Generative AI Use and Student Well-Being in Higher Education: A Literature Review

Yijia Dou *

School of Psychology, Tianjin Normal University, Tianjin 300387, China

* Corresponding Author Email: yijia_dou@163.com

Abstract. Generative artificial intelligence (AI) has become increasingly embedded in university students' learning practices, yet its implications for student well-being remain insufficiently explored. This literature review synthesizes existing evidence on the potential benefits and risks of generative AI use for university student well-being and examines the psychological mechanisms that may explain these relationships. The reviewed literature suggests that when generative AI is used as a learning-support tool, it may contribute to reduced academic stress, stronger learning confidence, greater learning efficiency, emotional support, and greater satisfaction with task completion. In contrast, when AI substitutes for rather than supports core cognitive processes, its use may be associated with over-reliance, diminished autonomous learning, academic-integrity concerns, AI-related employment anxiety, and technostress. Self-efficacy, cognitive offloading, academic stress, and autonomy emerge as important psychological mechanisms through which generative AI use may relate to student well-being. Overall, the relationship between generative AI use and student well-being does not appear to be uniformly beneficial or harmful but varies according to how, why, and to what extent students use AI. Future research should therefore move beyond whether students use generative AI and examine more precisely the patterns and conditions of use that support or undermine student well-being.

Keywords: Generative AI; student well-being; higher education; academic stress; self-efficacy; cognitive offloading; autonomy.

1. Introduction

Mental health concerns among university students have become a major issue across higher education systems worldwide. In recent years, stress, anxiety, depression, and suicidal ideation have become increasingly prominent on university campuses. According to the 2024–2025 Healthy Minds Study, the largest student mental health survey in the United States, responses from more than 84,000 students across 135 institutions indicated that 37% reported moderate-to-severe depressive symptoms, 33% reported moderate-to-severe anxiety symptoms, and 11% had seriously considered suicide during the previous year [1]. These figures highlight the mental health problems that students at universities face. Well-being in the context of college students is a multidimensional concept involving the emotional, psychological, and social aspects. According to the Complete State Model of Mental Health proposed by Keyes (2002), well-being includes emotional well-being (positive affect and satisfaction with life), psychological well-being (self-acceptance, personal growth, purpose in life, environmental mastery, autonomy, and positive relations), and social well-being (social acceptance, actualization, coherence, contribution, and integration) [2]. In this case, the lack of mental disorders itself is not an indication of good mental health; mental health should be viewed from the perspective of functioning in all mentioned aspects. Student well-being plays a key role since it influences several academic and occupational aspects. For example, according to Gleason et al. (2025), in a sample of college students, there were statistically significant correlations between the aspects of well-being and GPA, and the most important aspect predicting GPA was grit-resilience, explaining 18.13% – 24.75% variance in GPA [1]. Moreover, high well-being is connected with more participation in internships, extracurricular activities, career network development, and better employment after graduation [3].

Generative AI is revolutionizing the world of higher education with its fast-paced developments. Ever since the release of ChatGPT to the general public in November 2022, there has been a rapid

adoption of generative AI tools in academic settings, which have transformed the way students interact with learning material and perform assignment tasks. It has been observed in Middlebury College of the United States that more than 80 percent of students use generative AI for academic purposes as an on-demand tutoring tool for activities like explaining concepts, summarizing texts, searching for information, and generating ideas [4]. Therefore, generative AI has increasingly become an integral part of the academic activities of students.

The existing literature on the use of AI in education has largely centered around two themes: the efficacy of learning and academic integrity. While the literature on learning efficiency has considered the ways that AI can help boost students' academic performance and improve the process of learning, the literature on academic integrity has addressed topics such as AI content detection, plagiarism, and erosion of critical thinking skills [4]. On the other hand, much less attention has been paid to the issue of generative AI and its effects on students' well-being. In the context of an analysis of the influence of AI on the well-being of students, Klimova and Pikhart (2025) have noted that this area is poorly researched. Through the examination of the literature on the topic in databases such as Web of Science and Scopus, the researchers were able to find just 11 studies [5].

In light of this, the ubiquitous adoption of generative AI technology by university students along with the existing worries about student mental health make a perfect basis for studying the possible associations between the use of AI and students' well-being. It is relevant not only in terms of academic research but also in relation to the current practice in education. Therefore, this review discusses the existing body of research on the positive and negative aspects of using generative AI by university students and possible ways to fill in the gaps in the research.

2. Generative AI Use in Higher Education

Since the arrival of ChatGPT at the end of 2022, generative AI has been gaining more popularity in higher education and has become part of many university students' learning process. Large-scale surveys indicate high rates of student AI use across different contexts. For example, a February 2025 survey conducted by the Higher Education Policy Institute (HEPI) among 1,041 UK undergraduates found that 92% had used some form of AI tool and 64% had used text-generating AI such as ChatGPT, compared with 30% in 2024 [6]. Similarly, the Digital Education Council's 2024 global survey reported that 86% of university students used AI in their studies and 24% did so daily [7]. Against this backdrop, students' uses of generative AI have diversified across several major learning activities.

2.1. Writing Assistance

Writing assistance represents one of the most prevalent applications of generative AI among university students. The HEPI survey reported that 88% of UK undergraduates had used generative AI in assessed work [6], while the Digital Education Council survey found that 86% of students used AI in connection with academic tasks [7]. Smerdon (2024) further examined this pattern among Australian undergraduates and found that students who used AI had a higher pre-semester mean GPA (5.46 on a seven-point scale) than non-users (4.92, $p = .025$), suggesting that students with stronger prior academic performance may be more inclined to adopt AI-supported writing practices [8]. More broadly, AI-assisted writing may allow students to shift some cognitive resources away from lower-level text production toward higher-order activities, although the extent to which this occurs is likely to depend on how the technology is used.

2.2. Explaining Complex Knowledge

Beyond writing assistance, university students also use generative AI to explain and simplify complex academic concepts. According to Kasneci et al. (2023), the large language models can help summarize and explain the complexities of texts, which would possibly improve their reading comprehension and increase the accessibility of the educational materials [9]. Similarly, an observation among university students from Tanzania revealed that they perceived ChatGPT to be

useful for simplifying difficult concepts, explaining difficult topics, giving explanations of theories and easily accessible answers in a way similar to a personalized tutor [10].

2.3. Generating Learning Materials

Generative AI is also used by university students to generate personalized learning materials. In a design studio at North Carolina State University, Oh (2024) reported that 57 undergraduate and graduate students used tools such as ChatGPT to generate interview questions, user personas, and contextualized textual materials to support design-thinking activities. The study found that generative AI could produce contextualized content in less than five minutes, enabling students to devote more time to learning and applying foundational design principles [11]. The generation of tailored learning materials may therefore support more focused use of study time and provide students with a greater sense of control over the learning process, although these potential benefits require further empirical examination.

2.4. Providing Immediate Feedback

The provision of immediate feedback constitutes another prominent educational application of generative AI. A systematic review of generative-chat feedback in higher-education academic writing reported that students valued the immediacy of ChatGPT feedback because it allowed them to devote more time to writing practice and revision. The review further suggested that AI-generated feedback may support self-regulated learning and writing motivation [12]. By shortening the interval between task completion and feedback, generative AI may enable students to adjust learning strategies more promptly and engage in iterative revision, potentially supporting a more active and efficient learning process.

2.5. Supporting Language Learning

Moreover, the capabilities of Generative AI have been proven in the context of language learning, especially in relation to learners of English as a foreign language (EFL). The findings from Teng's (2024) mixed-method research conducted on a sample of 45 EFL learners in Macao about their attitudes toward ChatGPT as a source of writing feedback are largely positive and emphasize the practical importance of using this tool for proofreading and revising. Students particularly valued the individualized and clearly presented feedback provided by the system [13]. For language learners, immediate, personalized, and relatively non-judgmental feedback may reduce anxiety associated with language production and create greater opportunities for repeated practice, thereby contributing to a more supportive learning experience.

3. Positive Effects on Student Well-Being

Although discussions of generative AI in higher education have largely centered on academic integrity and academic performance, an emerging body of research has begun to examine its potential implications for students' psychological well-being. When generative AI is used to support rather than replace learning, it may contribute to students' perceived control, competence, and satisfaction with the learning process.

The following sections review five areas in which generative AI use may be positively associated with student well-being.

3.1. Reducing Academic Stress

Emerging evidence suggests that generative AI may alleviate academic stress and anxiety by providing students with immediate and relatively non-judgmental learning support. In a meta-analysis of 69 experimental studies, Deng et al. (2025) found that ChatGPT use was associated with a substantial improvement in affective-motivational states ($g = 0.881$) and a reduction in mental effort ($g = -0.675$) [14]. These findings suggest that AI-supported learning may reduce some of the cognitive

demands experienced during academic tasks. Bhatti et al. (2025), in a quantitative study of 280 university students, further reported that AI-powered assessment tools incorporating immediate feedback, personalized assessment, and adaptive questioning were associated with lower levels of test anxiety [15]. Participants perceived these tools as contributing to a clearer and more student-centered assessment environment, which may help reduce emotional pressure during assessment.

The relationship between effort reductions and improved well-being needs interpretation. Reduced mental effort can be considered positive if it results from stripping away irrelevant effort such as excessive formatting, tedious searches for material or information, and difficulties in comprehending instructions. In this situation, students can pay their attention to the actual requirements of learning. Nevertheless, effort is an integral part of the process of education and, thus, is not always undesirable. Effort reductions caused by AI can result in temporary comfort but not necessarily in the increased level of mastery. Thus, the findings provided by Deng et al. (2025) and Bhatti et al. (2025) demonstrate that AI can lead to improved affective experience and decreased anxiety in some specific situations of learning and assessment, not that reduced effort is always beneficial [14,15]. The key point for the well-being of students is whether or not the AI strips away unnecessary effort while maintaining engagement with the task.

3.2. Improving Learning Confidence

Use of generative AI can also correlate with increased academic self-efficacy and self-confidence for learning. Hasanein and Sobaih (2023), through qualitative research among stakeholders from Saudi higher education on ChatGPT, observed that ChatGPT was considered by students as non-judgmental and easily accessible source which helped students to develop their language skills in a less stressful environment and thus lowered anxiety regarding language difficulties and improved confidence in communicating their thoughts [16]. The research also indicates that provision of instant and accurate feedback may help students feel competent in performing academic tasks. Consistent with this pattern, Bhatti et al. (2025) reported a positive association between AI-powered assessment tools and academic self-efficacy ($B = 0.54$, beta = 0.482, $p < .001$) [15].

Confidence may develop through several features of AI-supported learning. Students can obtain a response without waiting for formal feedback, ask follow-up questions, and repeat a task before exposing their work to external evaluation. These opportunities may provide experiences of progress and mastery, both of which are relevant to self-efficacy. Nevertheless, confidence supported by AI is educationally useful only when it remains calibrated to students' actual capabilities. If students attribute successful performance primarily to the system or become unable to reproduce performance without it, apparent confidence may be fragile. This qualification is consistent with the broader evidence reviewed later on AI dependency. The positive association reported by Bhatti et al. (2025) should therefore be interpreted as evidence that appropriately designed AI-supported assessment can coexist with stronger academic self-efficacy, while leaving open the question of how such confidence develops and whether it transfers to independent performance [15].

3.3. Enhancing Learning Efficiency

A growing body of evidence also indicates that generative AI may enhance learning efficiency by reducing the time and effort required for some academic tasks while supporting engagement with higher-order learning activities. Deng et al. (2025) reported that ChatGPT use was associated with improved academic performance ($g = 0.881$) and stronger higher-order thinking dispositions ($g = 0.703$) [14]. In programming education, Llerena-Izquierdo et al. (2024) found that 67 students using an AI code-completion tool reported substantial reductions in the time required for algorithm development and code selection, alongside greater problem-solving efficiency, learning engagement, and perceived learning gains; 91% expressed strong interest in and satisfaction with the AI-supported learning experience [17]. Furthermore, a study involving Italian students enrolled at university also concluded that ChatGPT use had a direct relationship with positive attitudes, high levels of satisfaction, and enhanced learning support, with the clarity and efficiency of these tools being valued

by students [18]. Taken together, it is clear that efficiency can be one of the mechanisms through which generative AI affects the quality of the learning experience positively.

Efficiency is an important psychological construct because academic load is not only about the amount of academic work but also about the amount of time and cognitive effort needed to complete this work. Tools that help reduce the time taken for certain steps of a process leave more time for other activities. The programming example reported by Llerena-Izquierdo et al. (2024) is illustrative because students perceived both greater efficiency and stronger engagement with the learning experience [17]. Nevertheless, efficiency should be distinguished from educational quality. Completing a task more quickly may be advantageous when AI automates low-value procedural work, but less advantageous when speed is achieved by bypassing reasoning that the task was intended to develop. Thus, the potential contribution of efficiency to well-being depends on what is being made more efficient and what students do with the resources that are released.

3.4. Providing Emotional Support

AI chatbots may additionally provide accessible forms of psychological and emotional support for university students. In a randomized controlled trial involving 74 students from 15 U.S. universities, Fulmer et al. (2018) found reductions in anxiety and depressive symptoms after two and four weeks among students using the Tess AI chatbot, together with higher satisfaction than in the control condition [19]. The authors characterized AI as a potentially accessible and cost-effective adjunct to psychological support. A 2025 rapid systematic review of nine studies involving 1,082 participants similarly reported that eight studies identified statistically significant improvements in anxiety, depression, or well-being; in one study, use of the Woebot chatbot was associated with a 22% reduction in depression scores over two weeks (PHQ-9: Delta = -3.16, $p < .05$) [20]. From these studies, it can be suggested that AI-powered chatbots can serve as another potential source of accessible help, especially during periods of increased academic stress; however, these systems must not be viewed as replacements for professional mental health assistance.

These studies should not be confused with the wider issue of the application of generic-purpose AI generators within academia. Both Tess and Woebot were created specifically for the provision of psychological support purposes, and results of studies with such systems cannot be extrapolated onto the ordinary use of ChatGPT or other similar AI generators in academia. The importance of these studies for the current review consists in showing that conversational AI can, in certain circumstances, increase accessibility of support and reduce psychological symptoms [19,20]. This may be especially important for students who face practical or interpersonal barriers to seeking immediate assistance. However, AI-based support should not be interpreted as equivalent to professional mental-health care, particularly where students experience severe or persistent symptoms. Within the narrower question of student well-being, the available studies indicate a potential supportive role while also highlighting the need to differentiate therapeutic or support-oriented chatbots from general educational AI systems.

3.5. Supporting Task Completion

Generative AI may also facilitate task completion and contribute to students' satisfaction with their academic work. Hmoud et al. (2024) found that the use of ChatGPT for learning tasks was associated with a sense of internal satisfaction and greater confidence in completed work [21]. Students described gaining access to information and knowledge that increased their confidence in the quality of submitted assignments. In addition, a machine-learning analysis based on a dataset of 1,000 respondents identified ChatGPT satisfaction and frequency of use as important predictors of academic performance, with the XGBoost model achieving an $R2$ of .92 [22]. SHAP analysis further indicated that problem-solving ability and learning motivation were influential in predicting individual satisfaction. Although predictive importance should not be interpreted as evidence of causality, these findings suggest that satisfaction with AI-supported task completion may be closely intertwined with students' broader learning experiences.

Task completion may influence well-being through the subjective experience of progress. Academic tasks that remain unresolved can contribute to frustration, uncertainty, and perceived overload, whereas completing a task can provide a sense of competence and closure. The findings of Hmoud et al. (2024) are consistent with this possibility, as students linked ChatGPT-supported task completion with internal satisfaction and confidence in their work [21]. However, satisfaction with an AI-assisted product is not necessarily evidence of learning, and the machine-learning findings reported by Dahri et al. (2025) identify predictive relationships rather than causal pathways [22]. These distinctions matter because a student may be satisfied with an efficiently completed assignment even when the process provides limited opportunity for skill development. The contribution of task support to well-being is therefore likely to depend on whether successful completion is accompanied by understanding and a continuing sense of personal agency.

4. Negative Effects on Student Well-Being

Despite these potential benefits, a growing body of research has identified risks associated with inappropriate or excessive use of generative AI. When AI functions primarily as a substitute for learning rather than as a support for it, its use may be associated with diminished autonomous learning, concerns regarding academic integrity and future employability, and emerging forms of technostress. The following sections consider five potential adverse implications for student well-being.

4.1. Over-Reliance on AI

The phenomenon of overreliance on generative AI has been found as one of the major issues in higher education institutions. In their systematic review of 14 studies, Zhai et al. (2024) reported that overreliance on AI dialog-based systems could have negative effects on cognitive functions such as decision-making, critical thinking, and analysis [23]. It includes acceptance of suggestions of AI without any thorough analysis and preference for quick solutions rather than the more elaborate ones. Zhang et al. (2024), in their investigation of 300 students from universities in Seoul that had used ChatGPT, additionally found that academic stress was an important correlate of problem AI use in which students with higher levels of academic stress were more dependent on AI [24]. Perceived consequences included an increase in laziness, misinformation, lack of creativity, poor critical thinking skills, and lack of independence. Being repeatedly misled by AI and inability to perform tasks independently may negatively affect self-perception of competence among students.

This idea is important because the use of technology and problematic dependency are two different things. A person might use artificial intelligence frequently but still be able to question the results produced, think independently, and make necessary decisions without help. Alternatively, infrequent use of the software could become problematic if a student cannot start the assignment without AI or simply does not evaluate the output provided. Therefore, the data that was analyzed by Zhai et al. (2024) is most helpful when applied to the quality of dependency on AI, rather than to the use of it [23]. Another aspect is that this differentiation explains the coexistence of positive (e.g., efficiency) and negative (e.g., cognitive risks) consequences of using one particular technology. It is especially true since assistance provided by technology is more problematic if the student changes his/her role from independent evaluator into passive receiver of information. When it comes to well-being, this shift of roles is especially important.

4.2. Reducing Autonomous Learning

Excessive use of generative AI may also compromise autonomous and self-regulated learning. Torres-Peralta et al. (2026), in a comparative study conducted in Mexico, documented perceived cognitive dependence among some university students, including reports of difficulty initiating learning tasks without AI support [25]. Although the study also suggested increasing awareness of the need to balance AI use with independent reasoning, concerns regarding over-reliance remained evident. The same study reported that 40.7% of surveyed high-school students expressed concern that

excessive ChatGPT use could encourage laziness and weaken independent learning; because this finding derives from a high-school sample, it should not be interpreted as direct evidence regarding university students. More broadly, Zhai et al. (2024) concluded that over-reliance on AI may reduce information-search skills and engagement in deeper knowledge exploration [23], both of which are central to the development of critical thinking and creative problem solving in higher education.

Autonomous learning is similarly broader than completing work without technological assistance. Students routinely use textbooks, search engines, calculators, and peer support while remaining autonomous learners. The central issue is whether they continue to set goals, select strategies, monitor understanding, and evaluate outcomes. Torres-Peralta et al.'s findings concerning cognitive dependence are therefore notable because difficulty initiating a task without AI suggests a change in students' perceived capacity to regulate their own learning [25]. This kind of dependence can take on psychological significance as students become aware of instances where AI is not available or permitted. On the other hand, the study also found a rising awareness of the importance of balancing the use of AI with critical thinking. This shows that usage patterns may evolve as students become more accustomed to technology. The evolving nature of this issue should be taken into account for future research on AI dependence.

4.3. Increasing Academic Integrity Anxiety

There is a potential for the extensive deployment of generative AI to also create issues pertaining to academic integrity and related moral distress. According to Chan (2024), in a qualitative investigation into secondary school students in Hong Kong, the concept of 'AI guilt' has been discussed, which means that the moral and psychological discomfort that emerges due to the use of AI for performing tasks that have previously been done using personal effort [26]. The three components have been identified: feelings of laziness and lack of authenticity in results, fear of being judged by others, and threats to one's identity and self-efficacy. Due to the fact that this research was carried out on secondary school students, care must be taken in generalizing its findings to the realm of higher education. However, the systematic review conducted by Mukherjee et al. (2026) found that higher education students experienced guilt, ethical distress, and discomfort related to academic integrity when using generative AI, especially in non-technical subjects [27].

Academic integrity issues have particular complexity in that doubt can be experienced by students even when they try to utilize AI appropriately. Institutional guidelines can vary from course to course and from assessment to assessment, and the line between legitimate aid and illicit substitution may sometimes blur. Under such conditions, students may experience ambiguity not just regarding how much AI can help them, but also regarding how far they can go in using AI. The issue described by Chan (2024) is important because it describes psychological discomfort related to laziness, authenticity, judgement, and self-efficacy. However, the focus on high school students precludes direct generalization to college [26]. The college study conducted by Mukherjee et al. (2026) is better suited to provide empirical evidence for the coexistence of satisfaction and moral unease [27].

4.4. AI Replacement Anxiety

Quick developments in AI could also be another source of anxiety connected to possible future joblessness and occupational replacement. Based on a 10-year trend analysis of the U.S. Chapman Survey of American Fears (2016-2025), there was a considerable increase in people's worries regarding occupation replacement through artificial intelligence in 2024-2025 with the respondents of the age range 18-29 years being most afraid [28]. While these results relate to the general population and not students enrolled at universities, they could be applied to the age group of people including the majority of students. In particular, one study conducted among English majors in China found that career adaptability had a negative correlation with AI anxiety (beta = -0.463, $p < .001$) [29].

From a developmental perspective, for university students, AI fears related to employment may coincide with a stage of life where educational decisions and identity as a professional are yet to take

shape. Consequently, concerns regarding job losses caused by AI may affect not only one's perception of future employment opportunities but also one's perception of present education. In terms of trends observed in the United States, it can be noted that AI-related fear of job losses affects mostly younger adults. At the same time, the findings related to English majors from China show a correlation between low career adaptability and increased AI fears [28,29]. It is important to note that such observations do not suggest that the actual use of generative AI causes career anxiety. On the contrary, it may be said that the student experiences AI in the context of a broader socio-cultural environment, where AI is both a learning tool and a source of potential disruption in one's employment prospects.

4.5. Information Overload and Technostress

The use of generative AI can lead to even more problems related to information overload and technostress. According to the research conducted among adult Romanians, Litan (2025) found out that technostress caused by overload and insecurity due to AI was positively correlated with the level of anxiety and depression [30]. However, the sample comprised adults instead of university students; therefore, the findings cannot be considered as direct proof of what happens to the latter. In hybrid learning environment, another study demonstrated that 65% of the participants felt anxiety and mental fatigue due to information overload and other aspects of digital distraction, whereas 54% of them were affected by lack of motivation and procrastination caused by those aspects [31].

Technostress further emphasizes the point that the load due to AI may originate from the digital learning environment as a whole and not just a particular application. It could mean having to assess the various outputs, filter the true and false information, understand evolving interfaces, and figure out which technologies to use at what times. All these things could build up even if the purpose of the individual tools used is to make things easier. The data on adults in Romania provided by Litan (2025) should be considered skeptically as it is not a direct reflection of students at universities, but it does identify overload and insecurity as potential sources of AI stress [30]. Student data from the hybrid learning settings better demonstrates the ways digital interruptions, information overload, and difficulties adjusting to online platforms may coexist alongside anxiety, tiredness, decreased motivation, and procrastination [31].

5. Psychological Mechanisms

The link between the use of generative AI and student well-being at universities will hardly be one-dimensional. In fact, it is possible that several psychological mechanisms may be responsible for the relationship of the same kind of AI usage resulting in different effects for various individuals and educational environments. Below there are four mechanisms that have been recurrently discussed in the literature.

5.1. Self-Efficacy

Self-efficacy is one of the key concepts in Social Cognitive Theory. According to Bandura (1997), "self-efficacy refers to people's judgments of their capabilities to organize and execute courses of action required to produce designated levels of performance" [32]. It affects activity selection, effort, and perseverance in the event of difficulties and is strongly correlated with motivation, well-being, and success. Generative AI can help in building academic self-efficacy by offering instant feedback and creating opportunities for successful task performance. As mentioned above, Hasanein and Sobaih (2023) revealed that ChatGPT was viewed as an easily accessible source, which did not judge students and offered opportunities for practicing in low-stress settings and increased students' confidence in the expression of their thoughts [16]. Nevertheless, Zhang et al. (2024) demonstrated a more complicated relationship, according to which there was no direct connection between academic self-efficacy and AI dependence; however, there was an indirect relationship mediated by academic stress (beta = -0.028, SE = 0.015, 95% CI [-0.062, -0.006]) [24].

Self-efficacy offers a useful mechanism for integrating apparently contradictory findings. When AI helps students understand a difficult concept, revise a weak draft, or complete a challenging task after repeated attempts, the experience may strengthen perceptions of capability. In contrast, when successful performance is experienced as dependent on AI availability, students may have fewer opportunities to attribute success to their own developing competence. This distinction is consistent with Bandura's emphasis on judgments of personal capability rather than performance alone [32]. Zhang et al.'s (2024) finding that academic self-efficacy was indirectly related to problematic AI use through academic stress further suggests that self-efficacy should not be treated simply as an outcome of AI use [24]. It may also shape how students respond to academic pressure and whether they turn to AI as strategic support or as a means of avoiding demands they feel unable to manage independently.

5.2. Cognitive Offloading

Cognitive offloading refers to the use of external resources to reduce demands on internal cognitive processing. Risko and Gilbert (2016) defined it as the use of physical action to alter the information-processing requirements of a task and thereby reduce cognitive demand [33]. Cognitive offloading is not inherently detrimental; however, when external tools replace rather than support core cognitive processes, repeated offloading may contribute to skill degradation. In the context of generative AI, cognitive offloading may therefore have both adaptive and maladaptive consequences. Zhai et al. (2024) concluded that over-reliance on AI dialogue systems may impair decision-making, critical thinking, and analytical reasoning [23]. Gerlich (2025) further reported a significant total association between AI-tool use and critical thinking ($b = -0.42$, $SE = 0.08$, $p < .001$), together with a significant indirect effect through cognitive offloading ($b = -0.25$, $SE = 0.06$, $p < .001$) [34]. These findings suggest that routinely outsourcing analysis, reasoning, and synthesis to AI may weaken opportunities to exercise independent reasoning. Conversely, strategic offloading that releases cognitive resources for higher-order thinking may be beneficial. Distinguishing dependent from autonomous forms of cognitive offloading is therefore important [35].

The difference between dependent and independent cognitive offloading is particularly helpful in understanding the usage of generative AI. The delegation of memory functions or other routine tasks could be beneficial if the students were able to use their scarce cognitive capacities for analysis, comparison, or problem-solving activities. In this case, the student is in control of the intellectual aspects of the activity and utilizes the AI sparingly. Dependent offloading is another case when the external tool is performing processes which the learner is expected to develop or engage in. Mediation studies by Gerlich (2025) provide empirical evidence in favor of the notion that cognitive offloading is one of the mechanisms through which AI tool usage could contribute to poor critical thinking skills of the learners. On the other hand, Zhu et al. (2026) make a distinction between dependent and independent offloading of cognitive processes [34,35].

5.3. Academic Stress

Academic stress is defined as the pressure exerted on students in regard to academic activities such as class work and home work [36]. In terms of higher education, academic stress can be related to perceptions of study pressure, grade anxiety, expectations of the student himself/herself and disappointment in academic achievements and is a known predictor of psychological distress. Academic stress could have a complex role in the link between AI utilization and well-being. While on one hand, as shown by Deng et al., utilization of ChatGPT decreased mental effort ($g = -0.675$) indicating a possible avenue for how AI-assisted learning could reduce academic stress [14], on the other hand, Zhang et al. found that academic stress was positively associated with dependence on AI technology ($r = .242$, $p < .01$) [24].

Academic stress can therefore affect both the pre-AI use and post-AI use experiences of a learner. The individual may be highly motivated to get help quickly if he or she is suffering from high workloads or low self-efficacy; thus, academic stress can become the cause for the more problematic

use of AI. After using AI, the learner is likely to experience a lower level of mental effort and some kind of stress relief at that point. However, when dependence on technology becomes too great and hinders the development of independent skills, the future task will become harder without the technology's help, resulting in stress, which encouraged the use of AI initially. The current research does not prove the complete existence of this sequence, but the combination of the findings by Deng et al. about lowered mental effort and the ones by Zhang et al. about academic stress and AI dependency shows that this process can happen reciprocally [14, 24].

5.4. Autonomy

Autonomy is one of the three fundamental psychological needs in SDT. Ryan and Deci (2002) define autonomy as a feeling of being the source of one's own actions and behaving in accordance with one's interests and internal values [37]. Along with competence and relatedness, autonomy is recognized as an essential element of intrinsic motivation and psychological well-being. The impact of generative AI on student autonomy seems to be strongly determined by the application of technology. According to Zimmerman (2000), self-regulated learning consists of three phases forethought, performance, and self-reflection. The author emphasizes the crucial role of learners in the process of setting goals, monitoring their cognition, and managing their behavior [38]. If used in support of the above-mentioned process, e.g., by means of generating educational materials for learners to evaluate and expand, AI can contribute to autonomy. Conversely, delegating fundamental cognitive operations to AI can result in students' passivity. Cognitive dependence of some university students was demonstrated by Torres-Peralta et al. (2026); in particular, it involved difficulty in starting learning tasks without AI [25].

Autonomy is thus more dependent upon the relationship of control between the student and the AI than the existence of AI alone. The student that sets the problem, seeks specific help, evaluates the help provided, and decides what to do next about revising is still the one regulating the process of learning. However, a student who lets AI define the problem, construct the reasoning, and decide how to answer might not have any control over the process, even though the final result would be theirs. The difference is also linked to the connection of SDT with Zimmerman's theory of self-regulation in learning since autonomy is manifested in goal-setting, monitoring and evaluation instead of separation from the environment [37,38]. Therefore, an educational counseling does not need to strive to reduce the use of AI. The more appropriate goal would be to maintain the responsibility of students in making decisions regarding learning processes.

6. Discussion

6.1. Theoretical Implications

The literature reviewed here suggests that the relationship between generative AI use and university student well-being is unlikely to be unidirectional. Instead, its implications appear to depend on how, why, and to what extent students use AI. When generative AI functions as a learning support rather than a substitute for cognitive engagement, some evidence points to potential benefits for learning experience and psychological adjustment. Immediate feedback, for example, may alleviate aspects of academic anxiety, while concept clarification may help students overcome cognitive barriers. These findings should nevertheless be interpreted cautiously, as much of the positive evidence derives from controlled interventions or self-reported perceptions, and the robustness of these effects in authentic learning environments remains to be established.

Taken together, the positive findings are best interpreted as conditional rather than universal effects. Generative AI appears most likely to support well-being when it reduces avoidable barriers while leaving students cognitively and motivationally engaged in the task. Immediate explanation can reduce uncertainty; feedback can support revision; automation can reduce repetitive workload; and conversational systems can make certain forms of support more accessible. These functions may strengthen perceived competence and control. However, none of these affordances guarantee a

positive psychological outcome. Their value depends on the accuracy of AI responses, the student's ability to evaluate them, the purpose for which the tool is used, and the expectations established by the educational environment. This conditional interpretation helps reconcile why studies can report improved affective-motivational states and self-efficacy while the wider literature simultaneously raises concerns about dependency and cognitive offloading [14,15,23,34].

Conversely, when generative AI is used to replace rather than support core cognitive processes, literature identifies several potential risks. Over-reliance has been associated with weaker autonomous learning, reduced critical engagement, and greater concern about academic integrity. Zhai et al. (2024) concluded that excessive reliance on AI dialogue systems may compromise decision-making and analytical reasoning [23], whereas Zhang et al. (2024) identified academic stress as an important pathway associated with problematic AI use [24]. Chan's (2024) account of AI guilt further illustrates the moral discomfort that some students may experience when using AI for academic work [26], although the study's secondary-school sample limits direct generalization to higher education. Taken together, the evidence suggests that generative AI should not be conceptualized as inherently beneficial or harmful. Future research needs to examine more closely the conditions of use, individual differences, and longitudinal consequences that shape its relationship with student well-being.

Negative results also cannot serve as proof of the harmful nature of the utilization of AI. Most of the risks mentioned above are connected with usage patterns defined by substitution, uncertainty, and lack of control. Excessive reliance on AI becomes a risk factor when students stop checking the output provided; integrity risks create psychological problems because of unclear expectations; and technostress happens when technology requirements exceed a student's ability to cope with them. Therefore, further theoretical studies need to focus on factors other than whether students utilize AI or not. These factors include the purpose, the intensity, and the mode of using AI along with cognitive responsibility of students. These factors may be useful for future empirical research since they will help measure more accurately what actions related to AI students perform.

6.2. Practical Implications

Several preliminary practical recommendations may be derived from the above analysis, although their efficiency should be assessed in a particular educational environment. To begin with, it may be useful for higher education institutions to create well-defined and explicit standards concerning the permissible application of AI technologies. According to a qualitative study of 23 U.S. university students, the existing policies appeared to be ambiguous, old-fashioned, and contradictory, which led to non-compliance with them [39]. Furthermore, a survey of 102 master's degree students majoring in engineering management in South Africa revealed that, despite the fact that all respondents used generative AI technology in their learning process, only 6% stated that there was no need for institutional guidelines concerning its ethical application [40].

It is possible that clear policies can help well-being not because policy can remove all uncertainty, but because there will be less need for students to make their own inference on how they should behave in each specific situation. In case there are contradictions regarding what is acceptable and what is not, students may repeatedly come across a choice dilemma because what is considered appropriate behavior in one class can be discouraged in another one. The results of the studies on the attitudes of American university students and South African master’s students show that people are afraid of being ambiguous and require guidance from the institution [39,40]. In order to provide the needed guidance, it has to be specific enough to differentiate between appropriate use of AI and substituting work with it, but also flexible enough to apply in different situations of testing.

Secondly, instructors might be able to contribute towards encouraging more reflective and critical approaches to the use of AI technologies. From the evidence provided in the original article, it becomes apparent that there is an awareness on the side of students in relation to the authenticity of ChatGPT-generated sources and their subsequent verification, as well as the selective and reflective approach to the usage of AI-generated feedback on the part of high-performing students [41]. The

above observations imply that teaching by example and provision of scaffolding on the part of instructors can help students learn to use AI technologies in a strategic manner. There is also interest in the assessment strategies that go beyond standard and easily automatable activities [39].

Instructional guidance is equally important because responsible AI use requires skills that cannot be supplied by policy statements alone. Students need to decide whether an output is credible, whether a reference exists, whether feedback is relevant to the assessment criteria, and whether accepting a suggestion improves or weakens their own reasoning. Evidence that students cross-check references and that higher-achieving students use feedback selectively suggests that strategic evaluation already forms part of some students' AI practices [41]. Making such practices explicit could help shift attention from obtaining an answer to interrogating the quality of the answer. Instructors can also design tasks in which students are required to explain, verify, compare, or revise AI outputs, thereby retaining intellectual responsibility while using the technology as a resource. The evidence reviewed here supports this direction conceptually, although stronger intervention research is needed to establish which instructional approaches most effectively support both learning and well-being.

Finally, the development of AI literacy and self-regulated learning may be particularly important. Salhab et al. (2025) reported moderate levels of AI literacy (M = 3.075/5) and 21st-century skills (M = 2.871/5) among Palestinian university students, indicating considerable scope for further development [42]. A study of Austrian pre-service teachers similarly found comparatively low scores for understanding AI technology (M = 2.62) and AI self-efficacy (M = 3.12), suggesting a need for guidance in the meaningful and ethical use of AI tools [43]. These findings imply that blanket prohibition may be neither feasible nor educationally optimal. A more constructive approach may be to embed AI literacy within curricula so that students can understand the capabilities and limitations of AI, identify bias and misinformation, and use these technologies responsibly while retaining cognitive agency.

AI literacy should therefore encompass more than operational familiarity with a chatbot. Students may be able to generate fluent outputs while having limited understanding of how those outputs are produced, where errors may arise, or when verification is necessary. The moderate AI-literacy levels reported by Salhab et al. (2025) and the comparatively low technological-understanding scores reported among Austrian pre-service teachers suggest that functional use can coexist with important knowledge gaps [42,43]. From a well-being perspective, stronger AI literacy may reduce uncertainty by giving students more realistic expectations of what technology can and cannot do. When combined with self-regulated learning, it may also support more deliberate decisions about when to seek AI assistance and when to persist independently. The practical objective is therefore not simply greater AI use, but more informed and self-directed use.

7. Conclusion

This review synthesized existing literature on the use of generative AI in higher education and its complex relationship with student well-being. The available evidence indicates that generative AI is reshaping university students' learning experiences in multiple ways; however, its implications for psychological well-being do not appear to be predetermined. Rather, they are likely to vary according to patterns and intensity of use, individual characteristics, and the broader educational context.

When generative AI is used as a learning-support tool, existing studies point to potential benefits including reduced academic pressure, stronger learning confidence, greater learning efficiency, and accessible forms of emotional support. In contrast, when AI substitutes for rather than supports core cognitive processes, the literature identifies potential risks involving over-reliance, diminished autonomous learning, academic-integrity concerns, AI-related employment anxiety, and technostress. The coexistence of these potential benefits and risks underscores the complexity of the relationship between AI use and student well-being.

Future higher education practice may therefore need to focus less on whether students use generative AI and more on how they use it. Supporting students in using AI as a resource for learning

rather than as a substitute for thinking may be particularly important. Nevertheless, the effectiveness of such approaches remains to be established across educational contexts, and the rapid evolution of generative AI means that the evidence base will require continued reassessment. Conceptualizing AI as uniformly beneficial or harmful is unlikely to capture this complexity; a more defensible approach is to recognize its potential value while remaining attentive to the conditions under which risks may emerge.

The current evidence base nevertheless remains limited in several respects. Much of the literature relies on self-report data, cross-sectional associations, relatively small samples, or studies conducted within specific courses and national contexts. Some evidence reviewed here also comes from secondary-school students or general adult populations and should therefore be treated as contextual rather than direct evidence concerning university students. In addition, rapidly changing AI systems create a moving research target: findings based on one generation of tools, institutional policies, or student practices may not remain stable as capabilities and norms evolve. Future research would benefit from longitudinal designs that examine changes in AI-use patterns and well-being over time, experimental work that distinguishes different modes of AI assistance, and more precise measurement of dependent versus autonomous use. Such work would help determine not merely whether generative AI is associated with student well-being, but under what conditions particular forms of use become supportive or detrimental.

References

[1] Healthy Minds Network. (2025). Healthy Minds Study: 2024–2025 annual report. University of Michigan School of Public Health.

[2] Keyes, C. L. M. (2002). The mental health continuum: From languishing toflourishing in life. Journal of Health and Social Behavior, 43(2), 207-222.

[3] Zhou, S., Weiss, H. A., McCuskey, B., & Tay, L. (2025). College student well-being: explaining academic and behavioral outcomes from a representative college student sample. Journal of Happiness Studies, 26(5), 75.

[4] Contractor, Z., & Reyes, G. (2025). Generative AI in higher education: Evidence from an elite college. Higher Education: Evidence from an Elite College. IZA Discussion Paper, (18055).

[5] Klimova, B., & Pikhart, M. (2025). Exploring the effects of artificial intelligence on student and academic well-being in higher education: A mini-review. Frontiers in Psychology, 16, 1498132.

[6] Freeman, J. (2025). Student generative AI survey 2025. Higher Education Policy Institute: London, UK.

[7] Campus Technology. (2024, August 28). Survey: 86% of Students Already Use AI in Their Studies.

[8] Smerdon, D. (2024). AI in essay-based assessment: Student adoption, usage, and performance. Computers and Education: Artificial Intelligence, 7, 100288.

[9] Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., ... & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and individual differences, 103, 102274.

[10] Victor, D. (2024). Factors and impacts of ChatGPT adoption for academic purposes in higher learning institutions: students' perspectives. Global Scientific Journals, 12(8), 327-351.

[11] Oh, D. (2024). Generative AI in higher education design studio. DS 130: Proceedings of NordDesign 2024, Reykjavik, Iceland, 12th-14th August 2024, 588-597 (12) Urzúa, C. A. C., Ranjan, R., Saavedra, E. E. M., Badilla-Quintana, M. G., Lepe-Martínez, N., & Philominraj, A. (2025). Effects of AI-assisted feedback via generative chat on academic writing in higher education students: A systematic review of the literature. Education Sciences, 15(10), 1396.

[12] Urzúa, C. A. C., Ranjan, R., Saavedra, E. E. M., Badilla-Quintana, M. G., Lepe-Martínez, N., & Philominraj, A. (2025). Effects of AI-assisted feedback via generative chat on academic writing in higher education students: A systematic review of the literature. Education Sciences, 15(10), 1396.

[13] Teng, M. F. (2024). “ChatGPT is the companion, not enemies”: EFL learners’ perceptions and experiences in using ChatGPT for feedback in writing. Computers and Education: Artificial Intelligence, 7, 100270.

[14] Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. Computers & Education, 227, 105224.

[15] Bhatti, J. A., Ilyas, F., Naseer, H., & Farooq, M. (2025). Exploring the Impact of AI-Powered Assessment Tool on Test Anxiety and Academic Self–Efficacy. Review of Applied Management and Social Sciences, 8(2), 1007-1021.

[16] Hasanein, A. M., & Sobaih, A. E. E. (2023). Drivers and consequences of ChatGPT use in higher education: Key stakeholder perspectives. European journal of investigation in health, psychology and education, 13(11), 2599-2614.

[17] Llerena-Izquierdo, J., Fiallos-Vargas, I., Portugal-Gorozabel, J., & Veloz-Arce, A. (2024, November). Towards an experience in AI-driven development for programming applied to multimedia using Tabnine. In 2024 IEEE URUCON (pp. 1-5). IEEE.

[18] Buizza, C., Dagani, J., & Ghilardi, A. (2026). Is the rise of artificial intelligence redefining Italian university students’ learning experiences? Perceptions, practices, and the future of education. Education Sciences, 16(2), 258.

[19] Fulmer, R., Joerin, A., Gentile, B., Lakerink, L., & Rauws, M. (2018). Using psychological artificial intelligence (Tess) to relieve symptoms of depression and anxiety: randomized controlled trial. JMIR mental health, 5(4), e9782.

[20] Nyakhar, S., & Wang, H. (2025). Effectiveness of artificial intelligence chatbots on mental health & well-being in college students: a rapid systematic review. Frontiers in Psychiatry, 16, 1621768 (21) Hmoud, M., Swaity, H., Hamad, N., Karram, O., & Daher, W. (2024). Higher education students’ task motivation in the generative artificial intelligence context: The case of ChatGPT. Information, 15(1), 33.

[21] Hmoud, M., Swaity, H., Hamad, N., Karram, O., & Daher, W. (2024). Higher education students' task motivation in the generative artificial intelligence context: The case of ChatGPT. Information, 15(1), 33.

[22] Dahri, N. A., Dahri, F. H., Laghari, A. A., & Javed, M. (2025). Decoding ChatGPT's impact on student satisfaction and performance: A multimodal machine learning and explainable AI approach. Complex Engineering Systems, 5(2), N-A.

[23] Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. Smart learning environments, 11(1), 28.

[24] Zhang, S., Zhao, X., Zhou, T., & Kim, J. H. (2024). Do you have AI dependency? The roles of academic self-efficacy, academic stress, and performance expectations on problematic AI usage behavior. International Journal of Educational Technology in Higher Education, 21(1), 34.

[25] Torres-Peralta, R., Cirett-Galán, F., Heras-Sanchez, M. D. C., Lerma-Molina, K., & Espinoza-Flores, I. (2026). Perceived Learning vs. Engagement in AI-Assisted Homework: A Comparative Study of ChatGPT Use Across High School, University, and Teachers in Sonora, Mexico (2024–2025). Future Internet, 18(3), 122.

[26] Chan, C. K. Y. (2024). Exploring the Factors of" AI Guilt" Among Students--Are You Guilty of Using AI in Your Homework. arXiv preprint arXiv:2407.10777.

[27] Mukherjee, D., Jena, L. K., Chakraborty, S., & Islam, M. (2026). Why Do Students Feel Satisfied Yet Uneasy with Artificial Intelligence: A Process-Oriented Conceptual Review of How Cognitive and Moral Dissonance Account for the Satisfaction–Dissonance Paradox in Higher Education. Behavioral Sciences, 16(6), 846.

[28] Jalalian Ebrahimi, M., & Austin Lee, S. (2026, April). A 10-Year Trend in Fear of AI-Driven Job Displacement in the United States. In Proceedings of the Extended Abstracts of the 2026 CHI Conference on Human Factors in Computing Systems (pp. 1-6).

[29] Wang, X. (2026). The impact of career adapt-abilities on AI anxiety among English majors: a dual perspective analysis based on core self-evaluations at the person-and variable-centered. Frontiers in Psychology, 17, 1767791 (30) Liţan, D. E. (2025). Mental health in the “era” of artificial intelligence: technostress and the perceived impact on anxiety and depressive disorders—an SEM analysis. Frontiers in Psychology, 16, 1600013.

[30] Lițan, D. E. (2025). Mental health in the “era” of artificial intelligence: technostress and the perceived impact on anxiety and depressive disorders—an SEM analysis. Frontiers in Psychology, 16, 1600013

[31] Daud, N. M. (2025). From innovation to stress: analyzing hybrid technology adoption and its role in technostress among students. International Journal of Educational Technology in Higher Education, 22(1), 31.

[32] Bandura, A. (1997). Self-efficacy: The exercise of control. Macmillan.

[33] Risko, E. F., & Gilbert, S. J. (2016). Cognitive offloading. Trends in cognitive sciences, 20(9), 676-688.

[34] Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. Societies, 15(1), 6.

[35] Zhu, Q., Li, X., Dong, Y., Chang, P., & Fan, M. (2026). Not all cognitive offloading is equal: distinguishing dependent and autonomous offloading to generative AI. Frontiers in Psychology, 17, 1878629.

[36] Kristensen, S. M., Larsen, T. M. B., Urke, H. B., & Danielsen, A. G. (2023). Academic stress, academic self-efficacy, and psychological distress: A moderated mediation of within-person effects. Journal of youth and adolescence, 52(7), 1512-1529.

[37] Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. Handbook of self-determination research, 2(3-33), 36.

[38] Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In Handbook of self-regulation (pp. 13-39). Academic press.

[39] Fu, Y., Lin, Y., Wang, Y., Tran, S., & Hiniker, A. (2026). " Everyone's using it, but no one is allowed to talk about it": College Students' Experiences Navigating the Higher Education Environment in a Generative AI World. arXiv preprint arXiv:2602.17720.

[40] Smit, M., Wagner, R. F., & Bond-Barnard, T. J. (2025). Ambiguous regulations for dealing with AI in higher education can lead to moral hazards among students. Project Leadership and Society, 100187.

[41] Liu, X., Xiao, Y., & Li, D. (2025). Assessing strategic use of artificial intelligence in self-regulated learning: Instrument development and evidence from Chinese university students. International Journal of Educational Technology in Higher Education, 22(1), 69.

[42] Salhab, R., & Aboushi, M. M. (2025, September). Influence of AI literacy and 21st-century skills on the acceptance of generative artificial intelligence among college students. In Frontiers in Education (Vol. 10, p. 1640212). Frontiers Media SA.

[43] Bećirović, S., Polz, E., & Tinkel, I. (2025). Exploring students’ AI literacy and its effects on their AI output quality, self-efficacy, and academic performance. Smart Learning Environments, 12(1), 29.