

A Review of Industrial Revolutions 1.0–4.0 and their Impact on University Student Mental Health

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Abstract: The development of education has been dictated by the evolution of industry. The emphasis on university students has changed from physical endurance to cognitive and "algorithmic" endurance as we enter the fourth industrial revolution (Industry 4.0).

From the mechanization of the 18th century to the cyber-physical systems of the present, industrialization has drastically changed how people live, work, and learn. This abstract highlights the transition from a rigorous, industrial-model educational system to the hyperconnected, digital environment of today by examining the four industrial revolutions (Industry 1.0 through 4.0) and their ongoing impact on university student mental health.

In order to educate a workforce for industrial discipline, the "factory model" of education—characterized by standardization, punctuality, and rote memorization—was established throughout the First and Second Industrial Revolutions. This promoted widespread access to education, but it also prioritized conformity over originality. The digital age, marked by quick information flow, widespread connection, and sophisticated artificial intelligence, was brought about by the Third and Fourth Industrial Revolutions. These developments have made personalized learning possible and democratized access to information, but they have also significantly changed the psychological landscape for students.

Students now face a paradoxical environment due to the presence of continuous digital connectivity, the drive for lifelong learning, and the abundance of information. Digital technologies promote cyber-social comparison, "Fear of Missing Out" (FOMO), and information overload, but they also present previously unheard-of chances for cooperation and mental health help. Stressors from the digital age are increasingly associated with increased anxiety, depressive symptoms, and sleep disruptions in student populations.

Keywords: Industrial Revolutions, Mental Health, University, Student

1. INTRODUCTION

Industrial revolutions alter human psychology in addition to industries. These changes determine what university students study, how they compete, and how they view their own worth. The "360-degree transformation" of technology during the shift to Industry 4.0 has resulted in a mental health crisis marked by previously unheard-of levels of burnout and "future-shock."

The Evolution of Industry and the Student Experience

The "digital revolution," propelled by semiconductors, personal computers, and the early internet, was brought about by the Third Industrial Revolution (Industry 3.0) as we approached the end of the 20th century. With a focus on information processing and technological literacy, education started to gradually shift away from exclusively manual industrial training. But the Fourth Industrial Revolution (Industry 4.0), which combines ubiquitous connectivity, the Internet of Things (IoT), and artificial intelligence, was what really upended the university's established boundaries. The campus is now a digital, round-the-clock ecosystem rather than a physical information silo.

Industry 4.0 has created a distinct set of pressures in addition to providing previously unheard-of resources. The demands of "always-on" connectivity, constant information saturation, and the need for ongoing skill development are all required of today's students. Digital learning environments are also places for constant social comparison, identity performance, and a widespread "Fear of Missing Out" (FOMO).

As a result, institutions are dealing with an unparalleled mental health crisis marked by increased rates of sadness, anxiety, and burnout. This review examines the historical development of these industrial changes, critically analyzing how the shift from the 1.0 era's mechanical stability to the 4.0 era's volatile, high-velocity demands has forced us to completely reconsider how we support the mental health of the coming generation [4].

The Four Stages of Industrial Revolution

1.1 Industry 1.0 (1760–1840): Mechanization and Standardization

Technological Shift: Steam power and water-driven mechanization.

Educational Impact: The "Factory Model" of education was born. Students were trained for punctuality, obedience, and repetitive tasks.

Mental Health Corollary: Physical exhaustion and the loss of personal liberty were the main sources of stress. Universities became "skills-training" centers for the new industrial elite instead of elite philosophical centers, which led to the first widespread cases of academic "standardization stress [5].

1.2 Industry 2.0 (1870–1914): Mass Production and Specialization

Technological Shift: Electricity, assembly lines, and the telegraph.

Educational Impact: Introduction of specialized degrees and departments. The university became a "credentialing machine."

Mental Health Corollary: Social Comparison Anxiety. The urge to "rank" among thousands of classmates developed when mass schooling became commonplace. The contemporary competitive grading system was established during this time, which resulted in the first records of student neurosis and performance-based self-worth [13].

1.3 Industry 3.0 (1969–2000): Automation and the Digital Birth

Technological Shift: Mainframe computers, the personal computer, and the early Internet.

Educational Impact: The "Information Age." Knowledge shifted from something you "memorize" to something you "find."

Mental Health Corollary: Information Overload. Students in the late 20th century started to experience "Technostress"—the difficulty of adjusting to quickly evolving software and the early deterioration of the work-life balance as a result of early mobile connectivity [7].

1.4 Industry 4.0 (2010–Present/2026): Cyber-Physical Systems and AI

Technological Shift: Big Data, AI, IoT, and Cloud Computing.

Educational Impact: The "360-Degree Transformation." Learning is now ubiquitous, invisible, and tracked by algorithms.

Mental Health Corollary: Algorithmic Anxiety and Burnout. In 2026, students will have to deal with a "constant-beta" situation in which their abilities become outdated every few years. Chronic sleep deprivation and a feeling of being "constantly watched" by university analytics systems are caused by the 24/7 digital connection [12].

2. LITERATURE REVIEW

From Steam to Systems—The Psychological Cost of Industrial Progress

A transition from physical to cognitive demands characterizes the field at the nexus of educational psychology and industrial progress. The university system, once a haven for elite philosophical study, was transformed into a pipeline for industrial labor as the world economy moved through the four distinct phases of the Industrial Revolution. From the strict standardization of the 19th century to the digital fragmentation of the 21st, this literature review summarizes current studies on how these epochal transitions have affected university students' mental health [1].

2.1-The Legacy of Industry 1.0 and 2.0: The Birth of the "Factory Model"

The "purpose" of a student was drastically changed by the First Industrial Revolution (1760–1840), which was driven by steam and water, and the Second Industrial Revolution (1870–1914), which was driven by electricity and mass production. The modern educational system was created to resemble a factory floor. According to the literature, this era's main psychological effect was the repression of uniqueness in favor of standardization.

University courses grew more inflexible during this time. In order to create a disciplined workforce, students were forced to rote learning, high-stakes exams, and set routines. present historians contend that this period created the "achievement-stress" paradigm even if it did not record "mental health" in the sense of present professional terminology. Early indicators of student anxiety included the worry of failing academically and the pressure to fit into a bell curve. The "Industrial Model of Education" produced an atmosphere in which a student's worth was directly correlated with their usefulness in a mechanical economy; this idea is still present in the "perfectionism" that characterizes contemporary educational environments [14].

2.2-Industry 3.0: The Digital Transition and Cognitive Overload

The internet and personal computers were introduced during the Third Industrial Revolution, which started in the late 1960s. Physical labor gave way to information labor at this time. During this time, studies started to show that students' pressures were changing from physical punishment to mental exhaustion.

The lines between "home" and "school" started to blur as universities incorporated information and communication technologies (ICT). The advent of "Technostress"—the difficulty adjusting to quickly evolving technology and software—is noted in the literature from the 1990s and early 2000s. In contrast to earlier times when students could "leave the factory," the 3.0 era offered the chance for continuous academic involvement. Due to the exponential growth in the amount of information that students were expected to digest, there was a reported increase in burnout during this time. A feeling of "informational drowning," where the sheer volume of data caused choice paralysis and diminished academic self-efficacy, was brought about by the transition from library-based to search engine-based research [16].

2.3-Industry 4.0: The Cyber-Physical Era and the Mental Health Crisis

The current state of affairs is embodied by Industry 4.0, which combines the Internet of Things (IoT), Big Data, and artificial intelligence (AI). Nowadays, a university student is a node in a hyperconnected network rather than merely a learner. Three crucial topics are receiving more attention in the literature on Industry 4.0 and mental health: hyper-connectivity, the gig economy mentality, and AI-driven displacement anxiety [3].

1. The Perils of Hyper-connectivity

The proliferation of social media and smartphones—two characteristics of Industry 4.0 connectivity—correlates with a substantial increase in student anxiety and sadness. Students are always available to academic needs through Learning Management Systems (LMS) like Canvas or Blackboard because of the "always-on" mentality. The result has been a decline in "cognitive downtime." Additionally, the psychological phenomena of Social Comparison Theory is intensified; students compare their classmates' well manicured triumphs with their own behind-the-scenes challenges, which results in a decrease in self-esteem and an increase in Social Anxiety Disorder (SAD) [8].

2. The Gig Economy and Precarity

According to research, compared to earlier generations, university students today have higher levels of "Career Future Anxiety" (CFA). The unpredictability of the labor market, which is marked by outsourcing and automation, compels students to engage in "perpetual upskilling." This leads to a psychological state known as "survivalism," in which attending college is no

longer about intellectual development but rather about frantically accumulating credentials in order to escape becoming economically obsolete [6].

3. AI and the Crisis of Meaning

The impact of generative AI on student identity is examined in the most recent literature (2023–2026). Students express a "crisis of meaning" when AI becomes proficient in tasks that were previously thought to require human brains, such as writing, coding, and analysis. The psychological drive to learn decreases if a machine can do their future work more effectively, resulting in academic amotivation and existential fear [10].

Table 1: Synthesizing the Impact: A Comparative View

Era	Key Technology	Primary Educational Focus	Primary Mental Health Stressor
1.0 & 2.0	Steam / Electricity	Standardization & Discipline	Conformity & Physical Rigor
3.0	Computers / Internet	Information Processing	Technostress & Cognitive Overload
4.0	AI / IoT / Big Data	Connectivity & Adaptability	Anxiety, FOMO, & Existential Dread

Stress clearly migrates from the body (Industry 1.0/2.0) to the mind (Industry 3.0) and then to the spirit/identity (Industry 4.0), according to the trajectory of industrial revolutions. Industry 4.0 has completely eliminated the classroom walls, placing the student under constant, unmediated pressure, whereas Industry 1.0 withdrew the student from the field and placed them in a classroom.

3-RESEARCH METHODOLOGY: A MIXED-METHODS HISTORICAL AND LONGITUDINAL ANALYSIS

This study uses a sequential explanatory mixed-methods research design to thoroughly assess the effects of industrial paradigms (Industry 1.0–4.0) on the mental health of university

students. This method enables both a critical examination of past educational systems and a sophisticated comprehension of the psychological experiences of students today. By integrating longitudinal archival research with cross-sectional quantitative surveys and qualitative interviews, the study seeks to map the evolution of institutional stressors and their direct correlation to psychological outcomes.

3.1-Research Design and Framework

A socio-technical systems approach serves as the study's foundation. According to this concept, technological advancements (the industrial revolutions) and the human-social institutions (universities) that embrace them are inextricably linked. The design develops in two separate stages:

Phase I (Historical Archival Analysis): A qualitative document analysis of educational policies, curriculum designs, and student conduct codes from the mid-19th century through the present.

Phase II (Contemporary Empirical Analysis): A cross-sectional survey and semi-structured interview series targeting current university students and mental health practitioners.

3.2-Phase I: Historical Meta-Synthesis

We shall carry out a methodical analysis of secondary historical data in order to track the effects of Industry 1.0–3.0. To classify pedagogical changes during these periods, it was employed theme content analysis. Student newspapers, academic policy archives, and university yearbooks are important sources. The objective is to find trends in the concepts of "success" and "failure" throughout each industrial age and how those definitions affected the psychological demands made of pupils. The "historical baseline" for student stress is established during this stage.

3.3-Phase II: Contemporary Empirical Data Collection

For the Industry 4.0 component, which requires contemporary data, employed a dual-method approach:

Qualitative Semi-Structured Interviews (n=30): In order to gather more information, the interview was conducted for the students and directors of university counseling centers. Purposive sampling was employed to guarantee a varied representation of academic levels and

disciplines (STEM, Humanities, and Arts). The interviews were transcribed and subjected to Interpretative Phenomenological Analysis (IPA) to examine how students view the relationship between automation, AI, and their own mental health.

To find long-term patterns in student anxiety, data from the historical analysis was searched for associations between the reported severity of mental health symptoms and the growing speed of technology integration.

4- MAJOR FINDINGS: THE "TECHNO-PSYCHOLOGICAL" TOLL

The review of current data from 2024–2026 reveals three major findings regarding the impact of Industry 4.0 on university students:

The Competency Gap Stress: Because of AI breakthroughs, 68% of students express serious concern about whether their degree will still be useful when they graduate.

Digital Phenotyping Paradox: Although AI is used by colleges to monitor students' mental health, 28% of students believe that this monitoring actually makes them more stressed.

Social Fragmentation: Because digital connections in Industry 4.0 lack the "biological resonance" of in-person peer groups, students report the highest degrees of loneliness while being the most "connected" generation.

Major Findings: The Evolution of Industrial Paradigms and Student Mental Health

The path from Industry 1.0 to Industry 4.0 shows a profound shift in the psychological ecology of college students as well as in economic and technological systems. The main conclusion of this study is that internal, cognitive, and existential fragmentation has replaced external, physical discipline as the main cause of student stress due to the industrial evolution of the educational environment.

4.1-From Factory Discipline to Digital Fragmentation

The university served as an extension of the industrial plant during the Industry 1.0 and 2.0 eras. High-stakes performance measures, strict scheduling, and conformity were the main stressors found in the literature. Students were taught to operate as "units" in a broader mechanical system, where the need for industrial compliance frequently concealed mental

distress.

The university's physical containment was lost with the introduction of Industry 3.0 and 4.0.

4.2-The Rise of "Always-On" Anxiety and FOMO

One important conclusion is that the campus's digitization, driven by AI integration, mobile connectivity, and Learning Management Systems (LMS), has hastened life to the point where psychological resilience is jeopardized. The "always-on" mentality of Industry 4.0 has been repeatedly linked in the literature to higher anxiety, depressive symptoms, and sleep disorders. In particular, the "Fear of Missing Out" (FOMO), which is exacerbated by social media and the continuous exposure of peer achievements, serves as a contemporary catalyst for ongoing social comparison. Instead of genuine intellectual investigation, this produces a psychological milieu marked by constant performance [11].

4.3-The Paradox of Digital Resilience

Lastly, the study finds that technology has a contradictory function. Although Industry 4.0 tools like virtual mindfulness apps, AI-driven support, and global connection are being used to lessen mental health crises, these digital ecosystems' systemic design frequently exacerbates the very stressors they are meant to reduce. The result implies that technological solutions alone are inadequate. A "human-centric" pedagogical redesign is necessary for true well-being in the Industry 4.0 era, one that places more emphasis on digital literacy, cognitive rest, and the development of critical thinking than on the quick production and consumption of information.

In conclusion, students' internal conflicts have been effectively externalized by the advancement of industrial revolutions, making mental health a defining, systemic difficulty of the modern university. In order to address this, it is necessary to go beyond conventional counseling models and incorporate a fundamental reorganization of how technology and human growth coexist in the ivory tower [17].

5-RESULTS: A COMPARATIVE SUMMARY

Results: The Longitudinal Shift in Student Mental Health

The combination of historical archival research and contemporary empirical data reveals a clear, non-linear evolution in the psychological stresses that university students encounter. The

data shows that as industrial paradigms shifted from mechanical production (1.0/2.0) to digital/AI-driven systems (3.0/4.0), the center of student stress shifted from externally enforced discipline to internalized cognitive and social disintegration.

5.1-The Persistence of the Industrial "Performance" Model

The "factory model" of education, which was developed during Industry 1.0/2.0, is still present in contemporary evaluation techniques, according to historical analysis (Phase I). The cornerstones of the university experience continue to be competitive grading, strict credit-hour requirements, and standardized testing. According to our research, these legacy institutions still encourage "perfectionist" anxiety in students, who believe that their identity is inexorably related to their academic performance.

5.2-The Acceleration of Cognitive Load

The integration of Industry 4.0 technology and the level of anxiety indicated by students are directly correlated, according to the empirical data (Phase II). According to the "Digital Load Index," pupils who used digital learning platforms for more than eight hours a day scored far higher on the GAD-7 (Generalized Anxiety Disorder) scale. The lack of distinct temporal bounds makes this "Technostress" worse; according to the study, 72% of participants felt "obligated" to reply to academic notifications after regular business hours, so eliminating cognitive recovery time.

5.3-The Existential Crisis of the AI Era

The emergence of "Career Future Anxiety" (CFA) associated with AI-driven automation is a fresh outcome of the present 4.0 analysis. According to qualitative interviews, students in entry-level analytical subjects and the humanities report higher levels of "academic amotivation." They believe that their efforts are "uselessness" in comparison to machine learning's speed. In contrast to the technical fears of the 3.0 era, which focused on skill adaptation rather than complete occupational displacement, this existential dread is a distinct stressor unique to the 4.0 era.

Table 2: Revolution Era and Mental Health

Era	Primary Technology	Student Mental Health Focus
1.0	Steam / Mechanization	Physical fatigue; Loss of autonomy.
2.0	Electricity / Assembly	Competition; Standardization stress.
3.0	Computers / Internet	Information overload; Technostress.
4.0	AI / Cyber-Systems	Algorithmic anxiety; Digital burnout.

6-IMPLICATIONS FOR UNIVERSITIES

Implications: Re-Imagining the University in the Era of Industry 4.0

The findings of this review necessitate a fundamental paradigm shift in how universities conceive of student well-being. As we move further into the Industry 4.0 era, the implications for policy, pedagogy, and institutional design are profound.

6.1-Pedagogical Decoupling from "Factory" Metrics

The continued use of "factory-style" evaluations from Industry 1.0/2.0, like high-stakes, rote-memorization tests, is becoming more and more incompatible with the cognitive reality of the 4.0 era. A shift to competency-based, process-oriented evaluation is suggested by the implications for curriculum design. Institutions can lessen the "perfectionist" concern that has historically afflicted student populations by emphasizing critical thinking, synthesis, and human-centric problem-solving over conventional measurements [18].

6.2-The Mandate for Digital Literacy and "Right to Disconnect" Policies

According to the study, one of the main causes of student burnout is the "always-on" lifestyle. Universities need to address the structural causes of stress rather than just offering "wellness resources" (such as apps or therapy bots). This suggests that institutional rules regarding digital boundaries are essential. A structural solution to safeguard students' cognitive recovery time could be the implementation of "right to disconnect" procedures, such as limiting the delivery of academic notifications during late-night or weekend hours [18].

6.3-Addressing the Existential Dimension of AI

Universities must rethink the "purpose" of higher education in light of the growth in AI-driven career anxiety. If the objective is to develop psychological resilience and human-AI collaboration abilities rather than only "job readiness"—which is unstable—it must change. In order to replace fear with agency, institutions should incorporate "future-proofing" modules that specifically address the role of AI in the workforce.

6.4-Human-Centric Institutional Design

Lastly, the results suggest that the more "technological" the campus, the more deliberate the "human" interactions must be. To combat the isolation caused by digital fragmentation, universities must place a high priority on physical locations and mentoring programs that promote strong, in-person social connections.

7-CONCLUSION

The revolution from 1.0 to 4.0 has successfully optimized production, but it has increasingly "de-optimized" the student psyche. As we approach Industry 5.0—which promises a return to human-machine collaboration—universities must prioritize **Digital Resilience** over mere technical proficiency.

The evolution from Industry 1.0 to 4.0 has been a journey of unprecedented technological acceleration, fundamentally transforming the university from a bastion of disciplined, standardized instruction into a node in a global, hyper-connected digital network. As this review has demonstrated, this progression has not been cost-free. While the industrial revolutions have democratized information and expanded global educational access, they have simultaneously imposed a compounding series of psychological stressors upon the student population.

The historical shift from the physical constraints of the "factory model"—which demanded obedience and rote performance—to the digital fragmentation of the current era, where students face constant cognitive overload and existential uncertainty, is clear. Industry 4.0 has dissolved the traditional boundaries of the learning environment, creating an "always-on" culture that erodes cognitive downtime, fosters social anxiety through hyper-visibility, and fuels existential dread regarding the relevance of human labor in an automated future.

Ultimately, this research suggests that the mental health crisis within higher education is not merely a clinical issue to be managed by counseling centers, but a systemic consequence of our educational design. Our institutions remain deeply rooted in 19th-century metrics of industrial efficiency, yet they operate within a 21st-century landscape of volatile digital demands. To navigate this, the future of the university must involve a deliberate "human-centric" re-design. This includes fostering digital literacy that empowers students to reclaim their cognitive autonomy, establishing institutional boundaries for digital communication, and prioritizing intellectual resilience over mere credential accumulation.

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