Secure Systems Design and Technology Development. Veliko Tarnovo, Bulgaria
Proceedings of the International Scientific Conference, 2026. Volume III, 195-202

AI Dependency in Higher Education: Are Students Becoming Over-Reliant?

Julija Mironova
Department of Management
Riga Nordic University
Riga, Latvia
julija.mironova@isma.lv

Viktoriia Riashchenko
Department of Management
Riga Nordic University
Riga, Latvia
viktoriia.riashchenko@isma.lv

Baiba Rivža
Department of Economics and Social Development
LBTU
Jelgava, Latvia
rivzab@lbtu.lv

Valentina Djakona
Department of Management
Riga Nordic University
Riga, Latvia
valentina.djakona@isma.lv

Marina Celika
Department of Management
Riga Nordic University
Riga, Latvia
marina.celika@isma.lv

Ieva Nicgala
Riga Management College
Riga, Latvia
ieva.nicgala@college.lv

***Abstract*— Artificial intelligence has become part of daily life in universities, for both students and educators. However, despite the fact that we all understand that AI is shaping and changing the education paradigm, the question of how often and for what we use AI remains on the agenda. Yes, AI has made many daily tasks easier; however, are students using AI for tasks they could solve without it?**

The aim of this study is to investigate the extent to which students in higher education are becoming dependent on artificial intelligence (AI) tools, particularly generative AI systems, in their academic activities. The study seeks to explore how frequent AI usage influences students' learning behaviors, critical thinking, and academic engagement.

This study employs a quantitative research design and a cross-sectional survey to examine students' dependence on AI tools in higher education. A structured questionnaire was developed to collect data on students' AI usage patterns, dependency levels, and perceptions of its impact on learning. The results of the study show the impact of AI on learning, academic integrity, self-perceived dependency, and risks, as well as how AI has changed the way students' study.

Keywords*— *Artificial intelligence, higher education, learning, academic integrity, risks, students.

I. Introduction

Currently, Artificial Intelligence technologies have become widely used in the context of higher education and transformed academic processes. Students now have more options for completing assignments, conducting research, generating texts, engaging in discussions with virtual assistants and much more. However, these technologies present several opportunities and challenges - the application of AI has resulted in the appearance of new forms of educational products that enhance students' productivity, for example, students can easily generate texts, receive quick feedback from automated assistants, and find solutions to the problems they might face during the study process. Second, AI offers several benefits to students, such as saving time, receiving personalized assistance, and increasing the accessibility of learning resources. However, it is very clear that AI tools play an essential role in higher education today, as higher education has definitely changed with the launch of the AI generative tools a few years ago.

Nevertheless, despite the positive aspects associated with AI in higher education, certain concerns have arisen recently. Although students have multiple opportunities for learning with the help of artificial intelligence, there are worries that students might become too dependent on AI tools. Indeed, students can perform any task quickly without expending much effort by simply using AI. As a consequence, learners may no longer be engaged in independent thinking, analysis, and critical reflection. Besides, there is uncertainty in the scientific discussion about the influence of AI on students critical thinking and the way how they study.

Despite the vast literature related to the problems associated with the introduction of AI into education, information regarding the level of dependence on AI technologies by students and its consequences for their

Online ISSN 3044-7771
https://doi.org/10.68302/std2026.vol3.174

learning process is extremely limited. While most of the literature focuses on the normative and ethical side of integrating artificial intelligence technologies in educational institutions, little research quantifies the use of these technologies by students. Furthermore, research is often deficient in analyzing the correlation between the variables mentioned above. To fill in these gaps, the purpose of this research is to identify the degree of students' dependence on AI tools in higher education. Furthermore, this study analyzes how students' AI usage frequency and their dependency on AI technologies affect their critical thinking, stress levels, and perceptions of academic integrity risks.

Theoretical Background and Hypothesis Development

1. The Dual Impact of Generative AI: Self-Efficacy and Technological Dependence

While the advantages of generative artificial intelligence (AI) are widely acknowledged, its increasing integration has instigated discussions regarding its implications for technological dependence and the cultivation of self-efficacy (Backfisch et al., 2021; Huang et al., 2024b). Self-efficacy, a foundational construct within educational psychology, denotes an individual's conviction in their capacity to successfully execute particular tasks, and it has been demonstrated to exert a substantial influence on learning motivation and academic achievement (Bandura, 1997). Technological dependence, conversely, refers to a pronounced reliance on specific digital tools and services, rendering them essential for daily operations and the accomplishment of objectives. Should this dependence reach a significant degree, the capacity to function effectively without the technology may be compromised (Davis, 1989)—a circumstance educational environments ought to proactively mitigate.

Empirical evidence indicates that generative AI can enhance student confidence and operational efficiency, consequently bolstering their self-efficacy (Liang et al., 2023b; Meyer et al., 2019; Yilmaz & Yilmaz, 2023). Conversely, extensive engagement with generative AI may cultivate undue technological dependence, which could potentially diminish students' capacity for autonomous problem-solving (Huang et al., 2020; Zhang et al., 2024). This inherent paradox presents a significant challenge: while immediate advantages, including improved learning efficiency and heightened confidence, are discernible, the protracted effects could potentially erode students' autonomous learning capabilities and psychological resilience.

Despite the existing literature underscoring the potential of generative AI to enhance learning outcomes, systematic inquiry into the dual impact of usage frequency on both self-efficacy and technological dependence remains limited (Huang et al., 2020; Zhang et al., 2024). A more comprehensive understanding of the intricate relationships among these variables represents a notable lacuna in current research. Accordingly, we propose the following hypothesis:

2. AI Dependence and Critical Thinking

Empirical investigations have consistently indicated that students exhibiting substantial reliance on AI tools tend to demonstrate diminished capacities in information evaluation and autonomous problem-solving (Bahrini et al., 2023; Hinss et al., 2022). This particular pattern of reliance has been attributed to cognitive inertia, a phenomenon where the recurrent outsourcing of cognitive processes results in a reduction of intellectual effort (de la Puente et al., 2024; Lee et al., 2025). Furthermore, instances of passive AI utilization, characterized by actions such as the uncritical reproduction of generated content, have similarly been associated with surface-level learning and a restricted comprehension of intricate subject matter (Dwivedi et al., 2023; Gerlich, 2025).

From a theoretical perspective, cognitive offloading provides a pertinent framework for understanding these observed effects. When students delegate specific cognitive tasks to AI systems, there is an observable reduction in their internal cognitive load; however, this often occurs at the potential expense of more profound cognitive processes, including inference, synthesis, and evaluation (Chaudhry et al., 2023; Storm et al., 2017). The habitual engagement in such offloading over an extended period has the potential to cultivate what has been termed "cognitive laziness," thereby impeding the development of higher-order thinking skills.

Nevertheless, the relationship between the utilization of AI and cognitive abilities is not exclusively detrimental. Certain investigations suggest that AI possesses the capacity to enhance critical thinking, particularly when integrated as a scaffold within active learning paradigms. For example, the strategic deployment of conversational AI, such as ChatGPT, to facilitate structured debates or to prompt the critical evaluation of its generated outputs, has been observed to foster heightened analytical reasoning and more profound engagement with subject matter (de la Puente et al., 2024; Supriyanti et al., 2020; Walter, 2024; Yilmaz & Yilmaz, 2023a). Consequently, the cognitive impact attributed to AI appears contingent upon the manner in which learners engage with these tools: when utilized in a reflective and appropriately regulated fashion, AI can indeed function as a catalyst for intellectual development; conversely, an approach characterized by excessive or passive reliance risks diminishing the very cognitive proficiencies it is intended to augment (Strzelecki, 2023). Drawing upon this rationale, we propose the following hypothesis:

3. AI Dependence and Academic Stress

Investigations into AI utilization have revealed that it presents a dual nature, offering both potential relief and additional burdens for users. While AI applications demonstrably enhance efficiency, students frequently express apprehension concerning the reliability and perceived fairness of the outputs generated by these systems (Chen et al., 2024). Moreover, Abbas et al. (2024) observed that a reliance on AI may compromise academic integrity and diminish student engagement, thereby introducing supplementary stressors pertaining to

self-doubt and external evaluative pressures. In a similar vein, Bermeo et al. (2024) reported that frequent reliance on AI tends to erode students' sense of agency, consequently exacerbating their evaluative stress.

Consistent with the transactional model of stress and appraisal (Lazarus & Folkman, 1984), these conditions are posited to intensify stress when an individual's perceived demands surpass their available coping resources. Importantly, AI dependence may amplify academic stress through multiple mechanisms—for instance, by reducing authentic social interaction or by undermining students' confidence in their own academic abilities. However, a detailed examination of these specific mediating pathways lies beyond the scope of the current study. Accordingly, we focus on the direct relationship and hypothesize:

4. Ethical Issues and Academic Integrity

The ethical challenges raised by AI are not minor or abstract. As Batista et al. (2024) and Perera & Lankathilaka (2023) observe, the distinction between assistance and deception becomes blurred when generative AI allows novel forms of academic dishonesty that evade detection. The creation of fake references—a documented weakness of certain GenAI systems—compounds the problem, eroding scholarly trust and muddying questions of attribution and originality (H. Wang et al., 2024). Kurtz et al. (2024) echo these worries, highlighting how GenAI-enabled cheating threatens educational integrity.

Beyond ethics, there is a more fundamental pedagogical concern: what does student learning look like when machines do too much? Cordero et al. (2025), D. Lee et al. (2024), and Zhang & Xu (2025) examine the danger of cognitive disengagement, arguing that learners may rely on GenAI to the point where they lose chances to practice creativity, reasoning, and problem solving. Batista et al. (2024) support this view, noting that without scaffolding, GenAI can end up bypassing deep engagement with course material altogether. However, in most of this critical literature, students' own views of GenAI—their interpretations, interest, confidence, or doubt—are seldom examined as influences on misuse. Given these points, we propose:

5. Regulatory Imperatives and AI Literacy

Despite the risks noted, there is agreement that AI's place in higher education is neither optional nor avoidable. As the literature keeps stressing, the path forward is not rejection but governance—grounded in institutional policies, ethical frameworks, and collective expectations (Batista et al., 2024; Cordero et al., 2025; Kurtz et al., 2024; D. Lee et al., 2024; Perera & Lankathilaka, 2023; H. Wang et al., 2024; Zhang & Xu, 2025). Nevertheless, any effective policy must reflect the diversity of higher education institutions and their learners. Yusuf et al. (2024) caution that cultural variability across global institutions renders one-size-fits-all policy frameworks unrealistic. Instead, they argue for context-specific strategies sensitive to distinct educational values and ethical norms.

Central to this adaptation is GenAI literacy—not only for students but also for faculty and staff. Farrelly & Baker (2023) emphasize that responsible GenAI integration cannot be achieved without equipping educators with the tools to navigate it critically and creatively. They, together with McGrath et al. (2023), highlight frameworks such as those developed by Ng et al. and Hillier, which provide structured approaches to building GenAI literacy in academic environments. Zhang & Xu (2025) similarly underline that institutions must invest in upskilling their workforce, not merely to keep pace with technology but to shape its use in pedagogically sound and ethically aligned ways.

II. MATERIALS AND METHODS

For the purpose of this research, the authors developed a survey for the students of Higher Education. Survey was distributed during the period of time from February 2026 to April 2026. Survey was administered via Google Forms and all the data was collected anonymously. For the testing authors used Jamovi software.
The structure is presented in the Table 1.

TABLE 1 STRUCTURE OF THE SURVEY

Part	**Structure of the survey**	
	Question	***Type of responses***
A	Respondent profile	**6** items: gender, age, level of study, field of study, year of study, region
B	Experience in usage of AI	**7** items measuring frequency, duration, purposes of AI use, extent of academic reliance, and awareness/adherence to institutional AI policies (Likert scale, multiple choice, and percentage-based responses)
C	AI Reliance and Learning Impact	**9** statements measuring students' reliance on AI, perceived effects on learning, critical thinking, and academic behavior (Likert scale: 1–5)
D	Student Stress and Psychological Support	**3** items measuring perceived stress frequency, need for psychological support, and sources of academic pressure (Likert scale and multiple-response question)

To test the internal consistency of the part C, which later is used for AI Dependency Index, authors employed Cronbach's alpha in Jamovi. Block C (AI Reliance and Learning Impact) demonstrated high internal consistency, with a *Cronbach's alpha of 0.873*, suggesting that the items reliably measure a common underlying construct.
Students from Europe and participated in the survey. Distribution of the respondents is presented in the Table 2.

TABLE 2 DISTRIBUTION OF THE RESPONDENTS BY REGION

Country	Counts	% of Total	Cumulative %
Europe	103	74.60%	74.60%
Asia	35	25.40%	100.00%

As can be seen from the findings, there is a great presence of the sample in Europe. In this regard, this aspect will affect the generalization of the findings. There is a smaller sample presence in Asia. Thus, the findings will be not compared from the perspective of the region in this study.

TABLE 3 DISTRIBUTION OF THE RESPONDENTS BY AGE

Age	Counts	% of Total	Cumulative %
More than 35	21	15.20%	15.20%
31-35	10	7.20%	22.50%
26-30	20	14.50%	37.00%
22-25	35	25.40%	62.30%
18-21	50	36.20%	98.60%
Under 18	2	1.40%	100.00%

The demographic structure suggests that the majority of the respondents are young students, specifically those between the ages of 18 to 25 years old. Therefore, the findings generated from this study reflect the views of the university students who are new to college life. The older age groups are less represented in this survey.

TABLE 4 DISTRIBUTION OF THE RESPONDENTS BY GENDER

Gender	Counts	% of Total	Cumulative %
Female	58	42.00%	42.00%
Male	78	56.50%	98.60%
Other	2	1.40%	100.00%

The ratio of gender is almost equal, but there are more males than females. However, there is no analysis in this specific articles based on the gender.

TABLE 5 DISTRIBUTION OF THE RESPONDENTS BY STUDY FIELD

Field of study	Counts	% of Total	Cumulative %
Other	19	13.80%	13.80%
Medicine	5	3.60%	17.40%
Manufacturing	1	0.70%	18.10%
Engineering	1	0.70%	18.80%
Mathematics	1	0.70%	19.60%
IT	35	25.40%	44.90%
Management	50	36.20%	81.20%
Finance	6	4.30%	85.50%
Economics	17	12.30%	97.80%
Education	3	2.20%	100.00%

From the data provided in the Table 5, it can be seen that the sample comprises more individuals in the field of management and IT than any other discipline.

TABLE 6 DISTRIBUTION OF THE RESPONDENTS BY STUDY LEVEL

Level of studies	Counts	% of Total	Cumulative %
Short cycle	8	5.80%	5.80%
Bachelors	82	59.40%	65.20%
Masters	37	26.80%	92.00%
PhD	11	8.00%	100.00%

The respondents who have registered for their bachelor's degree form the larger proportion of the sample size, hence the results can be applied to undergraduates.

TABLE 7 DISTRIBUTION OF THE RESPONDENTS BY STUDYYEAR

Study year	Counts	% of Total	Cumulative %
1	87	63.00%	63.00%
2	26	18.80%	81.90%
3	8	5.80%	87.70%
4	17	12.30%	100.00%

The sample contains a lot of first-year students, meaning that the results are primarily influenced by students who are still new to college life.

III. RESULTS AND DISCUSSION

For the analysis of the Block C, authors analysed students responses with the highest ranking – 4 and 5. Students were asked to rate statements from 1 to 5, where 1 is Strongly disagree, 5 is Strongly agree.

Table 8 shows the amount of the respondent who rated following statement with 4 and 5, and the % from the total share of the respondents.

TABLE 8 RESPONDENTS' AGREEMENT WITH STATEMENTS

Statement	Rated for 4 and 5	% from total share

I rely on AI to complete assignments	30	22%
I use AI even when I could solve tasks myself	25	18%
I feel uncomfortable studying without AI	29	21%
AI is my first option when facing academic challenges	29	21%
AI reduces my need to think deeply/critical thinking	38	28%
I trust AI answers without verifying them	21	15%
I rely on AI more than textbooks or course materials	26	19%
I feel more confident when using AI	31	22%
I feel stressed when I cannot use AI	14	10%

The results suggest a rather considerable level of usage of artificial intelligence (AI) among students, especially in situations associated with academic issues and efficiency.

The highest percentage agrees with the notion that " AI reduces my need to think deeply" - 28%, which means that almost 1/3 from the total share perceive AI as a means capable of replacing deep intellectual work. Therefore, this finding may raise concerns about critical thinking development among young people.

Also, it should be noted that a relatively high percentage of respondents

- I rely on AI to complete assignments -22%;

- I feel more confident when using AI - 22%; and

- AI is my first option when facing academic challenges - 21%.

Thus, these data prove that AI is not just an additional helper but an integral part of students' academic activity that contributes to their success and self-confidence.

On the one hand, 21% of participants find it uncomfortable to study without AI support, which may be a sign of forming some dependency on the technology. On the other hand, the signs of serious dependences among respondents are rather rare, namely

- only 10% of participants become stressed when AI is absent; and

- 15% of respondents trust all information received from AI without checking.

Overall, it means that while AI is actively used in students' work, its uncritical and emotional usage is quite common but not typical for most respondents.

Moreover, AI usage in academic work exceeds that of traditional sources such as textbooks or course materials in 19% of cases.

To reach the goal of the study, the following hypothesis is proposed:

H1: AI usage frequency is positively correlated with AI dependency;

H2: AI dependency is positively associated with reduced critical thinking;

H3: AI dependency is positively correlated with students' stress levels;

H4: AI dependency is associated with perceived academic integrity risks.

Firstly, authors created AI dependency Index, as there is no specific question "How/Are you dependent on AI", as the authors considered this question too direct and potentially leading to biased responses. Instead of that, following questions were included, and later AI dependency Index was created:

1. I rely on AI to complete assignments
2. I use AI even when I could solve tasks myself
3. I feel uncomfortable without AI
4. AI is my first option for academic challenges
5. AI reduces my need to think deeply/critical thinking
6. I trust AI answers without verifying them
7. I rely on AI more than textbooks
8. I feel more confident using AI
9. I feel stressed without AI

Average AI Dependency Index included above mentioned 9 statements. Based on the average scores ranging between 2.0 and 3.5 on a 5-point Likert scale, the level of AI dependency can be interpreted as moderate.

For the H1, authors employed Spearman's correlation test for 2 variables: AI Dependency Index and ranking of the students on how often do they use AI (1-never, 5-very often). The results revealed a statistically positive correlation between the two variables, $p = 0.001$; $\rho(138) = 0.272$. This indicates that students who use AI more frequently tend to exhibit slightly higher levels of dependency on AI tools. Therefore, H1 was supported.

For the H2, authors employed Spearman's correlation with the following variables: AI Dependency Index and ranking of the students about critical thinking. Results of the analysis revealed statistically moderate significant positive correlation with $p<0.001$, $\rho(138) = 0.558$, indicating that higher levels of AI dependency are associated with greater perceived reduction in critical thinking. Therefore, H2 was supported.

For the H3, authors examined the relationship between AI Dependency Index and evaluation of the students on how often do they feel stress during their studies. Analysis showed that there is no significant relationship between AI Dependency Index and stress level of the students, what leads to the fact that H3 is not supported.

To test the last hypothesis – H4, authors used AI Dependency index and following statements, which are perceived academic integrity risks:

- AI tools can easily be misused in academic work
- Overuse of AI in studies can be considered dishonest
- It is difficult to distinguish between cheating and learning when using AI

The results indicated no statistically significant relationships between the variables, therefore, H4 is not supported.

As mentioned above, the current study provides new empirical evidence related to the growing prevalence of AI among college students and its potential connection with learning behaviors associated with dependence on external help. Based on the research findings, AI has become a part of the students' academic routine, though this influence varies across different dimensions.

First of all, H1 was confirmed as a statistically significant weak positive correlation between the frequency of using AI and the AI Dependency Index was obtained, $\rho(138) = 0.272$, $p = 0.001$. It means that the more often students use AI to complete their assignments, the higher is their AI dependency. Nonetheless, as indicated by the low strength of the relationship, the mere frequency of the AI use does not explain dependency issues fully. Namely, students can use the tool to support their activities or substitute it for completing academic assignments independently. In other words, dependency seems to be affected not only by the frequency but also by the mode and purpose of using the technology, along with a specific attitude toward it.

Secondly, H2 was also supported as a statistically significant moderate positive correlation between the variable of AI dependency and the perceived reduction in critical thinking was detected, $\rho(138) = 0.558$, $p < 0.001$. As noted above, this finding is quite interesting because it indicates that students, who are more dependent on AI, see this tool as a factor decreasing their critical thinking. Hence, AI may be viewed as a facilitator of cognitive offloading, as a person may outsource intellectual activities to machines instead of analyzing situations, reflecting on them, and developing solutions independently. However, this result needs to be explained. The problem is that students themselves reduce critical thinking by using AI passively and not verifying the generated output and results critically.

Thirdly, H3 was not confirmed because a statistically significant relationship between AI dependency and the stress level was not found. This result might mean that there is no relationship between these variables. One of the reasons might be that the impact of AI on students' stress might be twofold, depending on how people use this technology. Namely, AI might reduce stress, for instance, by facilitating the completion of assignments and helping with understanding complicated topics. Meanwhile, using AI and being dependent on it may create additional uncertainty concerning academic misconduct and lead to anxiety. Therefore, researchers should distinguish between different kinds of stress in order to find the link between AI dependency and the emotional state of students.

Finally, H4 was not confirmed either as no statistically significant relationship between AI dependency and academic integrity risks was observed. As seen from this result, students do not always see their AI use as the violation of academic norms. Namely, they may consider this tool as one of the ways to facilitate learning activities and, hence, not as cheating. This is especially true as institutional policies in this area may be inconsistent, leading to confusion among students. Consequently, higher education institutions need to address this issue as they cannot assume that all students know where the boundaries lie regarding AI.

From the results presented above, it can be concluded that AI dependency in higher education is a rather complicated concept. The study does not argue that the technology itself is something negative. On the contrary, AI helps facilitate learning activities, increase access to information, and boost confidence. Nonetheless, the obtained findings demonstrate that this technology may affect the quality of learning processes negatively. In particular, the most interesting and alarming result of this study is the relationship between AI dependency and perceived reduction in critical thinking.

The obtained findings have certain practical implications. For instance, universities should develop specific guidelines on using AI in education. Namely, they need to explain students when and how to use this technology. In particular, students need to understand how to verify information generated using AI tools and what role such technologies play in the learning process in comparison with their actions. From this point of view, AI literacy

should become a necessary aspect of educational programs in higher education institutions.

In conclusion, the study had several limitations. First, the sample includes mostly students from Europe and first-year students. Secondly, the data were collected through surveys, so the results might be affected by respondents' subjective views. Finally, the cross-sectional nature of this study prevents the establishment of causal relationships. As a result, further research will require employing longitudinal designs, larger and more representative samples, and separate measurement of various variables discussed here.

REFERENCES

[1] M. Abbas, F. A. Jam, and T. I. Khan, "Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students," *International Journal of Educational Technology in Higher Education*, vol. 21, no. 1, p. 10, 2024. doi: 10.1186/s41239-024-00456-3.

[2] I. Backfisch, A. Lachner, K. Stürmer, and K. Scheiter, "Variability of teachers' technology integration in the classroom: A matter of utility!," *Computers & Education*, vol. 166, art. no. 104159, 2021. doi: 10.1016/j.compedu.2021.104159.

[3] A. Bahrini, M. Khamoshifar, H. Abbasimehr, R. J. Riggs, M. Esmaeili, R. M. Majdabadkohne, and M. Pasehvar, "ChatGPT: Applications, opportunities, and threats," in *2023 Systems and Information Engineering Design Symposium (SIEDS)*, 2023, pp. 274–279. doi: 10.1109/SIEDS55613.2023.10132220.

[4] A. Bandura, *Self-efficacy: The exercise of control*. New York: Freeman, 1997.

[5] G. Barbayannis, M. Bandari, X. Zheng, H. Baquerizo, K. W. Pecor, and X. Ming, "Academic stress and mental well-being in college students: Correlations, affected groups, and COVID-19," *Frontiers in Psychology*, vol. 13, art. no. 886344, 2022. doi: 10.3389/fpsyg.2022.886344.

[6] J. Batista, A. Mesquita, and G. Carnaz, "Generative AI and higher education: Trends, challenges, and future directions from a systematic literature review," *Information*, vol. 15, no. 11, p. 676, 2024. doi: 10.3390/info15110676.

[7] S. D. R. Bermeo, M. L. Salazar, F. F. P. Terán, J. C. M. Calero, and V. J. A. Centeno, "Impact of AI on virtual learning: Self-sufficiency and academic confidence in university students," *Ciencia Latina Revista Científica Multidisciplinar*, vol. 8, no. 6, pp. 7414–7429, 2024. doi: 10.37811/cl_rcm.v8i6.15416.

[8] J. T. Cacioppo and S. Cacioppo, "The growing problem of loneliness," *The Lancet*, vol. 391, no. 10119, p. 426, 2018. doi: 10.1016/S0140-6736(18)30142-9.

[9] I. S. Chaudhry, S. A. M. Sarwary, G. A. El Refae, and H. Chabchoub, "Time to revisit existing student performance evaluation approaches in higher education in a new era of ChatGPT—A case study," *Cogent Education*, vol. 10, no. 1, art. no. 2210461, 2023. doi: 10.1080/2331186X.2023.2210461.

[10] D. Chen, Y. Liu, Y. Guo, and Y. Zhang, "The revolution of generative artificial intelligence in psychology: The interweaving of behavior, consciousness, and ethics," *Acta Psychologica*, vol. 251, art. no. 104593, 2024. doi: 10.1016/j.actpsy.2024.104593.

[11] J. Cordero, J. Torres-Zambrano, and A. Cordero-Castillo, "Integration of generative artificial intelligence in higher education: Best practices," *Education Sciences*, vol. 15, no. 1, p. 32, 2025. doi: 10.3390/educsci15010032.

[12] F. D. Davis, "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, vol. 35, no. 8, pp. 982–1003, 1989. doi: 10.1287/mnsc.35.8.982.

[13] M. de la Puente, J. Torres, A. L. Blanco Troncoso, Y. Y. Hernández Meza, and J. X. Márquez Carrascal, "Investigating the use of ChatGPT as a tool for enhancing critical thinking and argumentation skills in international relations debates among undergraduate students," *Smart Learning Environments*, vol. 11, p. 55, 2024. doi: 10.1186/s40561-024-00347-0.

[14] Y. K. Dwivedi, N. Kshetri, D. L. Hughes, C. Coombs, J. S. Shareef, M. A. Shareef, and A. K. Kar, "'So what if ChatGPT wrote it?' Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy," *International Journal of Information Management*, vol. 71, art. no. 102642, 2023. doi: 10.1016/j.ijinfomgt.2023.102642.

[15] A. Fanari and C. Segrin, "Longitudinal effects of US students' reentry shock on psychological health after returning home during the COVID-19 global pandemic," *International Journal of Intercultural Relations*, vol. 82, pp. 298–310, 2021. doi: 10.1016/j.ijintrel.2021.02.003.

[16] T. Farrelly and N. Baker, "Generative artificial intelligence: Implications and considerations for higher education," *Education Sciences*, vol. 13, no. 11, p. 1109, 2023. doi: 10.3390/educsci13111109.

[17] M. Gerlich, "AI tools in society: Impacts on cognitive offloading and the future of critical thinking," *Societies*, vol. 15, no. 1, art. no. 6, 2025. doi: 10.3390/soc15010006.

[18] M. F. Hinss, A. M. Brock, and R. N. Roy, "Cognitive effects of prolonged continuous human–machine interaction: The case for mental state-based adaptive interfaces," *Frontiers in Neuroergonomics*, vol. 3, art. no. 898745, 2022. doi: 10.3389/fnrgo.2022.898745.

[19] Y.-M. Huang, M. Y. Hsieh, and M. Usak, "A Multi-Criteria Study of Decision-Making Proficiency in Student's Employability for Multidisciplinary Curriculums," *Mathematics*, vol. 8, no. 6, art. 897, 2020. doi: 10.3390/math8060897.

[20] S. Huang, X. Lai, L. Ke, Y. Li, H. Wang, X. Zhao, X. Dai, and Y. Wang, "AI technology panic—Is AI dependence bad for mental health? A cross-lagged panel model and the mediating roles of motivations for AI use among adolescents," *Psychology Research and Behavior Management*, vol. 17, pp. 1087–1102, 2024. doi: 10.2147/PRBM.S456789.

[21] B. Klimova and M. Pikhart, "Exploring the effects of artificial intelligence on student and academic well-being in higher education: A mini-review," *Frontiers in Psychology*, vol. 16, art. no. 1498132, 2025. doi: 10.3389/fpsyg.2025.1498132.

[22] G. Kurtz, M. Amzalag, N. Shaked, Y. Zaguri, D. Kohen-Vacs, E. Gal, G. Zailer, and E. Barak-Medina, "Strategies for integrating generative AI into higher education: Navigating challenges and leveraging opportunities," *Education Sciences*, vol. 14, no. 5, p. 503, 2024. doi: 10.3390/educsci14050503.

[23] R. S. Lazarus and S. Folkman, *Stress, Appraisal, and Coping*. New York: Springer Publishing Company, 1984.

[24] D. Lee, M. Arnold, A. Srivastava, K. Plastow, P. Strelan, F. Ploeckl, D. Lekkas, and E. Palmer, "The impact of generative AI on higher education learning and teaching: A study of educators' perspectives," *Computers and Education: Artificial Intelligence*, vol. 6, art. no. 100221, 2024. doi: 10.1016/j.caeai.2024.100221.

[25] H.-P. Lee, A. Sarkar, L. Tankelevitch, I. Drosos, S. Rintel, R. Banks, and N. Wilson, "The impact of generative AI on critical thinking: Self-reported reductions in cognitive effort and confidence effects from a survey of knowledge workers," in *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*, 2025, Paper no. 3713778, pp. 1–23. doi: 10.1145/3706598.3713778.

[26] J. Liang, L. Wang, J. Luo, Y. Yan, and C. Fan, "The relationship between student interaction with generative artificial intelligence and learning achievement: Serial mediating roles of self-efficacy and cognitive engagement," *Frontiers in Psychology*, vol. 14, art. no. 1285392, 2023. doi: 10.3389/fpsyg.2023.1285392.

[27] C. McGrath, T. C. Pargman, N. Juth, and P. J. Palmgren, "University teachers' perceptions of responsibility and artificial intelligence in higher education — An experimental philosophical study," *Computers and Education: Artificial Intelligence*, vol. 4, art. no. 100139, 2023. doi: 10.1016/j.caeai.2023.100139.

[28] P. Perera and M. Lankathilaka, "AI in higher education: A literature review of ChatGPT and guidelines for responsible implementation," *International Journal of Research and Innovation in Social Science*, vol. 7, no. 6, pp. 306–314, 2023. doi: 10.47772/IJRISS.2023.70618.

[29] D. Perlman and L. A. Peplau, "Theoretical approaches to loneliness," in *Loneliness: A Sourcebook of Current Theory, Research and Therapy*, L. A. Peplau and D. Perlman, Eds. New York: John Wiley & Sons, 1982, pp. 123–134.

[30] B. C. Storm, S. M. Stone, and A. S. Benjamin, "Using the Internet to access information inflates future use of the Internet to access other information," *Memory*, vol. 25, no. 6, pp. 717–723, 2017. doi: 10.1080/09658211.2016.1210171.

[31] A. Strzelecki, "To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology," *Interactive Learning Environments*, 2023, advance online publication. doi: 10.1080/10494820.2023.2209881.

[32] S. Supriyanti, A. Permanasari, and F. Khoerunnisa, "Correlation between information literacy and critical thinking enhancement through PjBL-information literacy learning model," *Journal of Educational Sciences*, vol. 4, no. 4, pp. 774–784, 2020. doi: 10.31258/jes.4.4.p.774-784.

[33] Y. Walter, "Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education," *International Journal of Educational Technology in Higher Education*, vol. 21, no. 1, p. 15, 2024. doi: 10.1186/s41239-024-00448-3.

[34] H. Wang, A. Dang, Z. Wu, and S. Mac, "Generative AI in higher education: Seeing ChatGPT through universities' policies, resources, and guidelines," *Computers and Education: Artificial Intelligence*, vol. 7, pp. 2–11, 2024. doi: 10.1016/j.caeai.2024.100237.

[35] Y. Wang and S. Xu, "Relationship between artificial intelligence tool usage experience and academic stress among college students: Mediating role of loneliness and moderating role of academic self-efficacy," *Acta Psychologica*, vol. 263, art. no. 106220, 2026. doi: 10.1016/j.actpsy.2025.106220.

[36] R. Yilmaz and F. G. K. Yilmaz, "The effect of generative artificial intelligence (AI)-based tool use on students' computational thinking skills, programming self-efficacy and motivation," *Computers and Education: Artificial Intelligence*, vol. 4, art. no. 100147, 2023. doi: 10.1016/j.caeai.2023.100147.

[37] R. Yilmaz and F. G. K. Yilmaz, "Augmented intelligence in programming learning: Examining student views on the use of ChatGPT for programming learning," *Computers in Human Behavior: Artificial Humans*, vol. 1, no. 2, art. no. 100005, 2023. doi: 10.1016/j.chbah.2023.100005.

[38] A. Yusuf, N. Pervin, and M. Román-González, "Generative AI and the future of higher education: A threat to academic integrity or reformation? Evidence from multicultural perspectives," *International Journal of Educational Technology in Higher Education*, vol. 21, p. 21, 2024. doi: 10.1186/s41239-024-00454-5.

[39] L. Zhang and J. Xu, "The paradox of self-efficacy and technological dependence: Unraveling generative AI's impact on university students' task completion," *The Internet and Higher Education*, vol. 65, art. no. 100978, 2025. doi: 10.1016/j.iheduc.2025.100978.

[40] S. Zhang, X. Zhao, T. Zhou, and J. H. Kim, "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*, vol. 21, no. 1, p. 34, 2024. doi: 10.1186/s41239-024-00467-0.