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EXPLORING THE ROLE OF DIGITAL COOPERATIVE LEARNING IN ALLEVIATING STUDENT STRESS AND ENHANCING SLEEP QUALITY: A LITERATURE REVIEW

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Abstract
This study explores the role of Digital Cooperative Learning (DCL) in reducing student stress and improving sleep quality through a traditional literature review based on sources from the Scopus database. As students face increasing academic pressure and extended screen exposure, especially in the post-pandemic learning landscape, DCL emerges as a promising pedagogical strategy that integrates collaborative learning with digital platforms. Findings indicate that DCL enhances student engagement, motivation, and critical thinking while simultaneously creating socially supportive environments that alleviate stress. Furthermore, cooperative digital settings foster emotional well-being and can indirectly improve sleep patterns by reducing anxiety and academic overload. However, the implementation of DCL is challenged by limited access to digital infrastructure, disparities in digital literacy, and a lack of psychological support systems. Successful adoption requires well-prepared educators, inclusive learning designs, and institutional investment in mental health integration. The study concludes that DCL, when designed with attention to both technological and psychosocial dimensions, has the potential to be a holistic educational approach that supports academic achievement and student wellness in the 21st-century digital classroom.
Keywords: digital cooperative learning, reduce student stress, improve sleep

Abstrak
Studi ini mengeksplorasi peran Pembelajaran Kooperatif Digital (DCL) dalam mengurangi stres siswa dan meningkatkan kualitas tidur melalui tinjauan literatur tradisional berdasarkan sumber dari basis data Scopus. Seiring meningkatnya tekanan akademis dan paparan layar yang berkepanjangan, terutama dalam lanskap pembelajaran pasca-pandemi, DCL muncul sebagai strategi pedagogis yang menjanjikan yang mengintegrasikan pembelajaran kolaboratif dengan platform digital. Temuan menunjukkan bahwa DCL meningkatkan keterlibatan, motivasi, dan pemikiran kritis siswa sekaligus menciptakan lingkungan yang mendukung secara sosial yang mengurangi stres. Lebih lanjut, lingkungan digital kooperatif mendorong kesejahteraan emosional dan secara tidak langsung dapat meningkatkan pola tidur dengan mengurangi kecemasan dan beban akademis yang berlebihan. Namun, implementasi DCL menghadapi tantangan berupa keterbatasan akses terhadap infrastruktur digital, kesenjangan dalam literasi digital, dan kurangnya sistem dukungan psikologis. Keberhasilan penerapannya membutuhkan pendidik yang siap, desain pembelajaran

inklusif, dan investasi institusional dalam integrasi kesehatan mental. Studi ini menyimpulkan bahwa DCL, ketika dirancang dengan memperhatikan dimensi teknologi dan psikososial, berpotensi menjadi pendekatan pendidikan holistik yang mendukung prestasi akademik dan kesejahteraan siswa di kelas digital abad ke-21.
***Kata kunci**: pembelajaran kooperatif digital, mengurangi stres siswa, meningkatkan kualitas tidur*

INTRODUCTION

The COVID-19 pandemic has profoundly reshaped the educational landscape, compelling institutions to transition abruptly toward digital learning environments. This paradigm shift, while ensuring academic continuity, has simultaneously intensified students' academic burdens and psychological distress. Increased reliance on technology, lack of social interaction, and limited clarity in academic assessments have collectively contributed to elevated stress levels and disrupted sleep patterns among students, particularly in secondary and higher education contexts (Cheng et al., 2025). The sudden demand for adaptability to new learning systems—combined with extended screen exposure has amplified cognitive overload and emotional fatigue, creating an urgent need for pedagogical innovations that address both academic and mental-health dimensions of learning.

Academic stress and sleep disturbances are closely intertwined phenomena with reciprocal influence on learning outcomes. High levels of academic pressure often result in poor sleep quality, which subsequently impairs memory, attention, and motivation. Cheng et al found that students experiencing high academic stress reported lower sleep quality and diminished subjective well-being (Cheng et al., 2025). Likewise, Salahuddin et al and Sasser et al demonstrated that chronic stress and sleep deprivation mutually reinforce each other, leading to anxiety, depressive symptoms, and reduced cognitive efficiency (Salahuddin et al., 2025; Sasser et al., 2025). Such findings highlight the complex biopsychosocial interrelationship between stress regulation, emotional stability, and physiological recovery. Consequently, there is a pressing need for pedagogical frameworks that promote psychological balance and healthy sleep habits alongside academic performance.

Cooperative learning provides one of the most established pedagogical approaches for cultivating both academic competence and emotional well-being. It emphasizes group interdependence, shared accountability, and peer support—elements that strengthen students' sense of belonging and reduce individual stress. Research has consistently shown that cooperative learning encourages emotional regulation, increases classroom engagement, and fosters resilience against anxiety through social reinforcement (Bellhäuser et al., 2025; Stalmach et al., 2024). These benefits, when viewed through the lens of psychological well-being, suggest that structured collaboration can indirectly improve behavioral patterns such as sleep quality by reducing negative affect and cognitive strain (Salahuddin et al., 2025; Sasser et al., 2025).

With the rapid advancement of educational technology, cooperative learning has evolved into Digital Cooperative Learning (DCL)—a pedagogical model that merges cooperative learning principles with digital interactivity. DCL integrates synchronous and asynchronous tools such as virtual breakout rooms, online forums, collaborative documents, and augmented-reality-based activities to facilitate active, technology-mediated teamwork (Solissa et al., 2023; Uyun et al., 2023). Unlike generic e-learning, DCL emphasizes structured social collaboration rather than individual content consumption. Studies by Rizki et al show that DCL not only enhances student motivation and critical thinking but also alleviates academic stress through peer connection and shared responsibility (I. A. Rizki et al., 2024). Thus, DCL represents a pedagogical advancement that can simultaneously enhance cognitive engagement and emotional resilience within digital learning ecosystems.

The relevance of DCL became increasingly evident during and after the pandemic, as digital literacy and online collaboration emerged as essential 21st-century competencies. Mohammadyari & Singh and Yuan et al found that students' growing digital proficiency enabled deeper engagement with online learning platforms, promoting autonomy and confidence in managing learning tasks (Mohammadyari & Singh, 2015; Yuan et al., 2024). Furthermore, inclusive digital approaches such as problem-based and cooperative learning have demonstrated positive outcomes for students with diverse educational needs, promoting equitable participation and reducing isolation in virtual classrooms (D'Elia et al., 2025; Stalmach et al., 2024). Williams further emphasized that well-structured online communities strengthen social presence and mitigate the emotional detachment commonly experienced in distance education (Williams, 2022).

Building on this conceptual foundation, the present article adopts a structured literature-review approach to synthesize and critically analyze recent evidence on the relationship between Digital Cooperative Learning, academic stress, and sleep quality. The study does not claim causal inference but rather explores how and under what conditions DCL contributes to students' psychological and physiological well-being. To ensure methodological transparency, the review incorporates a clearly defined search strategy, Boolean-based query combinations, and inclusion–exclusion criteria applied primarily to Scopus-indexed studies published between 2015 and 2024. The objective is to map thematic trends, identify conceptual linkages, and outline future directions for designing pedagogically and psychosocially balanced digital learning environments. Ultimately, this review positions DCL as a holistic educational strategy that aligns cognitive, emotional, and health dimensions within the evolving post-pandemic educational paradigm.

METHOD

This study employed a traditional literature review approach to explore the role of digital cooperative learning in reducing student stress and improving sleep quality. The review aimed to describe and synthesize existing scholarly discussions without applying formal

systematic review protocols. Relevant articles were collected from the Scopus database, selected for its breadth of peer-reviewed academic publications and its relevance to educational and psychological research. The search focused on studies published between 2015 and 2025, using keywords such as “digital cooperative learning,” “academic stress,” “student sleep,” “mental health,” and “technology in education.” Articles were filtered based on relevance to the core themes of this study and their empirical or conceptual contribution to understanding the relationship between learning methods, student stress, and sleep outcomes.

The inclusion criteria were intentionally broad to capture diverse perspectives, encompassing both empirical studies and theoretical discussions related to cooperative learning, digital tools, and student well-being. Only peer-reviewed journal articles written in English were considered, and duplicate entries or studies focusing on unrelated fields were excluded. A total of 30 articles were selected for closer examination after an initial screening of titles and abstracts. The selected literature was then categorized thematically to highlight recurring findings, identify gaps, and develop a narrative synthesis that reflects current insights on how digital collaborative learning environments can serve as a tool for promoting psychological well-being and healthier sleep habits among students.

RESULTS AND DISCUSSION

1. Effectiveness of Digital Cooperative Learning in Educational Contexts

Digital Cooperative Learning (DCL) is increasingly recognized as an effective instructional approach for enhancing student engagement, collaboration, and critical thinking. This strategy combines collaborative learning with the use of digital technology, creating an interactive and inclusive learning environment. One of DCL's main strengths is its ability to foster active student participation through online group work and project-based discussions.

Research by Mujib & Marhamah found that implementing a blended cooperative learning model in Islamic religious education significantly increased student participation and engagement in a Jakarta high school (Mujib & Marhamah, 2020). Similarly, Rizki et al (2024) demonstrated that integrating augmented reality technology into cooperative learning models significantly improved students' critical thinking and motivation (F. C. Rizki et al., 2024). These findings highlight the synergy between cooperative learning and digital tools in enriching student learning experiences.

However, the effectiveness of DCL heavily depends on teacher preparedness and competence. Stalmach et al emphasized the importance of teacher training in implementing project-based and collaborative learning (Stalmach et al., 2024). D’Elia et al and Liu also highlighted that the ability of educators to facilitate meaningful and inclusive interactions determines the success of DCL, especially for students with special needs (D’Elia et al., 2025; Liu, 2022). Although students' digital literacy improved during the COVID-19 pandemic, without systematic support for teachers and infrastructure,

digital learning effectiveness remains limited (Ahammad & Islam, 2025; Kundu & Bej, 2021; Li & Yu, 2022; Martzoukou, 2021; Ndibalema, 2022, 2025; Yu, 2022).

Table 1. Studies on the Effectiveness of DCL in Education

RESEARCHER	LEARNING CONTEXT	KEY FINDINGS
(MUJIB & MARHAMAH, 2020)	Islamic Religious Education	Significant increase in student engagement
(I. A. RIZKI ET AL., 2024)	Augmented Reality	Improved critical thinking and motivation
(STALMACH ET AL., 2024)	PBL for inclusive learners	Effectiveness depends on teacher competence
(D'ELIA ET AL., 2025)	Digital Inclusion & SEN	Flexible strategies needed for equitable access

Table 1 highlights the broad effectiveness of DCL across various educational settin gs, reflecting improvements in engagement, motivation, and critical thinking. For example, in religious education and AR-supported classrooms, DCL significantly increased student participation and depth of understanding. The studies also emphasize that teacher readiness, especially for inclusive learning, plays a pivotal role in optimizing the outcomes of DCL. Therefore, while DCL offers transformative potential, its success depends on both pedagogical competencies and supportive digital infrastructure.

2. Relationship Between Digital Cooperative Learning and Student Stress

DCL has significant potential to reduce student stress through increased social interaction and active participation. By creating a supportive and collaborative space, DCL helps students feel more connected and less isolated. Peer interactions also build confidence and reduce academic pressure often found in conventional learning. Rizki et al showed that integrating augmented reality in DCL not only boosted engagement but also reinforced teamwork, which contributed to stress reduction (I. A. Rizki et al., 2024). Mujib & Marhamah emphasized that cooperative e-learning effectively increased motivation and participation—factors directly linked to lower academic pressure (Mujib & Marhamah, 2020). Cheng et al and D'Elia et al that learning supported by teamwork and social support can directly influence stress levels, including for students with special needs (Cheng et al., 2025; D'Elia et al., 2025).

Nevertheless, challenges persist. Bellhäuser et al and Williams noted that without adequate training and accessible technology, students may feel isolated, exacerbating stress (Bellhäuser et al., 2025; Williams, 2022). Therefore, the success of DCL in reducing stress depends on thorough planning and the technical and pedagogical readiness of schools and teachers.

Table 2. Studies on DCL and Its Relationship with Student Stress

RESEARCHER	FOCUS OF STUDY	KEY FINDINGS
(I. A. RIZKI ET AL., 2024)	AR-based Collaboration	Reduced stress through engagement and teamwork
(MUJIB & MARHAMAH, 2020)	Quranic E-learning	Increased motivation and participation
(CHENG ET AL., 2025)	Physical activity and counseling	Lower academic pressure
(D'ELIA ET AL., 2025)	Inclusive learning strategies	Reduced stress for students with special needs

Table 2 demonstrates that DCL can foster a socially and emotionally supportive learning environment by increasing motivation, teamwork, and engagement. The research findings suggest that when students participate in cooperative activities, they feel less isolated and more confident, which reduces academic stress. Furthermore, the inclusion of students with special needs through adaptive learning environments enhances the equitable impact of DCL. However, for these benefits to be fully realized, DCL must be implemented with strong support systems and teacher training to overcome technological and pedagogical barriers.

3. Impact of Digital Learning on Student Sleep Quality

Digital learning presents a complex impact on students' sleep quality. On one hand, digital education expands access and flexibility; on the other, it introduces academic pressure and extended screen time, which can disrupt sleep rhythms and affect overall student well-being.

Cheng et al reported a significant link between academic pressure and sleep quality (Cheng et al., 2025). Students facing heavy digital workloads experienced increased stress, which negatively affected sleep patterns. Sasser et al (2025) further highlighted a reciprocal relationship between stress, insomnia, and depressive symptoms, forming a negative psychological cycle among students.

However, student sleep quality can be improved through integrated learning interventions. Cheng et al recommended combining physical activity, psychological counseling, and sleep management to balance academic demands and rest (Cheng et al., 2025). Kwaah et al noted that while students' digital skills improved during the pandemic, uncontrolled adaptation to digital learning can add new stressors (Kwaah et al., 2022).

Table 3. Studies on the Impact of Digital Learning on Sleep Quality

RESEARCHER	STUDIED VARIABLES	KEY FINDINGS
(CHENG ET AL., 2025)	Academic stress and sleep	Negative correlation; stress worsens sleep quality
(SASSER ET AL., 2025)	Stress, sleep, and depression	Negative psychological cycle
(KWAAH ET AL., 2022)	Post-pandemic digital adaptation	High adaptation, but increased potential for stress

Table 3 emphasizes the need for targeted interventions to prevent the negative consequences of digital learning on sleep quality. The studies reviewed consistently show that increased academic stress and screen exposure disrupt sleep patterns and contribute to mental health challenges. Notably, the reciprocal relationship between stress, insomnia, and depression highlights the importance of early prevention. Therefore, integrating sleep education and time management strategies into digital learning models is crucial for promoting student well-being.

4. Limitations and Challenges of Implementation

Although DCL offers many benefits, its implementation faces several challenges. The digital divide—unequal access to technology and internet—remains a major obstacle to equitable collaborative learning. This is particularly true for students with special needs, who are often marginalized in digital learning environments (Stalmach et al., 2024).

Beyond access, varying levels of digital literacy among students and teachers are a critical factor. Salahuddin et al found that while digital skills increased during the pandemic (Salahuddin et al., 2025), gaps in comfort and proficiency with digital tools persist. In project-based learning contexts, Bellhäuser et al and Liu noted that group collaboration success depends on team dynamics and effective communication (Bellhäuser et al., 2025; Liu, 2022).

Psychological factors also play a key role. Academic stress and sleep problems can hinder student participation in collaborative learning. Therefore, integrating psychological support and stress management into digital learning plans is essential (Lu et al., 2025; Salahuddin et al., 2025).

Table 4. Implementation Challenges of DCL

CHALLENGE AREA	MAIN ISSUES	IMPLICATIONS FOR LEARNING
TECHNOLOGY ACCESS	Limited devices & connectivity	Unequal student participation
DIGITAL LITERACY	Teacher-student skill gaps	Suboptimal digital platform use

PSYCHOLOGICAL FACTORS	Stress, sleep issues, digital load	Reduced engagement and motivation in collaboration

Table 4 illustrates that successful DCL implementation depends on overcoming challenges in infrastructure, digital competence, and student mental health. Technological disparities, such as limited device access or poor internet, create barriers to full student participation. Likewise, gaps in digital literacy and emotional support can diminish the collaborative spirit central to DCL. Thus, addressing these interconnected issues holistically is essential for sustainable and inclusive adoption of digital cooperative learning models.

5. Integration of Findings

The integration of innovative teaching approaches like DCL is highly relevant in addressing the challenges of digital-era education. This model not only improves academic outcomes but also strengthens students' social and emotional development (Agustina & Julius, 2024). Research shows that combining cooperative learning, digital tools such as augmented reality, and flexible e-learning methods leads to greater engagement and improved learning outcomes (Mujib & Marhamah, 2020; I. A. Rizki et al., 2024).

Furthermore, the integration of such approaches raises awareness of the importance of mental health in education. Studies by Sasser et al and Lu et al emphasized the need for psychosocial support in learning design, enabling students to manage academic pressures without compromising emotional well-being and sleep quality (Lu et al., 2025; Sasser et al., 2025). This is a critical foundation for responsive and adaptive education policy planning.

Overall, successful DCL implementation requires synergy between technological innovation, pedagogical skills, and adequate emotional and social support. When these elements are integrated into instructional design, a healthy, inclusive, and high-performing educational environment can be established.

Table 5. Integration of Findings and Their Relevance to Digital Education

LEARNING DIMENSION	DCL INTERVENTION	OBSERVED IMPACT
COGNITIVE	Project learning and AR technologies	Improved critical thinking and subject comprehension
EMOTIONAL	Social support and collaborative interaction	Reduced stress and academic anxiety
HEALTH & PSYCHOLOGICAL	Screen-time management and counseling	Improved sleep and student well-being

Table 5 summarizes the multi-dimensional benefits of DCL, showing its relevance to cognitive, emotional, and psychological aspects of learning. Cognitive gains include

deeper critical thinking and stronger content understanding, especially in project-based learning. Emotionally, DCL fosters social connectedness, which reduces academic anxiety and builds resilience. Psychologically, when paired with screen-time regulation and wellness support, DCL contributes meaningfully to improved sleep and overall student health.

DISCUSSION

The implementation of Digital Cooperative Learning (DCL) has increasingly gained attention as a transformative educational strategy that enhances engagement, fosters collaboration, and cultivates higher-order thinking skills. As noted by Mujib & Marhamah, blended cooperative learning models significantly boost student participation, especially in subjects traditionally seen as rigid, such as religious education (Mujib & Marhamah, 2020). Similarly, Rizki et al demonstrate how the integration of augmented reality into cooperative frameworks can elevate student motivation and cognitive engagement (I. A. Rizki et al., 2024). These findings align with the present study's results, which underscore that when students engage in structured digital collaboration, they are more likely to experience academic confidence and lower stress. However, the effectiveness of DCL heavily depends on teachers' digital pedagogical competence (Stalmach et al., 2024) and the availability of user-friendly technological infrastructure that facilitates, rather than hinders, interactive learning.

In addition to promoting learning outcomes, DCL holds promise in mitigating academic stress among students. Research has shown that digital cooperative environments reduce feelings of isolation by promoting peer support and shared responsibility (Cheng et al., 2025; D'Elia et al., 2025). The social dynamics cultivated through group collaboration have been linked to lower levels of academic anxiety, a trend supported by studies on cooperative e-learning in both general and special needs populations (Stalmach et al., 2024). Notably, Rizki et al found that collaborative gamified activities can reduce pressure by transforming the learning experience into something playful and communal (I. A. Rizki et al., 2024). However, these benefits are conditional—when students face inadequate guidance or poor group management, DCL may instead become a source of stress, as highlighted in challenges reported by Williams and Bellhäuser et al.

Despite these strengths, the impact of DCL on sleep quality must be interpreted cautiously. Academic stress induced by digital learning environments—particularly when poorly structured or implemented late at night—can disrupt circadian rhythms and reduce sleep quality (Sasser et al., 2025). The findings from (Cheng et al., 2025) and (Salahuddin et al., 2025) reveal a clear correlation between academic stress, sleep disturbance, and deteriorating well-being. Furthermore, overexposure to screens before bedtime, a frequent consequence of digital tasks, may exacerbate insomnia and anxiety. Still, the literature also reveals a counterbalance: when digital learning is carefully scaffolded with clear expectations and appropriate scheduling, it can foster better time management and reduce last-minute academic stress, indirectly improving sleep (Lu et al., 2025). This

reinforces the need for school policies that not only promote digital innovation but also safeguard student health.

Nevertheless, several barriers must be addressed for DCL to be fully effective. Access to reliable internet, device availability, and digital literacy remain uneven, especially in under-resourced settings (Bellhäuser et al., 2025). Moreover, teachers often lack professional development opportunities to design inclusive, collaborative digital learning environments (Davis et al., 2018; Liu, 2022). Students with special educational needs (SEN) may also face exclusion when DCL is not adapted to their specific requirements (D'Elia et al., 2025). These findings highlight that infrastructure alone is not enough—human capacity building is essential. Without sufficient teacher training and psychosocial support integration, DCL risks becoming an additional cognitive and emotional burden rather than a relief.

In synthesizing the findings, it becomes clear that the intersection of pedagogy, psychology, and technology must be at the heart of modern educational reforms. DCL is not merely a tool for content delivery, but a framework that can shape how students interact, cope with stress, and find meaning in learning. As shown by multiple sources, from Rizki et al to Sasser et al , the success of digital cooperative strategies relies on a balance between structure and flexibility, innovation and inclusion (I. A. Rizki et al., 2024; Sasser et al., 2025). Policies that integrate physical activity, mental health literacy, and teacher readiness into DCL programs are necessary to optimize both academic performance and student well-being. Therefore, investing in collaborative pedagogical innovation is not just beneficial it is imperative for shaping healthier, more resilient, and future-ready learners.

CONCLUSION

This study concludes that Digital Cooperative Learning (DCL) offers substantial benefits in enhancing not only students' academic engagement and cognitive skills but also their emotional well-being. Across diverse learning environments, DCL has proven effective in increasing motivation, participation, and critical thinking. The integration of augmented reality, blended learning, and inclusive strategies creates an interactive atmosphere that supports collaboration, reduces academic stress, and promotes healthier behavioral outcomes such as improved sleep. These benefits, however, are most fully realized when DCL is supported by strong teacher training, digital infrastructure, and attention to students' psychological needs.

Nevertheless, the implementation of DCL is not without its challenges. Unequal access to technology, disparities in digital literacy, and the absence of psychosocial support remain significant barriers. Therefore, educational institutions must prioritize capacity-building among educators, ensure equitable access to digital tools, and incorporate mental health support systems to foster sustainable adoption. When thoughtfully designed and equitably delivered, DCL has the potential to become a transformative pedagogical model

for 21st-century learning that nurtures both academic achievement and student well-being.

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