Mobile Dependency in Higher Education: A Bibliometric Mapping of Nomophobia and Related Constructs Among University Students

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ABSTRACT: Mobile dependency is used as an umbrella term for constructs: nomophobia, smartphone addiction, mobile phone addiction, and problematic smartphone use. These constructs share a behavioral core of anxious, compulsive device engagement and are operationalized with overlapping instruments; the rationale for reviewing them jointly is set out in the Introduction. Research has grown over the past decade, yet it has developed in isolation from educational innovation, learning-technology scholarship, digital pedagogy, and educational design. This gap is notable because mobile devices are central to teaching, assessment, and student engagement in higher education. Understanding dependency patterns should inform curriculum and learning-platform design, individual-level intervention and institutional planning. This study presents a bibliometric review of 815 Scopus-indexed journal articles on mobile dependency among university students, published between 2019 and 2025 and screened under the PRISMA 2020 protocol. Performance analysis and science mapping, including keyword co-occurrence, thematic mapping, and conceptual structure analysis, traced publication trends, influential contributors, and the intellectual structure of the field. Annual output nearly quadrupled from 43 articles in 2019 to 165 in 2025. This growth coincided with the shift toward remote/hybrid education during COVID-19, although bibliometric evidence cannot establish causality. Thematic mapping shows that the field remains anchored in an individual-deficit tradition, with limited integration of learning design, educational technology, or digital pedagogy, a gap not addressed by prior bibliometric reviews. The review proposes a research agenda repositioning mobile dependency as an educational innovation challenge, with implications for curriculum design, learning management system governance, and institutional strategy for student digital wellbeing.

Keywords: Bibliometric analysis, educational innovation, higher education, mobile dependency, mobile learning, nomophobia

1 INTRODUCTION

Universities have become saturated with mobile technology, and institutions increasingly rely on smartphones and connected devices to deliver teaching, assessment, and student services. This digital dependence carries a psychological cost. Nomophobia, a term combining “no mobile phone” and “phobia,” describes the anxiety that arises when a person is separated from a mobile phone or unable to access it, and the construct was first linked clinically to panic and anxiety symptoms [1]. Researchers subsequently proposed that nomophobia be recognized as a distinct diagnostic entity [2] and developed validated instruments, most notably the Nomophobia Questionnaire, to measure its severity [3].

Among university students, nomophobia has been consistently associated with elevated anxiety, with prevalence estimates rising across successive cohorts [4], and it has been linked to depressive symptomatology in systematic reviews of problematic smartphone use [5], to measurable anxiety responses when device access is restricted [6], and to fear of missing out as a contributing mechanism [7]. These findings sit within a broader framework that treats problematic smartphone use as a form of behavioral addiction [8], and this framing has shaped how the construct has been studied ever since.

Nomophobia, smartphone addiction, mobile phone addiction, and problematic smartphone use are treated jointly in this review because they are overlapping operationalization of a single underlying phenomenon rather than four independent literatures. Nomophobia refers specifically to the anxiety triggered by separation from, or inability to use, a mobile phone [1], [3], whereas smartphone addiction and problematic smartphone use describe the broader compulsive-use pattern from which that anxiety arises [5], [8]; mobile phone addiction is used largely interchangeably with smartphone addiction in earlier records that predate the smartphone's market dominance. Because validated nomophobia instruments share item content with smartphone-addiction scales, and because Scopus indexing frequently assigns overlapping author keywords across the four terms, treating them as a single combined dataset avoids artificially fragmenting a literature that already treats them as points on one construct; a pooling approach also adopted in prior bibliometric mappings of this literature [20].

University students are relevant to educational innovation scholars for two further reasons that this clinical framing does not capture. First, the academic environment now functions as a managed digital ecosystem in which learning management systems, mobile applications, and constant messaging shape engagement and performance, so nomophobia is as much an institutional design question as a clinical one. Second, the device dependence patterns associated with anxiety and reduced performance in university settings intersect directly with how courses are designed and delivered, since blended and mobile-enabled learning environments are themselves built on the very devices implicated in the construct [9]. How nomophobia research has developed is therefore relevant not only to student mental health but to how universities design curricula, learning platforms, and teaching practices for a generation whose relationship with technology differs from that of previous cohorts.

Despite this practical relevance, the nomophobia literature has developed almost entirely within psychiatry, clinical psychology, and public health. Educational innovation and learning-design perspectives, including technology acceptance [18], mobile-learning theory [16], and learning analytics [19] frameworks that are well established in research on classroom technology use, are rarely brought into conversation with this literature.

Two recent bibliometric mappings intersect with the present review. Wong, Yeo, and Lee [20] analyzed 924 Scopus-indexed smartphone-addiction publications and identified risk-factor, prevalence, and intervention themes through co-word analysis, and Bhattacharya, Singh, and Singh [21], in a 2010–2024 bibliometric mapping of nomophobia, similarly reported a field concentrated in medicine and psychology with limited disciplinary spread. Neither review examined the field's engagement, or lack of it, with educational innovation, mobile learning, or learning-design scholarship, nor did either restrict its sample to a university-student population in order to draw institutional implications for higher education specifically. The present review builds on this prior bibliometric work but is distinguished by its explicit focus on the university-student sub-literature and by its use of thematic mapping to assess cross-disciplinary integration with educational innovation research, rather than only describing the field's internal productivity and thematic structure.

This study addresses that gap through a bibliometric review guided by three research questions. RQ1 asks how scientific production and citation impact in this field have evolved over time. RQ2 asks which authors, sources, and countries have shaped the field, and what this concentration reveals about its disciplinary orientation. RQ3 asks what the thematic and conceptual structure of the literature reveals about the balance between clinical and educational-innovation-relevant perspectives, and where the two might be productively integrated. In answering these

questions, the review contributes a research agenda that connects mobile dependency to higher education policy and to educational innovation research on technology-enabled learning.

2 METHODOLOGY

This review follows a bibliometric review design, applying the PRISMA 2020 protocol [11] for identification, screening, and inclusion, and complementing it with science mapping techniques for thematic analysis. Records were retrieved from the Scopus database on 10 May 2026 using the following Boolean string applied to the title, abstract, and keyword fields: TITLE-ABS-KEY (nomophobia OR "no mobile phone phobia" OR "smartphone addiction" OR "smart phone addiction" OR "mobile phone addiction" OR "problematic smartphone use" OR "problematic mobile phone use") AND TITLE-ABS-KEY (student* OR undergraduate* OR postgraduate* OR university OR college OR "higher education") AND PUBYEAR > 2018 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")). Searches were limited to peer-reviewed journal articles published in English between 2019 and 2025 inclusive.

Following the PRISMA 2020 flow, 1,238 records were identified through the Scopus search; 14 duplicate records were removed, leaving 1,224 records for title-and-abstract screening. Titles and abstracts were screened against a single relevance criterion requiring that the study examine nomophobia or a closely related construct within a university student population; 306 records were excluded at this stage for addressing device use in unrelated populations or contexts, for not being original research, or for insufficient thematic relevance. The remaining 918 full-text articles were assessed for eligibility, and 103 were excluded (40 for studying a non-university-student population, 41 for not being peer-reviewed journal articles, and 22 for being published in a language other than English), yielding the final analytic sample of 815 documents (Fig. 1 summarizes annual output over the review period). Screening was conducted independently by two of the authors, with disagreements resolved through discussion with the third author until consensus was reached. As with any bibliometric review, this process depends on a single database and an English-language restriction, and the implications of these choices for the representativeness of the findings are addressed in the concluding section.

Prior to keyword and thematic analysis, near-synonymous keyword variants (e.g., "smart phone addiction" and "smartphone addiction"; "college student" and "university student") were merged using bibliometrix's synonym-merging function. Keywords occurring in fewer than three documents were excluded from network and thematic mapping to reduce noise, and thematic maps were built on author keywords using the centrality-density algorithm [14] with the Walk trap clustering algorithm and a minimum cluster size of five documents.

Bibliometric performance indicators, including annual scientific production, citation metrics, author and source productivity, and Lotka's law of author productivity [15], were computed alongside science mapping techniques such as keyword co-occurrence analysis, thematic mapping based on the centrality-density framework [14], multiple correspondence analysis, and hierarchical clustering. All analyses were conducted using the bibliometrix R package accessed through its Biblioshiny interface [13], following established guidelines for bibliometric analysis [12]. Thematic mapping classifies keyword clusters into four quadrants defined by centrality, or relevance to the field, and density, or internal development, labelled motor, basic, niche, and emerging or declining themes. This classification is used here not only to describe the field's structure but to assess how far educational innovation and learning-design constructs have been integrated into what the results show to be a predominantly clinical literature.

3 RESULTS

3.1 *Performance Analysis*

Annual scientific production on mobile dependency among university students rose from 43 documents in 2019 to 165 in 2025, an increase of almost fourfold (Fig. 1). Growth was gradual before 2021 and accelerated sharply afterward, a pattern that temporally coincides with the widespread adoption of remote and hybrid learning during

and after the COVID-19 pandemic; this association is descriptive rather than causal, since a bibliometric count cannot establish that the pandemic drove the increase in publications. Average citations per year peaked around 2020 at approximately 6.2 citations and declined to approximately 1.2 by 2025. This decline reflects the normal citation accumulation lag of recent publications rather than any loss of relevance, and it should be read alongside the production data as evidence of a field still in an expansion phase.

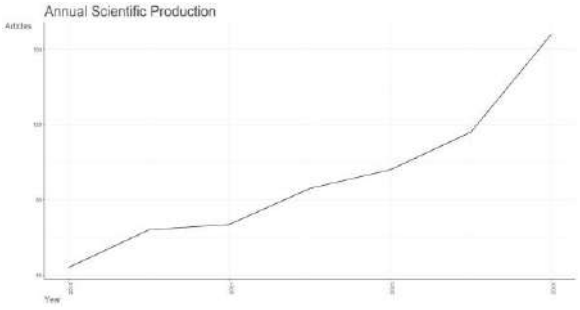


Figure 1. Annual scientific production of mobile dependency research among university students, 2019–2025

Author productivity followed Lotka's law of scientific productivity: most contributing authors published a single document, while a small group of scholars produced a disproportionate share of the literature, a pattern typical of a young, consolidating field. M.D. Griffiths was the most productive author, with sixteen documents and the highest local h-index of ten, followed by Lin C.Y., Wang Y., and Zhang G. with eleven documents each, and Elhai J.D. with nine documents and a local h-index of nine (Table 1). Griffiths' prominence is notable because his work established the components model of addiction that frames much of the field's conceptual vocabulary [8], a framework developed within clinical psychology rather than educational innovation or learning-design research. Frontiers in Psychology and Addictive Behaviors were together the two most prolific and highest-impact outlets, both recording a local h-index of sixteen, followed by the Journal of Affective Disorders and the Journal of Behavioral Addictions with a local h-index of twelve each. This concentration in psychology and psychiatry journals is consistent with the field having developed largely outside educational innovation scholarship, even though its subject matter the behavioral and instructional consequences of constant connectivity is directly relevant to that literature. The most cited document in the dataset, by Elhai and colleagues (2020, Addictive Behaviors), accumulated 249 citations, followed by Leung et al. (2020, Addictive Behaviors, 234 citations) and Geng et al. (2021, Journal of Affective Disorders, 227 citations) (Table 1). China was the leading contributing country by publication volume, consistent with the concentration of highly cited authors and sources in East Asian institutions.

Table 1. Leading authors, sources, and most-cited documents

Category	Entity	Metric
Most productive author	Griffiths M.D.	16 docs (h = 10)
	Lin C.Y., Wang Y., Zhang G.	11 docs each
	Elhai J.D.	9 docs (h = 9)
Most prolific source	Frontiers in Psychology	50 docs (h = 16)
	Addictive Behaviors	30 docs (h = 16)
Most cited document	Elhai et al., 2020, Addict. Behav.	249 citations
	Leung et al., 2020, Addict. Behav.	234 citations
	Geng et al., 2021, J. Affect. Disord.	227 citations

Source: Bibliometric analysis output (Biblioshiny).

3.2 *Science Mapping*

The most frequent keywords smartphone addiction (89 occurrences), nomophobia (63), problematic smartphone use (54), university students (52), mobile phone addiction (49), and anxiety (47) point to a vocabulary built around addiction and clinical symptomatology rather than around use, adoption, or performance, the terms that would be expected if educational innovation and learning-design research had shaped the field to a similar degree. Hierarchical clustering of keywords reinforces this reading. Two broad clusters emerge: one grouping psychological and behavioral correlates such as anxiety, depression, loneliness, sleep quality, self-control, and psychological distress, and a second grouping device-specific and demographic terms such as smartphone addiction, nomophobia, gender, academic performance, and mental health. Neither cluster contains vocabulary associated with established educational-technology frameworks, such as mobile-learning theory [16], student technology-engagement research

[17], technology acceptance models [18], or learning analytics [19], suggesting at the level of keyword co-occurrence that these literatures have developed largely independently of one another.

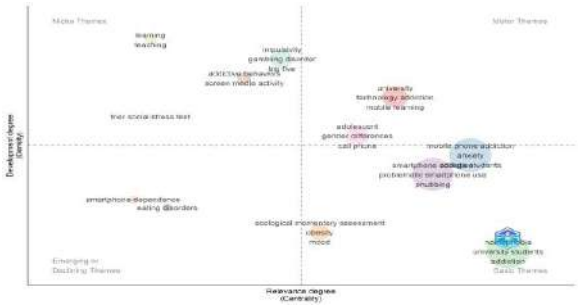


Figure 2. Thematic (strategic) map of mobile dependency research: centrality versus density

Thematic mapping (Fig. 2) positions smartphone addiction, mobile phone addiction, anxiety, problematic smartphone use, phubbing, and technology addiction as motor themes, meaning they are both central to the field and internally well developed. Nomophobia, university students, adolescent, gender differences, and cell phone form the basic themes that underlie the field without being theoretically well developed themselves. Learning and teaching, impulsivity, gambling disorder, and the Big Five personality traits occupy the niche quadrant, representing a smaller, specialized stream connecting nomophobia to individual differences research. Smartphone dependence, eating disorders, ecological momentary assessment, obesity, and mood sit in the emerging or declining quadrant.

These four quadrants do not represent a simple progression from foundational to advanced knowledge. They instead reflect at least two parallel and only loosely connected traditions. The first, comprising the motor and basic themes, treats nomophobia as a clinical symptom cluster to be measured, diagnosed, and predicted from personality and demographic variables. The second, visible mainly in the niche quadrant, treats nomophobia as one manifestation of a broader vulnerability to behavioral addiction, connecting it to gambling and impulsivity research. A third, still emerging perspective, visible in the ecological momentary assessment and latent profile analysis terms appearing in the most recent trend data (Fig. 3), treats nomophobia as a dynamic, situational state that fluctuates within a person over time rather than as a fixed trait. None of the three traditions engages directly with educational innovation constructs such as technology acceptance, instructional design, or institutional readiness for mobile-enabled learning, which is the central gap this review identifies.

3.3 *Trend Topics*

Trend topic analysis (Fig. 3) traces this evolution in more detail. Early general terms such as mobile phone, internet, and smartphone usage were prominent around 2020, giving way to population-specific inquiry, including medical students and higher education, in 2021. The core constructs of nomophobia, smartphone addiction, and problematic smartphone use consolidated in 2023, and their clinical correlates anxiety, mobile phone addiction, and university students became prominent in 2024. The most recent terms, physical exercise, network analysis, and latent profile analysis in 2025, point toward intervention-based and person-centered analytic approaches as a plausible next direction for the field, though even these remain framed in clinical rather than educational terms.

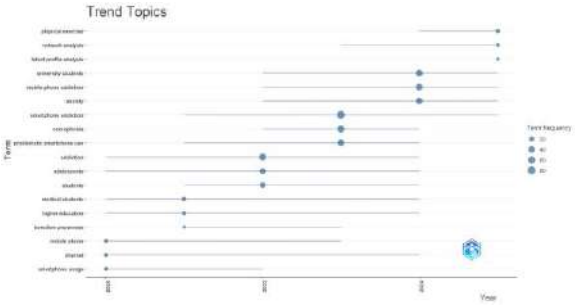


Figure 3. Trend topics in mobile dependency research among university students, 2020–2025

4 DISCUSSION

The results show a field that has matured steadily in volume and citation impact but has done so almost entirely within a clinical paradigm, a pattern already visible in the concentration of the most productive authors and journals in psychology and psychiatry rather than in education, learning technology, or educational innovation outlets. This is broadly consistent with the disciplinary concentration reported by Wong et al. [20] for smartphone addiction and by Bhattacharya

et al. [21] for nomophobia specifically, though neither prior review examined the university-student sub-literature's engagement with educational innovation scholarship, which is the focus adopted here. This pattern has two implications for educational innovation scholarship. First, universities function as learning organizations, and nomophobia's well-established association with anxiety and reduced academic performance is directly relevant to how institutions design digital learning environments, plan student support services, and design policies for the responsible use of mobile technology in teaching. The absence of educational innovation theory in this literature suggests that these institutional questions have, to date, been addressed mainly through health-service and clinical channels rather than integrated into higher education and educational innovation research; this interpretation follows from the absence of relevant keywords and outlets in the mapping and should be treated as a plausible reading of the evidence rather than a demonstrated causal account.

Second, the same behavioral pattern that produces nomophobia in university students near-constant device checking and anxiety when disconnected has direct conceptual parallels in the literature on learning environments and instructional design. The demands-resources logic developed to explain strain in high-demand settings [9] could plausibly apply to academic contexts, where constant connectivity may function as a demand that depletes the attentional and cognitive resources students need for sustained learning, while technology acceptance research [18] offers one possible explanation for why students continue to rely on a technology despite negative consequences. Neither framework has been tested against nomophobia data in the literature identified in this review, so both are presented here as untested, plausible extensions rather than established explanations, and they represent a currently unrealized opportunity for educational innovation research.

Table 2 summarizes these observations as a proposed, currently untested research agenda organized around the field's thematic maturity. For the well-established motor and basic themes, the priority is theoretical integration: testing whether technology acceptance and demands-resources constructs explain variance in nomophobia beyond existing clinical predictors, and whether nomophobia observed during university is associated with measurable learning outcomes such as attention, retention, and academic performance. For the niche, individual-differences stream, the priority is to test whether the addiction-vulnerability profile associated with gambling and impulsivity generalizes to classroom and study-related technology behaviors. For the emerging quadrant, ecological momentary assessment and latent profile analysis offer tools that learning-analytics researchers already use to study engagement over time [19] and could equally be applied to track how mobile dependency develops across a student's academic journey.

Table 2. Comparative thematic summary and proposed educational-innovation research agenda (untested directions)

Quadrant	Representative themes	Underlying tradition	Proposed future direction
Motor (established)	Smartphone/mobile phone addiction, anxiety, phubbing	Clinical/addiction paradigm	Test whether technology acceptance and learning-engagement constructs explain variance beyond existing clinical predictors
Basic (foundational)	Nomophobia, university students, gender, adolescent	Descriptive/diagnostic paradigm	Track, via longitudinal designs, whether nomophobia predicts learning engagement and academic performance
Niche (specialized)	Impulsivity, gambling disorder, Big Five	Individual-differences paradigm	Test whether addiction-vulnerability profiles generalize to classroom and study-related technology behaviors
Emerging/declining	Ecological momentary assessment, latent profile analysis, physical exercise	Person-centered, intervention paradigm	Apply EMA and latent-profile methods from learning-analytics research to track dependency across a student's academic journey

Source: Authors' synthesis of thematic mapping results.

5 IMPLICATIONS FOR EDUCATIONAL INNOVATION

The following implications are offered as potential considerations for institutions to weigh, not as validated interventions; none has been empirically tested in the present bibliometric study.

5.1 *Theoretical implications*

The mapping suggests technology acceptance [18] and demands-resources theory as candidate frameworks for explaining nomophobia in academic settings, and positions learning analytics [19] as a methodological bridge between clinical and educational-innovation research on device dependency. These are theoretical propositions arising from the bibliometric gap identified, and require empirical testing.

5.2 *Educational practice implications*

Faculty development programs could, in principle, equip instructors to design mobile-enabled learning activities that channel smartphone use toward engagement rather than distraction; whether this reduces dependency-related harm has not been tested here and would require intervention studies.

5.3 *Policy implications*

Curriculum and learning-technology policy could be evaluated not only for pedagogical effectiveness but for its potential contribution to problematic device dependence, an evaluation that educational innovation research is well placed to conduct in partnership with student-wellbeing units.

5.4 *Technology design implications*

Learning management system governance could consider structured attention breaks,

notification management, and mobile-use guidelines as part of course design, as one option among several rather than as leaving device use entirely to student self-regulation.

5.5 *Future research implications*

Beyond the agenda in Table 2, complementary co-citation, bibliographic coupling, and collaboration-network analyses would deepen understanding of the field's intellectual and social structure and are recommended as a direct extension of this review.

6 LIMITATIONS AND CONCLUSION

This review is limited by its reliance on a single database, Scopus, by its restriction to English-language publications, and by the macro-level nature of bibliometric analysis, which cannot capture study-level effect sizes or methodological quality. Complementary meta-analytic and qualitative syntheses, and empirical studies that directly test the educational innovation theories proposed here, are needed to build on these findings. The claims in this review that are supported directly by the bibliometric data as publication growth, author and source concentration, and keyword/thematic structure should be distinguished from the technology-acceptance and demands-resources connections proposed in the Discussion, which are interpretive propositions for future testing rather than findings of this study.

In conclusion, mobile dependency among university students is a rapidly expanding field of research that remains anchored in clinical and addiction-based paradigms, with little engagement from educational innovation and learning-design scholarship despite an evident practical relevance to how higher education institutions design curricula, learning platforms, and teaching practices. Connecting this literature to technology acceptance and demands-resources research offers one concrete route toward that engagement, and toward institutional responses that treat mobile dependency as a phenomenon that universities are well positioned to help address through deliberate learning design.

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