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From Classroom to Screen: Examining Academic Achievement in Indonesian Students' Transition to Online Learning in Pre- and Post-pandemic

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ABSTRACT

The COVID-19 pandemic posed an unprecedented challenge to the education system, requiring rapid adaptation to online learning. This study investigates how sustainable educational innovations facilitated this transition and supported student learning outcomes. The academic performance of 321 Indonesian university students from various fields was analyzed in online and offline learning environments. Findings revealed a notable improvement in GPA scores of 2.75 or lower in online settings compared to offline learning, while no significant differences were observed for higher GPA ranges. Students reported that online learning was more understandable, offered readily available multimodal resources, and provided additional learning time. Additionally,

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they felt that online learning enhanced academic success and promoted self-directed learning. This study highlights the critical role of online tools in sustaining academic continuity and addressing global educational challenges by offering adaptable educational frameworks. These insights can guide policymakers and educators in leveraging digital innovations to ensure uninterrupted learning experiences and ensuring academic continuity.

Keywords: Academic achievement, Indonesian University Students, online and offline learning

INTRODUCTION

The COVID-19 pandemic has presented an unprecedented global challenge, drastically altering various aspects of life, including the education sector. The sudden shift from traditional classroom settings to online learning has tested the resilience and adaptability of educational systems worldwide. Nearly all educational bodies, from elementary schools to universities, have adopted this learning approach in response to the shutdown of schools and campuses. In early April 2020, these closures impacted approximately 1.6 billion learners from 194 nations (accounting for over 90% of all enrolled students) (UNESCO, 2020). Online learning was implemented as a substitute to maintain student engagement and prevent educational setbacks, highlighting the magnitude of the shift toward digital education. Sustainable innovation in educational technology has been crucial in addressing the challenges posed by the sudden shift to online learning. Innovative teaching methods and digital tools have enabled educators to deliver lessons remotely, ensuring that students continue their education despite the disruptions.

Amid this transition, concerns about students' academic performance in online learning environments have surfaced, prompting extensive research into its effectiveness. Various studies (e.g., Cheise, 2023; El Takach, 2022; Kim et al., 2020; Lederman, 2021; Mothibi, 2015; Orlov et al., 2021; Spitzer & Musslick, 2021) have sought to determine the impact of online learning on student achievement. While some studies (e.g., Cheise, 2023; El Takach, 2022; Kim et al., 2020; Lederman, 2021; Orlov et al., 2021) have reported a decline in academic performance in online learning compared to traditional in-person settings, others (e.g., Mothibi, 2015; Spitzer & Musslick, 2021; Wang & Tafazoli, 2019) have found evidence to the contrary. Mothibi (2015), for instance, conducted a meta-analysis indicating a positive correlation between e-learning and academic achievement in higher education, highlighting the potential benefits of digital education. Similarly, Spitzer and Musslick (2021) observed improved academic outcomes among K-12 students in an online mathematics learning environment, suggesting that online learning can address educational disparities and enhance academic success.

Despite these divergent findings, a consensus on the impact of online learning on academic performance remains elusive. Therefore, there is a pressing need for further research to provide comprehensive evidence regarding the effectiveness of online learning. This research article aims

to contribute to this discourse by examining students' academic performance and perceptions of academic success in online learning environments, thereby informing sustainable innovation in education amid global challenges. The specific problem preceding this study is the pressing need to address the disparities in academic achievement between offline and online learning environments, particularly among Indonesian university students. Despite the widespread adoption of online learning as a response to school and campus closures, there is a lack of comprehensive understanding regarding its effectiveness in facilitating academic success in the Indonesian context. Existing research on the subject has yielded conflicting findings, with some studies suggesting a decline in academic performance in online learning settings compared to traditional in-person classrooms, while others report positive outcomes. This difference emphasizes the necessity for additional research to clarify the factors influencing academic achievement in online learning environments among Indonesian students.

Thus, this research article aims to contribute to this discourse or fill this gap by examining students' academic performance and perceptions of academic success in online learning environments. Specifically, it seeks to address the disparities or differences in academic achievement between offline and online learning environments, focusing on Indonesian university students. This study aims to offer valuable insights into the unique challenges and opportunities presented by online learning in the Indonesian educational context by conducting a comprehensive analysis. Ultimately, it aims to provide insights to inform evidence-based strategies for addressing disparities in academic achievement and promoting sustainable innovation in education amidst global challenges.

LITERATURE REVIEW

The rise of online learning has prompted numerous investigations into its effects on students' academic performance. Nadeak (2020) studied the efficacy of distance learning through social media platforms during the COVID-19 pandemic among students at Universitas Kristen Indonesia. The research findings suggested that while distance learning using social media is effective for theoretical and practical courses, it is less effective for practical courses and fieldwork. Specifically, platforms like Facebook, Instagram, and YouTube were found to be less conducive for remote learning in certain course types.

In another investigation by Hakim et al. (2023), they examined the influence of online learning on learning outcomes in Indonesian subjects. The results indicated that student performance in Indonesian classes improved more significantly after offline learning compared to online learning. It suggests that the impact of online learning on learning outcomes in Indonesian subjects is more pronounced following the implementation of offline learning, particularly for students in Indonesian Class IV at SD Negeri 1 Bonto-Bonto, Pangkep Regency.

Guan et al. (2021), on the other hand, explored the influence of online learning on college students in China during the

COVID-19 pandemic. Their research indicated that online learning negatively affected academic performance, particularly among students with lower self-regulated learning strategies and motivation. They proposed that enhancing support and training for self-regulated learning could potentially boost student performance in online learning settings.

Phan et al. (2021) analyzed the correlation between online learning and academic performance among high school students in Vietnam in a separate study. They discovered that students engaged in online learning achieved higher academic performance than their counterparts who did not participate in online learning. This correlation was influenced by the students' perceived enjoyment of online learning. The researchers suggested integrating engaging and interactive activities into online courses could enhance student performance and engagement.

Lee and Kim (2020) conducted a study to determine the effects of online learning on the academic performance of undergraduate students in South Korea. They found that students who participated in online courses had slightly lower grades than those who attended in-person courses, but the difference was not statistically significant. They noted that the discrepancy could be partly due to academically motivated students being more likely to opt for in-person courses, suggesting that online learning might benefit students with lower academic motivation.

On the other hand, Kaur and Mahal (2021) carried out a study on the impact of online learning on the academic performance of college students in India. Their research showed a positive influence of online learning on student performance, especially benefiting those with higher academic abilities and greater tendencies for self-directed learning. They recommended enhancing support for less self-directed students and promoting increased interaction and collaboration in online courses to improve student performance.

It emphasizes the crucial role of educators in effectively harnessing technology while comprehending the intricate dynamics of online learning environments to maximize student achievements (Downes, 2005; Siemens, 2005). As the educational landscape evolves, educators must adeptly integrate various digital tools and platforms into their teaching methodologies (Hakim et al., 2023; Nadeak, 2020). By embracing innovative technological solutions and leveraging them to facilitate engaging and interactive learning experiences, educators can empower students to navigate the complexities of online learning effectively. Additionally, educators need to be mindful of their students' diverse needs and learning styles, adapting their instructional approaches accordingly to foster an inclusive and supportive online learning environment. Ultimately, by embracing technology strategically and fostering a deep understanding of online learning dynamics, educators can enhance student engagement, facilitate knowledge acquisition, and ultimately optimize student outcomes in the digital age.

From a theoretical perspective, enhancing students' academic performance through online learning is based on the idea that students have access to a plethora of resources in the online environment. It aligns with the outcomes proposed by connectivist theorists in virtual learning scenarios. Siemens (2005) posited that, from a connectivist viewpoint, learning is not an isolated process but a distributed phenomenon across decentralized digital networks. Students actively navigate these networks to access diverse knowledge flows, and learning involves navigating and expanding these connections. Downes (2005) emphasized the importance of participation, collaboration, and leveraging technology's capabilities for real-time understanding of co-construction, presenting a conceptualization of student success within the context of connectivist learning theory. This theory is shaped by autonomy, diversity, openness, and interactivity, reflecting the dynamic nature of information in the digital age.

In connectivism, technology is a crucial element, acting as the conduit through which learners interact with information and each other. The fusion of social media, collaborative tools, and learning management systems cultivates a favorable digital environment for connectivist learning. Integrating technology in e-learning allows learners to delve into a variety of perspectives and engage in significant interactions, extending the learning experience beyond conventional boundaries. While connectivist theorists advocate the potential of online learning, existing research suggests that several factors may influence its impact on student academic achievement. These factors encompass students' motivation, self-regulated learning strategies, and their perceived enjoyment of online learning. As a result, additional research is needed to comprehensively examine the correlation between online learning and academic success. Additionally, collaborative online learning theory suggests that meaningful interactions and collaboration among students foster deeper understanding and knowledge construction (Dillenbourg, 1999). This perspective emphasizes the significance of social interaction and collaborative activities in online learning environments, further enhancing student engagement and learning outcomes. Nevertheless, it is crucial to acknowledge the existing gaps in research, particularly concerning the effectiveness of online learning across diverse global contexts. Students may exhibit unique characteristics that can impact the outcomes of such studies, highlighting the need for further investigation. In the Indonesian context, where our study is situated, distinct contextual factors exist compared to previous research settings. These differences necessitate additional investigation to validate findings from other contexts and provide insights specific to Indonesia. Specifically, previous studies have overlooked empirical issues such as the varied contexts and the frequency of digital learning modes, which are crucial for comprehensively understanding online education's effectiveness.

In response to these gaps, our research aims to investigate the effectiveness of online learning while tackling the disparities in academic performance between offline and online learning environments, particularly among Indonesian university students. This study will be conducted within the Indonesian context, considering the diverse characteristics and learning environments prevalent in the country. Indonesia's unique context necessitates further research to validate previously explored areas that differ from previous studies' settings.

METHODS

Research Design

This research utilized a dual approach of 'analyzing existing datasets' (Muijs, 2004) or 'secondary data analysis' (Donnellan & Lucas, 2013), a non-experimental design where the data were readily available through university administrator access, and conducting 'surveys' (Creswell & Creswell, 2023; Muijs, 2004) to explore the effects of different learning modes. The dataset included the grade point averages (GPA) of undergraduate students from all academic programs at a private university in Indonesia, capturing both the pre-COVID-19 offline learning period and the online learning period induced by the COVID-19 pandemic. Simultaneously, surveys were carried out to collect student perspectives on their experiences with online learning and its relationship with their academic achievements.

Participants of the Study

The research included students from English Literature, Public Administration, Psychology, and Industrial Engineering registered for the 2018 academic year. The participants, 60% female and 40% male were in the third year of study. They were from various parts of Indonesia (i.e., Bali, Kalimantan, Sulawesi), with Javanese as the dominant ethnic group and were considered low to middle socioeconomic status (12.000.000–36.000.000 IDR per annum). The participants were randomly selected based on their familiarity with traditional classroom learning and online instruction, guaranteeing they had experience with both teaching and learning modes. Furthermore, the participants were chosen from a variety of departments within the university, taking into account the possible differences in student attributes across various academic disciplines.

Research Instrument

The resources used in this research included a student grade point averages (GPAs) dataset, which contained GPA data from various academic programs at a university from 2018 to 2022. GPA indicates academic achievement (Choi, 2005; Parker et al., 2004). In addition, open-ended and multiple-choice survey questions were employed to determine whether online learning enhances comprehension of the subject matter and to assess students' views on their academic performance in an online learning environment.

Data Collection

The dataset of student GPAs across all academic programs was easily accessible through the university's Management Information System, with access granted to the administration and heads of study programs. The survey was created online using Google Forms and shared with the participating respondents via their WhatsApp Group.

Data Analysis

The analysis of quantitative data was performed using SPSS Statistics Version 26. The students' GPAs were gathered and examined using the Paired-sample t-test to determine if there was a notable difference between the two modes of learning—offline and online (Muijs, 2004; Phakiti, 2014). The qualitative data were analyzed using qualitative analysis techniques such as coding, charting, mapping, and interpretation (Miles et al., 2014).

RESULTS AND DISCUSSION

Academic Performance of Students in Online and Offline Learning Environments

Evaluating students' academic performance across majors: Public Administration, Industrial Engineering, Psychology, and English Literature during online and offline learning, the GPA is categorized as below or equal to 2.75, between 2.75 and 3.50, and above 3.50. The details are presented in Table 1.

Table 1
Students' GPAs in online and offline modes of learning

Study Mode	Study Program	GPA <= 2.75	GPA 2.75-3.50	GPA > 3.50	Total
		Number of Students	Number of Students	Number of Students	
Offline Semester 2 2019	Public Administration	1	107	81	190
	Industrial Engineering	1	62	74	137
	Psychology	1	174	66	241
	English Literature	1	60	41	102
Offline Semester 1 2020	Public Administration	1	92	97	190
	Industrial Engineering	1	69	67	137
	Psychology	1	179	61	241
	English Literature	0	63	38	101
Online Semester 2 2020	Public Administration	0	82	105	187
	Industrial Engineering	0	70	62	133
	Psychology	1	165	71	237
	English Literature	0	63	38	101
Online Semester 1 2021	Public Administration	0	66	109	175
	Industrial Engineering	0	58	72	130
	Psychology	0	137	95	232
	English Literature	0	58	41	99

As presented in Table 1, the GPAs of students majoring in English Literature, Psychology, Public Administration, and Industrial Engineering exhibit variations between online and offline learning. Few students achieved a GPA of 2.75 or lower, while a considerable number achieved GPAs between 2.75 and 3.50 and above 3.50. During the second semester of 2019 and the first semester of 2020, when learning was conducted offline (prior to the COVID-19 pandemic), the number of students achieving a GPA of 2.75 or lower was predominantly 1 and 0 for the English Literature major. However, during the second semester of 2020 and the first semester of 2021, when learning was conducted online (during the COVID-19 pandemic), the number of students achieving a GPA of 2.75 or lower was mostly 0, except for the Psychology major, which had 1.

A Paired-sample t-test was used for further analysis to determine if the differences in students' GPAs during offline and online learning were significant. Table 2 presents the results of the Paired samples t-test for those achieving a GPA of 2.75 or lower.

As illustrated in Table 2, the result of the Paired-samples t-test for GPAs of 2.75 or lower yielded a significant value of .014. Given that this value is below the significance level (.05), it indicates a significant difference in GPAs of 2.75 or lower between students studying offline and online modes. The number of students with GPAs of 2.75 or lower decreased significantly during the online learning period.

Furthermore, to determine if the differences in students' GPAs ranging from 2.75 to 3.50 were significant, an additional analysis was carried out using the Paired-samples t-test. The results of this analysis are presented in Table 3, showing the Paired-Samples t-test for GPAs ranging from 2.75 to 3.50.

Table 2
Paired-samples t-test for GPAs of 2.75 or lower

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	OFFLINE-ONLINE	.75000	.28868	.14434	.29065	1.20935	5.196	3	.014

Table 3
Paired-samples t-test for GPAs between 2.75 and 3.50

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	OFFLINE-ONLINE	13.37500	14.00223	7.00112	-8.90568	35.65568	1.910	3	.152

As shown in Table 3, the significance obtained was .152, implying no significant difference in students' GPAs ranging from 2.75 to 3.50 in both online and offline learning modes. The GPAs of students in the four study programs: State Administration, Industrial Engineering, Psychology, and English Literature remained consistent within the 2.75 to 3.50 range.

Additionally, a separate Paired-sample t-test was performed to determine if the differences in students' GPAs above 3.50 were significant. The results of this analysis are presented in Table 4, showing the Paired-samples t-test for GPAs above 3.50.

As demonstrated in Table 4, the result of the Paired-Samples t-test for GPAs greater than 3.50 was not significant, as the significance obtained was .250, which is larger than the significance level (.05). It suggests that the variations in students' GPAs above 3.50 were not significantly different in either the online or offline learning modes. In other words, the fluctuations in students' GPAs above 3.50 were not considerable in both learning modes.

From the above analyses, it was observed that the students' GPAs of 2.75 or lower significantly decreased, indicating that fewer students achieved a GPA of 2.75 or lower during online learning. However, the students' GPAs of 2.75 to 3.50 and above 3.50 remained relatively stable. Students' GPAs in these two categories did not significantly increase or decrease during online and offline learning. Any variations in the number of students falling into these categories were due to chance, not design. Overall, online and offline learning modes did not influence students' academic achievement in disciplines such as Public Administration, Industrial Engineering, Psychology, and English Literature. Therefore, students' academic achievement was consistent in both learning modes.

Differences in GPAs among study programs underscore the impact of discipline-specific factors, such as variations in course difficulty, grading norms, or student aptitude. Engineering and Public Administration, for instance, consistently exhibit lower GPAs, suggesting that these programs likely involve rigorous coursework, complex concepts, and demanding assessments. In contrast, English literature and Psychology consistently achieve higher GPAs. These disciplines may offer more lenient grading practices or inherently less challenging content. However, it is important to note that our analysis is based on aggregated data; therefore, individual experiences may differ.

Table 4
Paired-samples t-test for GPAs above 3.50

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	OFFLINE-ONLINE	-8.50000	11.93734	5.96867	-27.49497	10.49497	-1.424	3	.250

The university has integrated Turnitin, a text-matching software, into the E-learning Untag Surabaya (ELITAG) system to address cheating and plagiarism among online class participants. Any assignment submission should include a Turnitin scanned report to minimize such practice. For evaluation involving online tests or assessments, instructors frequently utilized supplementary tools such as smartphones with popular video conferencing platforms like Zoom, Google Meet, or Microsoft Teams. Smartphones, functioning as auxiliary devices, were often used by instructors as cameras to observe students during examinations. These strategies might not fully stop students from practicing plagiarism or cheating, yet these could minimize such practice. In this context, offline and online learning modes allow instructors to maintain control over assessments, ensuring the authenticity of students' work. Thus, students' GPAs in both learning modes were of equivalent quality.

The results of this study challenge the conclusions of previous research that suggested a decline in students' performance when learning online (i.e., Cheise, 2023; El Takach, 2022; Lederman, 2021; Orlov et al., 2021). As reported by El Takach (2022), Lederman (2021) and Orlov et al. (2021), students' academic performance experienced a downturn when they studied online during the COVID-19 pandemic. The decrease in students' performance was reportedly significant. Cheise (2023) argued that students' performance was low in online learning due to the lack of extrinsic factors that support students to perform well.

Contrarily, studies by Spitzer and Musslick (2021) and Mothibi (2015) revealed increased student performance during online learning. Spitzer and Musslick (2021) reported that "students with lower achievement showed greater improvements in performance than high-achieving students." Similarly, a meta-analysis study by Ulum (2021) investigating the effect of online education on academic success showed that the impact of online learning was at a moderate level. Spitzer and Musslick (2021) and Ulum (2021) suggest that online learning effectively enhances students' academic performance. Nguyen (2015) emphasized that the effectiveness of online learning is comparable to traditional classroom learning and depends on its design.

Therefore, it is important to note that learning modes, either online or offline, cannot be used as a predictor or determinant of the effectiveness of students' learning or their academic achievement. Factors that may influence students' outcomes in online learning, as discussed extensively in the literature, include learner characteristics, perceived usefulness, course content, course design, ease of use, and faculty capacity (Choi, 2021; Kira & Saade, 2006; Kraiwanit et al., 2023; Pham et al., 2021).

The findings opposed the connectivist learning theory, which suggests that students' academic performance is attributed to easy access to many resources in the online learning environment. The theory postulates that by having access to numerous resources in online learning, students can learn much

more than what they can do in offline learning. However, in this case, the student's academic performance during online learning was relatively the same as when they were in the offline mode of learning. It suggests that several factors contributed to the student's academic performance besides having access to numerous resources. A more comprehensive approach that integrates various learning theories, such as Behaviorism, Cognitivism, Constructivism, and Connectivism, may be recommended when designing online learning materials. Ally (2008) emphasizes that diverse theories, including behaviorist, cognitivist, and constructivist perspectives, have each contributed uniquely to shaping the design of online educational materials. These theories are expected to continue influencing the creation of learning resources for online environments. Behaviorist approaches are effective for conveying factual knowledge (the "what"), while cognitivist strategies excel in teaching principles and processes (the "how"). Constructivist methods are particularly useful for instilling real-life applications and facilitating contextual learning.

A significant trend involves an increasing emphasis on constructive learning, where learners actively construct meaning from information presented during online sessions. This shift encourages a more participatory and engaging educational experience. Ally (2008) argues for going beyond traditional theories by emphasizing the importance of incorporating connectivism into the development of online learning. This integration is important as connectivism aligns uniquely with our networked world, offering relevance and effectiveness in online education in today's interconnected society.

Moreover, the research by Hattie and Zeirer (2019) sheds light on the multifaceted factors influencing students' academic achievement. Their study identifies various student-related, home-related, school-related, classroom-related, curricular, teaching, learning, implementation, and teacher-related factors contributing to academic success. These include student-related factors (self-concept, working memory, concentration, persistence, engagement, self-efficacy, gender, boredom), home-related factors (socioeconomic status, home environment, parental involvement), school-related factors (principal, school climate, summer holidays), and classroom-related factors (acceleration, classroom behavior, peer influences, cognitive behavior programs, class size, ability grouping, open vs. traditional). The study also considers curricula, teaching strategies (classroom discussion, feedback, mastery learning, questioning), learning strategies (rehearsal and memorization, metacognitive strategies, student-centered teaching), and implementation methods (scaffolding, interventions for students with learning needs, reciprocal teaching, direct instruction, technology with students with learning support needs, cooperative vs competitive learning, inquiry-based teaching, mobile phones, teaching creative thinking, collaborative learning). By considering

these factors holistically, educators can adopt innovative and sustainable approaches to address online education's diverse challenges, effectively confronting global challenges and promoting academic achievement.

Additionally, ethical considerations and behavioral intentions play a crucial role in implementing educational interventions, as highlighted by Aziz et al. (2022). Ensuring ethical practices and fostering positive teacher-student relations are integral aspects of sustainable innovation in education, aligning with the overarching theme of confronting unprecedented global challenges through sustainable innovation. By embracing a comprehensive approach to online learning design and considering the multifaceted factors influencing academic achievement, educators can leverage sustainable innovation to address global challenges and foster meaningful learning experiences in the digital age.

Students' Perceptions of Academic Achievement in Online Learning

The survey results regarding students' perceptions of their academic achievement in online learning are outlined below:

Comprehensibility of Online Learning

As depicted in Figure 1, a significant proportion of students (69%) concurred that online learning was easy to comprehend. Students collectively expressed that "online learning offers more accessible materials that are easily understood and affords students additional time to learn them." The resources contributing to their understanding included video analysis, PowerPoint slides, and recorded video lectures. One student remarked, "online learning allows me to independently study the material without the pressure of peers and teachers." These responses affirm their view that online learning was easy to understand. However, a minority of students (31%) disagreed that

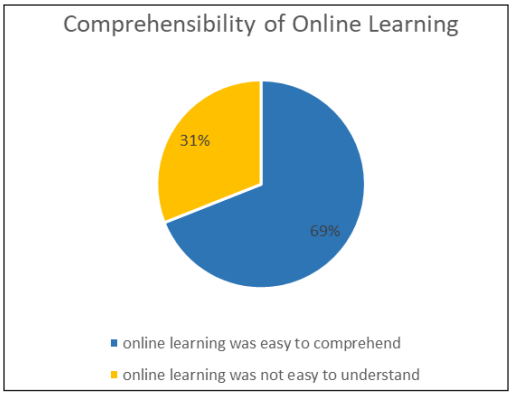

Figure 1. Students' perception of the comprehensibility of online learning

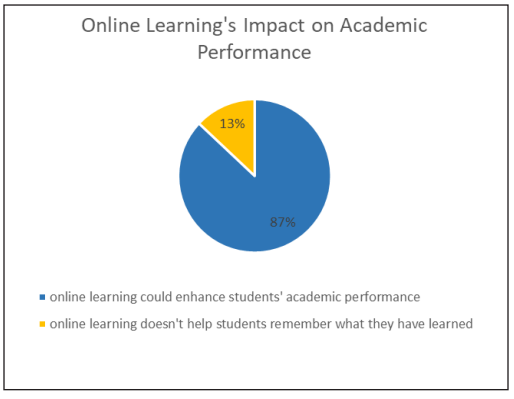

Figure 2. Students' perception of the impact of online learning on academic performance

online learning was easy to understand. They cited reasons such as "some courses assign too many tasks without adequate explanation and materials," "the teacher uses too many teaching methods, which cause confusion," and "technical issues like internet connectivity hinder my understanding of the material."

Online Learning's Impact on Academic Performance

As shown in Figure 2, most (87%) of students believed online learning could enhance their academic performance. Some students noted that "online learning is more conducive, especially when I attend classes from home. There are no distractions, and I can focus more on the course I'm participating in." Others felt that "online learning fosters independence since I can't rely on my classmates to complete tasks, boosts confidence in interacting with the teacher because I'm not nervous when asking questions through video conferencing platforms, and keeps me more informed about the topic discussed in the online sessions as the teacher assigns more homework with extended submission deadlines - helping me improve my course grade." However, a small percentage (13%) of students argued that "online learning doesn't help me remember what I've learned better, instead, face-to-face class sessions allow me to remember it well since I can immediately discuss with my classmates."

Students generally viewed online learning positively, viewing it as accessible and potentially beneficial for academic advancement. Their favorable attitudes towards online education likely stem from positive experiences with the medium. Scholars such as Tudor et al. (2010) stress the importance of understanding students' perceptions as they shape learning approaches. Consequently, fostering a positive attitude towards online learning is pivotal for its success, echoing the principles of sustainable innovation. While students' academic performance, measured by GPA, did not significantly improve during online learning, it did not decline either. However, considering the multifaceted nature of academic achievement, as highlighted by Hattie and Zeirer (2019), there exists potential for enhancement through various intervening variables. By addressing these factors, educators can leverage innovative and sustainable strategies to maximize the effectiveness of online learning, thereby contributing to the global effort of confronting unprecedented challenges through sustainable innovation.

CONCLUSION

In summary, this research aimed to determine whether students' academic performance varied between online and offline learning and to understand their perceptions of online learning and academic achievement. The findings suggest no significant difference in students' academic performance across both learning modes and that students generally had a positive view of online learning and academic achievement. This research adds to the existing knowledge on online and offline learning by confirming that the mode

of learning cannot be used as a predictor for students' academic achievement. Their course grades do not necessarily influence students' positive perceptions of online learning and academic success.

Implications of the Study

The findings of this study have several practical implications for educators, policymakers, and stakeholders in the field of education. Firstly, integrating multimodal resources in digitalized learning platforms can significantly enhance student comprehension and engagement by addressing Gardner's multiple intelligences. Visual learners (spatial intelligence) benefit greatly from digital tools that include diagrams, infographics, charts, and videos. Auditory learners (musical intelligence) find value in podcasts, recorded lectures, discussions, and text-to-speech options for written content. Linguistic learners thrive with digital content that incorporates bullet points, interactive text-based activities, and storytelling techniques, aligning with their preference for reading and writing. Kinesthetic learners (bodily-kinesthetic intelligence) engage well with interactive simulations, virtual labs, or activities that involve physical interaction with learning materials. Logical-mathematical learners can be effectively engaged through digital problem-solving activities and analytical tasks. Digital learning environments incorporating collaborative projects and online discussions cater to interpersonal learners, while intrapersonal learners benefit from self-reflective activities and autonomous learning opportunities. Naturalistic learners find virtual field trips and ecological simulations particularly beneficial in a digital format.

Secondly, the flexibility of digitalized learning allows students to manage their study schedules effectively, accommodating their time constraints and responsibilities. Thirdly, fostering a sense of autonomy within digital learning environments empowers students to pursue self-directed learning and critical thinking. Digital tools enable a seamless integration of various learning activities that cater to Gardner's multiple intelligence, ultimately enhancing overall educational outcomes. They can explore topics beyond the prescribed curriculum, pursue self-directed learning, and engage in critical thinking. Furthermore, online learning demonstrates its effectiveness as the world faces unprecedented disruptions. The ability to transition between in-person and online modes ensures educational continuity during crises. Lastly, while online learning benefits struggling students, it also maintains effectiveness for those with higher academic performance.

Implications and Recommendations of the Future Research

While this study provides valuable insights, its applicability is specific to the context of higher education in Indonesia, which may limit its generalizability. Future research should explore the impact of online and offline learning on academic achievement in diverse geographical and cultural contexts. The research design may also have inherent

biases or limitations that could influence the results. Employing different methodologies, such as longitudinal studies or randomized controlled trials, could provide deeper insights into the relationship between learning modes and academic performance. Further research should also investigate the long-term effects of online learning on student outcomes and well-being. These efforts are essential for advancing sustainable innovation in education and addressing the unprecedented global challenges faced by educational systems worldwide.

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