relationships, school climate, and broader stress exposure are also important. The framework instead specifies one relational route through which parental digital behaviour may become associated with regulatory functioning.

3.3 Emotional regulation and academic engagement

Academic engagement is treated as the principal educational outcome because it captures how children participate in learning rather than reducing educational functioning to grades. Fredricks et al. (2004) conceptualised engagement as behavioural, emotional, and cognitive. Behavioural engagement includes participation and persistence; emotional engagement concerns interest, belonging, and affective reactions; cognitive engagement involves strategic investment and willingness to exert effort. This multidimensional construct is well suited to a framework in which relational and emotional processes precede educational participation.

Emotion regulation can support each component of engagement. A child who can manage frustration is more likely to remain behaviourally involved in a difficult task. A student who can recover from embarrassment or disappointment may preserve emotional connection to school. Cognitive engagement requires attention and strategic effort that can be disrupted when emotional arousal becomes difficult to manage. Shao and Kang (2022) showed that parent-child relationship quality is linked with learning engagement through motivational and self-efficacy pathways, illustrating how relational experiences can reach educational outcomes through intermediate psychological processes.

Self-Determination Theory adds a motivational layer. Relatedness, competence, and autonomy are basic psychological needs that support

internalised and self-determined motivation (Deci & Ryan, 2000; Ryan & Deci, 2017). Responsive parental involvement can communicate relatedness while supporting competence without controlling the child's learning. Repeated phubbing may weaken perceived relatedness, particularly when a child interprets the device as receiving priority. Xiao and Zheng (2022) found that basic psychological-needs satisfaction and

self-esteem mediated associations between parental phubbing and depression among junior-high-school students, supporting the relevance of need-based mechanisms even though their outcome was not academic engagement.

IV. INTEGRATING THE EVIDENCE

Table 1

Representative Evidence Informing the Integrated Framework

Study	Design/context	Relevant finding	Role in framework
McDaniel & Radesky (2018a)	Parent technology distraction	Technoference associated with child behaviour problems	Establishes relational disruption
Xie et al. (2019)	Adolescents; cross-sectional	Parental phubbing linked with mobile-phone addiction through attachment-related processes	Supports attachment pathway
Wang et al. (2020)	Adolescents	Parental phubbing associated with depressive symptoms	Supports emotional consequences
Pancani et al. (2021)	Scale development	Developed perceived parental phubbing measure	Construct specification
He et al. (2022)	School students	Attachment and ego depletion implicated in learning burnout	Direct educational relevance
Modecki et al. (2022)	Systematic review	Digital parenting is multidimensional and inconsistently measured	Defines broader context
Komanchuk et al. (2023)	Scoping review	Parental technoference linked with relationship and developmental outcomes	Supports integrative approach
Jiang et al. (2023)	Adolescents	Parental phubbing associated with academic burnout via psychological mechanisms	Supports educational pathway
Liu et al. (2024)	Young children	Conflict and emotion regulation shaped media-use associations	Supports regulation pathway

Zhang & Wang (2025)	Preschool children	Conflict and negative emotion serially mediated social withdrawal	Supports sequential mechanisms
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Note. The table condenses representative studies used in the dissertation's critical synthesis; it is not a systematic meta-analytic summary.

The evidence base supports an integrated account but also imposes limits. Much of the parental-phubbing literature relies on cross-sectional self-report designs. Associations can therefore reflect shared-method variance, reverse directionality, or unmeasured family processes. Parenting stress is particularly important because it may increase device use while independently affecting responsiveness and child adjustment. McDaniel and Radesky's (2018b) longitudinal findings are valuable precisely because they point to reciprocal processes rather than a one-way technological effect. The conceptual framework must therefore be understood as a set of developmental propositions that organise existing evidence and identify what future studies need to test.

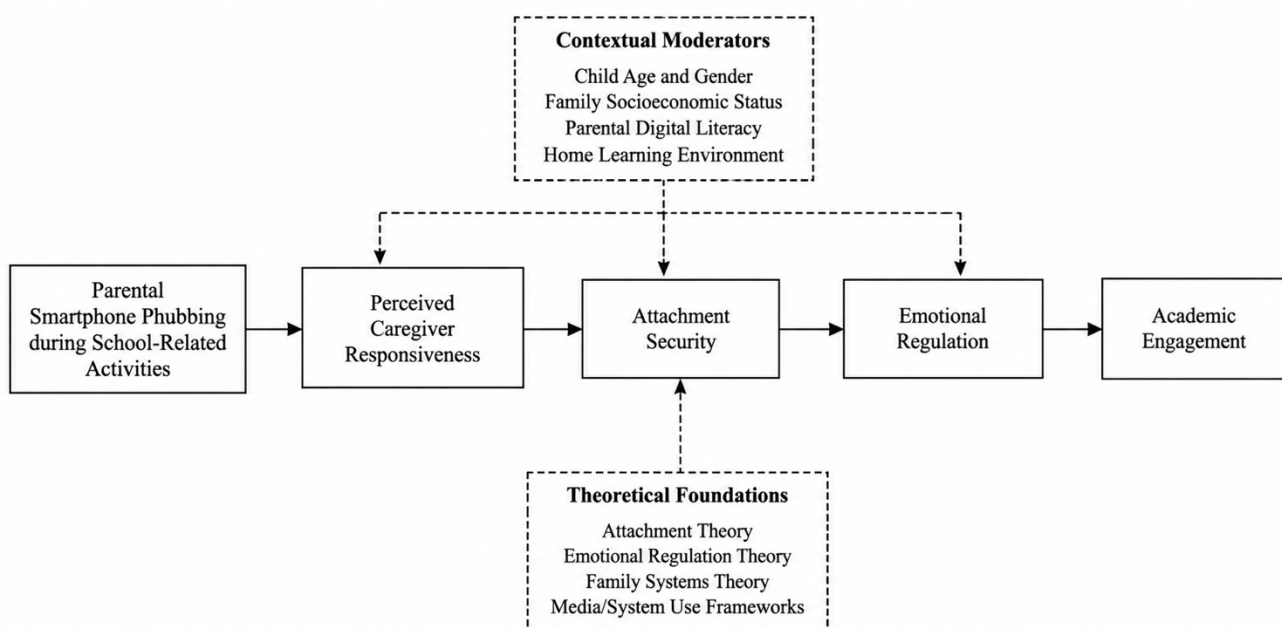
A second limitation of the literature is outcome fragmentation. Studies often isolate depression, problematic smartphone use, behavioural problems, burnout, or relationship quality. This is useful for estimating specific associations but makes it difficult to explain how a relational interruption could travel across domains. The

present model treats caregiver responsiveness, attachment security, emotional regulation, and academic engagement as linked but distinguishable constructs. This avoids collapsing them into a single index of well-being while allowing the possibility that change in one domain alters conditions in another.

Third, the evidence is culturally concentrated. A substantial portion of the literature comes from China and other East Asian settings, with additional evidence from Western contexts. Meta-analytic work on social-emotional adjustment has highlighted cumulative associations while also demonstrating the concentration of available studies (Zhang et al., 2023). The model is therefore not presented as culturally invariant. Expectations regarding parental involvement, educational achievement, family hierarchy, autonomy, and appropriate technology use can influence how a child interprets an interruption and how parents organise learning support.

Figure 1

Integrated Developmental Cascade of Parental Smartphone Phubbing During School-Related Activities



Note. The figure presents a conceptual, not empirically established causal, pathway. Contextual and moderating conditions may alter the strength, direction, or meaning of each proposed association.

V. DEVELOPMENTAL CASCADE AND BOUNDARY CONDITIONS

The framework begins with a digital parenting environment in which smartphones are routinely present during parent-child interaction. Parental phubbing is conceptualised as a specific event within that environment: attention is redirected from the child or shared educational activity to a smartphone. Repetition is critical. An isolated interruption may have little developmental significance, whereas recurring interruption at moments when the child is seeking assistance may become a pattern. The first proposed consequence is reduced perceived caregiver responsiveness. The qualifier “perceived” matters because parental intention and child experience may diverge.

The second stage concerns attachment-related expectations. If interruptions become sufficiently frequent, salient, and poorly repaired, they may contribute to uncertainty about caregiver accessibility. Repair is an important boundary condition that existing phubbing measures rarely capture. A parent who says, “I need one minute to answer this work message, then I am with you,” and reliably returns may preserve predictability. A parent who repeatedly shifts attention without explanation may create a different interactional experience. Future research should therefore distinguish interruption frequency from repair quality, transparency of purpose, and responsiveness after the interruption.

The third stage concerns emotional regulation. Children learn regulation through repeated interactions, not only through explicit instruction. During school-related stress, parental attention can help label emotion, reduce arousal, reframe failure, and organise a next step. Reduced access to such co-regulation may be particularly relevant for younger children or children facing high academic pressure. Yet individual differences are

likely substantial. Temperament, executive functioning, prior attachment history, and existing coping skills may buffer or intensify the association. The model consequently predicts moderation rather than uniform effects.

The fourth stage is academic engagement. Reduced engagement should not be interpreted as an inevitable outcome of parental device use. It is expected only insofar as relational interruption influences emotional and motivational processes relevant to learning. A child with strong teacher support, peer belonging, high self-efficacy, or other responsive caregivers may remain highly engaged despite frequent parental phone use. Conversely, phubbing may carry greater weight in families where the parent is the child's principal source of academic scaffolding. The model therefore accommodates equifinality and multifinality: similar digital behaviours may lead to different outcomes, and similar educational difficulties may arise through different developmental routes.

Family Systems Theory further challenges a simple parent-to-child direction of effect. Children who disengage from school may elicit increased parental monitoring, conflict, or technology use for checking assignments. A distressed child may communicate differently, and a stressed parent may rely more heavily on a device for work or emotional escape. Cox and Paley (1997) conceptualised families as interdependent systems in which change in one subsystem affects others. Sameroff's (2009) transactional perspective similarly emphasises mutual shaping across time. The model therefore includes feedback loops conceptually even though its central pathway is presented sequentially for analytical clarity.

Bronfenbrenner's bioecological perspective adds another boundary condition: proximal processes occur within nested systems (Bronfenbrenner & Morris, 2006). A parent's smartphone use may reflect exosystem pressures such as workplace expectations for constant availability. School policies may increase digital communication and

require parents to monitor applications. Socioeconomic conditions may determine whether a smartphone is the family's only internet-connected device. Cultural norms influence expectations of parental authority, academic supervision, and technology etiquette. These contexts can alter both the frequency of interruptions and their meaning. Treating parental

phubbing as an individual failure would therefore obscure the systems that generate attentional competition.

Table 2

Theoretical Complementarity in the Proposed Framework

Theory	Primary explanatory contribution	Limitation when used alone	Function in integrated model
Attachment Theory	Caregiver availability and internal working models	Limited specification of educational outcomes	Explains relational-security pathway
Emotion Regulation	Monitoring, modulation, and co-regulation of emotion	Does not by itself explain relational origins	Explains regulatory mechanism
Academic Engagement	Behavioural, emotional, cognitive learning involvement	Limited account of developmental origins	Defines educational outcome
Self-Determination Theory	Relatedness, competence, autonomy and motivation	Less specific about attachment processes	Adds motivational mechanism
Bioecological Systems Theory	Development within nested interacting systems	Broad rather than mechanism-specific	Defines multilevel context
Family Systems Theory	Reciprocal interaction and family-level dynamics	Limited academic specificity	Adds feedback and systemic reciprocity

VI. WHY SCHOOL RELATED INTERACTIONS MATTER

Locating the framework in school-related activity is not a cosmetic narrowing of general family research. Educational interactions have distinctive psychological properties. They often combine performance evaluation, uncertainty, future-oriented consequences, and parental expectations. A child asking for help with homework is simultaneously exposing a knowledge gap. An adolescent discussing poor marks may anticipate disappointment. Examination preparation can generate anxiety in both parent and child. These are precisely the circumstances in which responsiveness, relational security, and regulation become salient.

School-related interactions also make the difference between instrumental and emotional support visible. A parent can provide an answer without providing attunement. For example, sending a solution from a phone may solve the immediate academic problem but may not address the child's frustration or uncertainty. Conversely, a parent can support regulation without knowing the academic answer by remaining attentive, acknowledging difficulty, and helping the child plan how to seek assistance. The framework therefore broadens parental involvement beyond task completion and asks how the interpersonal quality of assistance shapes engagement.

This distinction has implications for measurement. Future studies should not simply ask how often

parents use phones “around” children. Measures should identify whether use occurs during homework, academic conversations, examination preparation, or moments of child distress; whether the use is related or unrelated to the shared task; whether the child initiated a bid for attention; how long the interruption lasts; and whether the parent repairs the interaction. Ecological momentary assessment, passive sensing used with strong privacy safeguards, and structured observation could complement child and parent self-report. Dyadic designs are especially important because discrepancies between parent and child perceptions may themselves be theoretically informative.

Academic engagement is also preferable to grades as the first educational outcome for empirical testing. Grades are shaped by prior ability, teaching quality, curriculum, socioeconomic resources, school assessment practices, and many other factors. Engagement is more proximal to the proposed emotional and motivational mechanisms. Longitudinal studies could examine whether changes in perceived responsiveness precede changes in regulation and engagement while controlling for baseline levels, family stress, parental mental health, child temperament, and prior achievement. Such designs would provide a more stringent test of temporal ordering than the cross-sectional evidence currently dominating the field.

VII. INDIAN EDUCATIONAL CONTEXT

The Indian context is theoretically relevant because rapid digitalisation intersects with strong family investment in education. Smartphones increasingly mediate parent-teacher communication, educational resources, tuition coordination, school notifications, and online learning. The same device that interrupts a conversation may therefore be indispensable to the child's education. This dual role makes a relational rather than anti-technology framework particularly appropriate. The issue is not whether parents should use smartphones, but how digital

demands are managed during interactions in which children require psychological presence. Cultural expectations may also shape interpretation. In many Indian families, parents are actively involved in homework supervision, examination preparation, tuition decisions, and monitoring academic progress. High parental involvement can provide support but may also intensify performance pressure. A smartphone interruption during an emotionally charged academic exchange may therefore be experienced differently depending on the family's communication style, achievement expectations, and hierarchy. The dissertation from which this article is developed accordingly treats India as an important context for future validation rather than assuming that findings from East Asian or Western samples transfer unchanged. India's expanding digital infrastructure further increases the practical relevance of studying the quality of digitally mediated family interaction (Telecom Regulatory Authority of India [TRAI], 2025).

Research in India should incorporate linguistic, regional, socioeconomic, and schooling diversity. Urban private-school families with multiple devices and high digital literacy may encounter different patterns of technofence from rural or lower-income households in which a smartphone is a shared educational resource. Work arrangements also matter: parents in platform work, healthcare, technology, or managerial roles may face different expectations of constant connectivity. A culturally responsive model should therefore test contextual moderators rather than treating nationality as a sufficient cultural variable.

VIII. IMPLICATIONS FOR RESEARCH AND PRACTICE

The immediate research priority is empirical specification. Existing scales, including the Parental Phubbing Scale developed by Pancani et al. (2021), provide a foundation, but school-related phubbing may require contextual items that capture interruption during learning and academic support. Measures of caregiver responsiveness, attachment security, emotion regulation, and academic engagement should be selected with attention to age appropriateness

and discriminant validity. Structural equation modelling could test indirect pathways, but statistical fit should not substitute for temporal evidence. Longitudinal and cross-lagged designs are needed to examine directionality, and observational studies can test whether reported phubbing corresponds to interactional behaviour. A second priority is to examine thresholds and heterogeneity. The framework predicts that developmental meaning depends on frequency, timing, salience, and repair. Person-centred analyses could identify profiles such as high device use with high responsiveness, low device use with low responsiveness, or high work-related interruption with effective repair. Such profiles would test the article's central claim that relational quality is more informative than device exposure alone. Moderated mediation models could examine whether parental stress, child temperament, school climate, social support, or socioeconomic conditions alter specific links in the cascade.

Third, future work should be dyadic and developmentally stratified. Parent and child reports of phubbing often need not agree. Parents report intention and constraint; children report experienced availability. Both are relevant. Younger children may rely more strongly on immediate co-regulation, whereas adolescents may value autonomy and interpret parental monitoring differently. Developmental stage may therefore change both the meaning of smartphone interruption and the mechanism connecting it to engagement. Longitudinal cohorts spanning late childhood and adolescence would be particularly informative.

Practice implications should remain proportionate to the evidence. The framework does not justify alarmist recommendations or blanket technology bans. For parents, a more defensible approach is to protect high-salience interactions: acknowledge a child's bid for attention, explain unavoidable interruptions, return when promised, and create predictable periods of shared attention during homework or academic discussion. Such practices target responsiveness rather than mere

device abstinence. They are also more realistic for parents whose employment or caregiving responsibilities require connectivity.

Schools can incorporate digital-parenting awareness into parent orientation and counselling without framing parents as the problem. Guidance can distinguish productive co-use of technology from unrelated interruption and can encourage families to agree on attention norms during learning. School counsellors and educational psychologists may consider family digital routines when assessing academic disengagement or emotional distress, but should avoid assuming causation. The framework is most useful as an assessment lens that prompts questions about interaction quality, stress, and support.

At policy level, digital well-being initiatives should recognise that educational digitalisation can itself increase parental device dependence. Schools and education systems can reduce unnecessary notification burden, consolidate communication channels, and avoid creating expectations of continuous parental availability. This systems-level implication follows directly from the bioecological model: if exosystem demands generate technofence, interventions aimed solely at individual self-control will be incomplete.

IX. LIMITATIONS AND FUTURE RESEARCH AGENDA

The proposed framework has several limitations. First, it is conceptual and therefore does not establish causal effects, temporal precedence, or effect sizes. Although individual relationships within the proposed sequence are supported by prior scholarship, the complete pathway from parental smartphone phubbing through perceived caregiver responsiveness, attachment-related security, and emotion regulation to academic engagement remains to be empirically tested. Second, the underlying literature is heterogeneous in participant age, measures, cultural settings, and outcomes, and much of the evidence is based on cross-sectional self-report designs. Third, publication and language biases may overrepresent statistically significant findings and English-language indexed scholarship while

underrepresenting regional evidence, particularly from India. Finally, integrating multiple theoretical perspectives increases explanatory breadth but also risks conceptual overextension. Future research should therefore determine whether the individual theoretical components provide incremental explanatory value rather than assuming that integration is inherently superior.

9.1 Conceptual Propositions for Empirical Testing

The framework generates seven related propositions.

P1: parental smartphone phubbing during school-related interactions will be negatively associated with children's perceived caregiver responsiveness.

P2: lower perceived responsiveness will be associated with less secure expectations of caregiver availability. This should not be interpreted as suggesting that ordinary smartphone use changes attachment classification; rather, the relevant outcomes concern trust, accessibility, communication, and help-seeking expectations within a broader attachment history (Bowlby, 1988; Sroufe, 2005).

P3: greater attachment-related security will be associated with more adaptive emotion regulation during school-related challenges, consistent with developmental accounts of caregiver-supported co-regulation (Kopp, 1989).

P4: adaptive emotion regulation will be positively associated with behavioural, emotional, and cognitive academic engagement (Fredricks et al., 2004).

P5: the association between parental phubbing and academic engagement will be partly indirect through perceived responsiveness, attachment-related security, and emotion regulation. Alternative pathways involving parent-child conflict, self-esteem, social anxiety, self-control, and psychological-needs satisfaction should also be examined rather than treating the proposed

cascade as exclusive (Jiang et al., 2023; Wang et al., 2020; Xiao & Zheng, 2022).

P6: child temperament, developmental stage, parental stress, socioeconomic circumstances, digital literacy, school climate, and social support will moderate particular pathways.

P7: interactional repair—acknowledging an interruption, explaining its purpose, and reliably returning attention—will weaken the negative association between phubbing and perceived responsiveness.

Together, these propositions translate the conceptual framework into empirically testable relationships without presenting them as established causal mechanisms.

9.2 Methodological Standards for Testing the Framework

Testing these propositions requires designs capable of examining temporal ordering. Cross-sectional surveys remain useful for initial association mapping, but longitudinal and dyadic studies are needed to determine whether earlier phubbing precedes changes in responsiveness and whether subsequent changes in attachment-related expectations and emotion regulation precede academic engagement. Multi-informant approaches would further reduce common-method bias: parents can report digital demands and interruption contexts, children can report perceived responsiveness, and teachers can provide complementary indicators of academic engagement.

Construct precision is equally important. Parental phubbing, technoference, general smartphone use, problematic smartphone use, and digital parenting should not be treated interchangeably. Parental phubbing specifically concerns smartphone attention that displaces an ongoing interpersonal interaction, whereas general device use need not involve relational interruption. The Parental Phubbing Scale developed by Pancani et al. (2021) provides a useful foundation, although school-related contexts may require additional

items capturing homework, examination preparation, academic conversations, and children's bids for assistance.

Research should also become more event-sensitive. Device use during independent work is not equivalent to interruption following a child's request for help or disclosure of academic distress. Ecological momentary assessment and structured observation could capture the purpose, timing, salience, child bid, response latency, and subsequent repair of interruptions. Passive device records may supplement these methods but cannot independently establish whether smartphone use constituted phubbing. Similarly, statistically significant indirect effects in cross-sectional data should not be interpreted as proof of developmental mediation. Stronger tests require temporal separation, appropriate controls, and consideration of family stress, parental mental health, socioeconomic conditions, prior achievement, and general relationship quality.

9.3 Developmental and Contextual Research Priorities

Developmental stage may alter both children's need for parental co-regulation and their interpretation of interruption. Younger children may depend more strongly on immediate support, whereas adolescents may simultaneously seek autonomy and expect reliable attention when assistance is explicitly requested. Longitudinal research spanning educational transitions could therefore clarify whether particular developmental periods increase sensitivity to parental digital interruption.

The purpose of smartphone use also requires attention. Work communication, school messaging, entertainment, social networking, and collaborative educational use are unlikely to carry identical meanings. A parent using a smartphone to obtain information for the child's assignment may support engagement, whereas unrelated scrolling during an explicit request for assistance may communicate displacement. Future studies

should consequently examine relational meaning alongside device frequency.

Cultural validation is particularly important in India, where smartphones increasingly mediate education, employment, school-parent communication, and family organisation (Telecom Regulatory Authority of India [TRAI], 2025). Research should include linguistic, regional, socioeconomic, urban-rural, and schooling diversity rather than treating nationality as a sufficient cultural variable. Measurement invariance should be established before comparing groups or assuming that the proposed pathways operate uniformly.

9.4 Practical Translation and Intervention Research

Intervention research should target responsiveness rather than smartphone abstinence. Digital connectivity is embedded in contemporary family life, and some interruptions are unavoidable or directly related to children's education. Low-burden interventions could therefore examine protected attention during high-salience interactions, explicit signalling of necessary interruptions, notification management, and predictable re-engagement. Interactional repair is especially important because it distinguishes unavoidable interruption from sustained relational disengagement.

Parents can be encouraged to explain why an interruption is necessary, indicate when attention will return, and reliably resume the interaction. Schools can contribute by consolidating digital communication and avoiding unnecessary expectations of continuous parental availability. Counsellors and educational psychologists may use the framework as a hypothesis-generating lens when exploring academic disengagement, while also considering family stress, child temperament, learning difficulties, teacher relationships, peer support, and socioeconomic circumstances. Smartphone interruption should therefore be treated as one possible component of a broader developmental ecology rather than as a diagnostic explanation.

9.5 Refined Research Agenda

A staged programme provides a feasible route to empirical validation.

Phase 1 should establish the content and ecological validity of school-related parental phubbing through qualitative work with children, parents, teachers, and counsellors.

Phase 2 should develop or adapt measures and examine factor structure, reliability, discriminant validity, and measurement invariance.

Phase 3 should use longitudinal, dyadic data to test temporal ordering among phubbing, responsiveness, attachment-related expectations, emotion regulation, and academic engagement.

Phase 4 should compare developmental, cultural, and socioeconomic contexts, including diverse Indian samples.

Phase 5 should evaluate low-burden interventions centred on protected attention and interactional repair rather than simple phone prohibition.

Experimental and micro-longitudinal methods can complement this programme. Structured learning tasks may examine immediate responses to brief device interruption, while ecological momentary assessment can capture naturally occurring events and same-day changes in perceived support or engagement. Such immediate responses should not be equated with attachment change, which reflects repeated relational experience across time. Future studies should also compare disruptive phubbing with neutral and positive digital interactions, including joint information seeking, educational collaboration, and task-relevant co-use.

Ultimately, the framework should be treated as a testable developmental architecture rather than an established causal model. Its contribution will depend on whether the proposed mechanisms withstand longitudinal, dyadic, observational, experimental, and cross-cultural examination. This maintains the manuscript's existing position that

parental phubbing should be understood probabilistically and contextually rather than as an inherently harmful form of smartphone use.

X. IMPLICATIONS FOR RESEARCH AND PRACTICE

Parental smartphone phubbing is best understood not as a simple problem of screen time but as a potential interruption to relational processes through which children receive support, develop emotional security, learn to regulate distress, and participate in education. The integrated framework developed here specifies a developmental cascade from parental smartphone interruption to perceived caregiver responsiveness, attachment-related security, emotional regulation, and academic engagement. It further embeds this sequence within motivational, family-system, and bioecological contexts.

The framework's contribution lies in explaining conditions and mechanisms rather than declaring smartphones harmful. Occasional or necessary device use is unlikely to carry a uniform developmental meaning. Repetition, salience, child perception, interactional repair, developmental stage, family stress, and broader social context are likely to determine whether an interruption matters. School-related interactions provide a particularly informative setting because they combine learning demands with emotionally significant parent-child exchanges.

The next step for the field is therefore empirical rather than rhetorical. Longitudinal, dyadic, observational, and culturally diverse studies should test whether the proposed sequence holds, where it breaks down, and for whom. If supported, interventions should focus on preserving responsiveness and repairing interrupted interaction rather than pursuing unrealistic device elimination. In a digital society, the developmental question is not whether families can avoid technology, but whether children can continue to experience reliable human attention within it.

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