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Nurturing Integrity in the Digital Age: Decoding the Dynamics of Data Literacy, Digital Literacy, and Faculty Supervision in Shaping Students' Academic Integrity

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Abstract: This study aims to investigate the effect of data literacy and digital literacy on student academic integrity by considering the supervisor's supervisory role as a mediating variable. The data is taken from a survey given to college students who have enrolled in undergraduate programs. The sample used was 182 students taken randomly from two faculties at two university. Data analysis was performed using Structural Equation Modeling. The results of the study show that data literacy have a significant positive effect on students' academic integrity. In addition, lecture supervision also has a significant positive influence on student academic integrity. This research has important practical and theoretical implications. The practical implication of this research is that higher education institutions need to improve student data literacy and digital literacy as well as strengthen lecture supervision to improve student academic integrity. The theoretical implication is that this study broadens our understanding of the factors that influence student academic integrity, as well as highlights the role of lecturer supervision as an important mediating variable

Keywords:data literacy, digital literacy, academic integrity, supervision

Introduction

In today's digital era, students often use information and communication technology in their learning and research. In this case, data literacy and digital literacy have a very important role in helping students collect, evaluate, and use information from various sources effectively. Academic integrity is also an important factor in the academic world(Jiang et al., 2013)(Nalyvaiko et al., 2022), which includes research integrity, honesty in assignments, and recognition of resources.(Guerrero-Dib et al., 2020)However, there has been an increase in cases of academic violations such as plagiarism and data manipulation, which can threaten the academic integrity of students. Therefore, it is necessary to conduct research to understand the factors that influence students' academic integrity.

Data literacy is the ability to understand and use data effectively(Wolff et al., 2016). Good data literacy skills are very important in supporting students' academic integrity because they can help students evaluate, interpret, and use data correctly. In an academic context, data literacy can help students complete assignments and research in a correct and honest way(Schildkamp et al., 2013).

For example, students can use data literacy to collect and evaluate data from various sources and use that data to make

valid and objective conclusions(Cui et al., 2023). However, if students do not have sufficient data literacy, they may not be able to evaluate data properly or not understand how to use the data properly(Mandinach& Schildkamp, 2021). This can lead to violations of academic integrity such as plagiarism, data manipulation, or other fraud.Therefore, data literacy can help support student academic integrity by providing the ability to collect and evaluate data properly(Raffaghelli, 2020) and use that data to make valid and honest conclusions(Koltay, 2015). In this case, universities can play an important role in providing training and support to improve student data literacy(Henderson & Corry, 2021), so that they can carry out assignments and research with high academic integrity(Kier & Ives, 2022).

Digital literacy is a very important skill for students in supporting academic integrity. Digital literacy is the ability to use information and communication technology (ICT) effectively and safely to process, present and share information(Sagitaa et al., 2019). Digital literacy enables students to access information from various sources, process, and present information properly(Erito, 2022), and communicate effectively with colleagues and lecturers(Title et al., 2016). Digital literacy can also help students complete assignments and research in a correct and honest way(Mudra, 2020). However, if students do not have sufficient digital literacy, they may not be able to use technology effectively or even understand how to use technology safely and correctly(Rusydiyah et al., 2020). This can lead to breaches of academic integrity such as plagiarism or cheating in assignments.Therefore, digital literacy is an important factor in supporting students' academic integrity by providing the ability to use technology effectively and safely in completing assignments and research(Abimanyu, 2016). In this case, Universities can play an important role in providing training and support to improve students' digital literacy(Spector, 2015), so that they can use technology properly and honestly in carrying out their assignments and research.

By having good digital literacy, students can also develop the ability to sort and select relevant and correct information from various sources and avoid inaccurate or unreliable information(Purnama et al., 2021). This can help maintain students' academic integrity and ensure that their assignments and research are conducted honestly and accurately.

In this research, we will study (1) the influence of data literacy on student integrity, (2) the influence of digital literacy on student integrity, (3) the influence of data literacy on lecturer supervision, (4) the influence of digital literacy on lecturer supervision, and (5) the influence lecturer supervision on student academic integrity.

Supervision is needed as a mechanism that helps maintain student academic integrity and encourages students to carry out their duties honestly and fairly. Through this research, it is hoped that it can provide a better understanding of the influence of data literacy, digital literacy, and supervision on student academic integrity. The findings of this research can help universities improve the quality of teaching and learning by strengthening data literacy, digital literacy and supervision as an important part of supporting student academic integrity.

Literature Review

Student Integrity

The academic integrity of students at the university refers to the moral and ethical principles that govern student behavior in an educational context. This includes a commitment to behave honestly, fairly and ethically in all aspects of their studies and research. The definition of student academic integrity includes several important aspects:

Students are expected to present their own work without plagiarism or imitation from other sources. They should give proper credit to the resources they use, whether in academic writing, presentations or other projects.Students are expected to pass exams and assignments without cheating. This means not manipulating answers or results, not giving or receiving unauthorized assistance, and following the guidelines set by the lecturer or institution(Namira et al., 2021).

Students must use technology (eg software, internet, and digital resources) ethically. This includes complying with applicable copyrights, privacy policies, and usage policies. Students are allowed to collaborate on projects and assignments, but they must behave honestly in such collaborations. They must respect the rules and guidelines applicable to academic collaboration(Knijnenburg et al., 2022).

Students involved in research must report data and results honestly. Manipulation or distortion of data is a serious violation of academic integrity(Patak et al., 2021). Students are expected to work together with lecturers and fellow students in a spirit of mutual respect and respect for the opinions of others. They must avoid behavior that harms or harms others. Each educational institution may have a code of ethics or regulations that students must follow. Students are expected to comply

with this code of conduct and be aware of the consequences if they violate these rules(Giorgini et al., 2015).

Academic integrity is a very important principle in the world of higher education. This creates an environment where knowledge can be gained and shared in an honest and fair manner. Violating academic integrity can negatively impact a student's academic reputation and can result in institutional sanctions, including disqualification from the program or expulsion from the university(Barberena-Cerda & Parnther, 2022). Therefore, understanding and complying with the principle of academic integrity is the key to student success and growth in the educational environment.

Data Literacy

Data literacy is an individual's ability to understand, analyze, evaluate, and use data effectively in various contexts. This includes the ability to collect, interpret, and communicate information found in data(Suryadi et al., 2021). Data literacy also involves understanding basic statistical concepts, data processing, and interpretation of results.

Data literacy is essential in academic research. Students and researchers need to be able to collect, process, and analyze data to support their arguments. This includes the ability to design valid surveys, experiments, or statistical analysis(Wolff et al., 2016).In an academic context, data literacy helps students and researchers make informed, evidence-based decisions. They can better evaluate scientific data and evidence to support their claims or arguments. Data literacy helps in reading and understanding scientific publications. Researchers who have good data literacy can critique research methodology in the literature, understand statistical results, and evaluate the validity of findings(Cui et al., 2023).

Students and researchers often have to present the results of their research. Data literacy enables them to visualize data effectively, create informative graphs and tables, and clearly communicate their findings to audiences(Loeb et al., 2017). Data literacy can help avoid violations of academic ethics, such as plagiarism. With a good understanding of how to properly cite and refer to data and sources, students and researchers can maintain their academic integrity(Prashanth et al., 2018).

Data literacy also includes the ability to evaluate information found on the internet, especially in the context of online research. This helps in avoiding the spread of false or inaccurate information. Data literacy can help in formulating hypotheses that are supported by existing data evidence. This helps researchers design their research better(Mrah, 2022).

In learning and research, the ability to analyze data can assist in solving problems and identifying effective solutions. In an academic context, data literacy is a key skill that helps students and researchers become more critical readers, more effective writers, and more competent researchers. It also supports academic integrity and positive contributions to scientific knowledge.

Digital Literacy

Digital literacy is an individual's ability to use, understand, interpret and participate in an increasingly complex digital world. This includes the ability to operate and interact with digital technology devices, understand digital information, and use digital tools effectively(Hutabarat et al., 2023). There are various definitions of digital literacy that have been proposed by various experts, and the definitions may vary. Here are some definitions of digital literacy according to some experts:

International Society for Technology in Education (ISTE)is an organization that promotes the use of technology in education. They define digital literacy as the ability to use digital technology, communications, and information-based tools to pursue personal, educational, career, and social goals(Trust, 2018).

Cornell University describes digital literacy as the ability to use, evaluate, integrate, create, and participate in an ever-evolving digital environment with technological competence(Yazon et al., 2019).American Library Association (ALA) considers digital literacy as an individual's ability to use information used in digital formats in an effective and sustainable manner in achieving personal, educational, career, and social goals(Becker, 2018).

The European Commission describes digital literacy as "the ability to use the knowledge, skills and attitudes necessary to use digital technologies and media effectively in everyday situations, including in working, studying and participating in society(Department of Learning, 2015). The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines digital literacy as the ability to understand, use, evaluate and participate in the digital world, with an ethical awareness that promotes inclusive and sustainable digital citizenship(Law et al., 2018).

All of these definitions emphasize the importance of understanding, effective use and participation in a digital world that is increasingly integrated into everyday life. Digital literacy is becoming increasingly important in the current information era, where digital technology dominates many aspects of human life, including education, work, communication and daily activities.

Faculty Supervision

The definition of faculty supervision in university academic life refers to a set of practices and processes undertaken by academic leaders (such as deans or department heads) and faculty colleagues to monitor, support, and improve the performance and development of faculty members(Resources, 2023). Faculty supervision aims to ensure that university faculty are high performing, adhere to academic and ethical standards, and contribute positively to the institution's educational and research missions(Tidjani& Lailiyah, 2023).

The following are some of the main elements in the definition of faculty supervision at universities:

Faculty supervision involves monitoring faculty performance, including assessment of student learning outcomes, research, publications, teaching, and other contributions to the university's mission(Al-Jaro et al., 2020).In addition to supervision, supervision also includes support of the faculty member's professional development. This may include training, mentoring, and guidance to assist lecturers in developing their skills and competencies(Elianur, 2022).

Faculty performance evaluation processes, such as annual appraisals or peer reviews, are an integral part of faculty supervision. This evaluation can be used to determine promotions, salary increases, and other recognition(Enyindah Senior lecturer, 2021).When performance problems or ethical issues arise, faculty supervision also includes taking action to address those problems. This may involve providing feedback, improving performance, or disciplinary action if necessary.Faculty supervision must support the achievement of the university's mission, including educational, research, and community service goals. Lecturers are expected to contribute positively to achieving this goal.

The supervision process must be fair and transparent, and should involve lecturer participation. Lecturers must have a clear understanding of the evaluation process and opportunities to provide input.Faculty supervision also includes ensuring faculty compliance with academic ethical standards, such as integrity in research and teaching(Munna& Kalam, 2021).

In the university context, faculty supervision is an important tool for ensuring the quality of higher education and meaningful contributions to research and the academic community. It also plays a role in helping faculty continue to develop and improve their performance over time.

Hypothesis development

The hypotheses of this research are: (1) Is there an influence of data literacy on academic integrity?, (2) Is there an influence of data literacy on lecturer supervision? (3) Is there an influence of digital literacy on academic integrity? (4) Is there an influence of digital literacy on supervision? (5) Is there an influence of lecturer supervision on student academic integrity?

Method

ResearchDesign

The research design uses a quantitative approach to cross-sectional design. The main steps in this research are as follows:

Sample

The sample used in this study was 182 students who were taken randomly from two faculties in two university. Data was taken through a survey given to students.

Data Collecting

Research instruments were developed to measure data literacy, digital literacy, supervision, and student academic integrity (Pratama et al., 2020)(Monteiro & Leite, 2021)(Ramdani, 2018). Instrument link: https://forms.gle/1pY3imQpVahfzfZG7.

Data Analyzed

The data collected was analyzed using SEM. The results of this study can provide practical and theoretical implications for

universities and future research. By using SEM, this research can test the relationships between variables in more detail and consider the influence of mediating variables(Fan et al., 2016) such as supervision. This can help us to better understand the factors that influence student academic integrity, as well as provide useful information for improving student academic integrity in universities.

Result

The scope of the planning area refers to the Regional Regulation of West Java Province No. 12 of 2014, that what is meant by the Rancabuaya Growth Center Area consists of 5 (five) sub-districts namely Caringin District, Mekarmukti District, Cisewu District, and Bungbulang District in Garut Regency, and Cidaun District in Cianjur Regency. The Rancabuaya Growth Center area is part of the southern Garut Regency and the southern Cianjur Regency.

Data Description

Table 1. Description of Data Literacy

Score Interval			Category	Frequency	Percentage
32.6	-	35	Very high	8	4.40
30.1	-	32.5	High	2	1.10
27.6	-	30	Enough	21	11.54
25.1	-	27.5	Low	36	19.78
22.6	**-**	**25**	**Very Low**	**115**	**63.19**
		Sum		**182**	**100**

Table 1 shows that the data literacy of students who are respondents to this study is dominated by the very low category of 115 respondents (63.19%).

Table 2. Description of Digital Literacy

Score Interval			Category	Frequency	Percentage
25.6	-	30	Very high	26	14.29
21.1	-	25.5	High	72	39.56
16.6	**-**	**21**	**Enough**	**73**	**40.11**
12.1	-	16.5	Low	7	3.85
7.6	-	12	Very Low	4	2.20
Sum				**182**	**100**

Table 2 shows that the digital literacy of students who are respondents to this study is dominated by the moderate category, with 73 out of 182 respondents (40.11%)

Table 3. Description of Academic Integrity

Score Interval			Category	Frequency	Percentage
30	-	35	Very high	54	29.67
24.9	**-**	**29.9**	**High**	**91**	**50.00**
19.8	-	24.8	Enough	32	17.58

14.7	-	19.7	Low	5	2.75
9.6	-	14.6	Very Low	0	0.00
Sum				**182**	**100**

Table 3 shows that the academic integrity of the students who were respondents to this study was dominated by the high category of 91 out of 182 respondents (50%).

Table 4. Description of Lecturer Supervision

Score Interval			Category	Frequency	Percentage
16.8	**-**	**20**	**Very high**	**76**	**41.76**
13.5	-	16.7	High	46	25.27
10.2	-	13.4	Enough	49	26.92
6.9	-	10.1	Low	9	4.95
3.6	-	6.8	Very Low	2	1.10
Sum				**182**	**100**

Table 4 shows that the supervision of lecturers in writing scientific papers who were respondents to this study was dominated by the very high category of 76 out of 182 respondents (41.76%).

Measurement Model Analysis

The outer model of the measurement analysis assesses the construct variables, their validity, and reliability. To determine the consistency of results within a test, internal consistency analysis is employed. This analysis uses a composite reliability value, with a variable considered reliable if the value exceeds 0.600 (Sarstedt et al., 2020)(Budiastuti & Bandur, 2018).

Table 5. Internal Consistency Analysis

	Cronbach's Alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average Variance Extracted
Academic Integrity	0.794	0.799	0.867	0.621
Data Literacy	0.640	0.732	0.746	0.351
Digital Literacy	0.803	0.829	0.862	0.522
Supervision	0.818	0.826	0.865	0.479

According to the internal consistency analysis data provided in the table, the results indicate that the academic integrity variable is reliable with a composite reliability value of 0.867 > 0.700. Similarly, the digital literacy variable (0.746 > 0.700) and the supervision variable (0.865 > 0.700) are also found to be reliable. Therefore, the data suggests that these variables demonstrate reliability.

Table 6. Convergent Validity Stage 1

	Academic Integrity	Data L	Digital L	Supervision
X1.1		0.557		

$X1._2$		0.104		
$X1._3$		0.722		
$X1._4$		0.750		
$X1._5$		0.716		
$X1._6$		0.075		
$X1._7$		0.731		
$X2._1$			0.725	
$X2._2$			0.794	
$X2._3$			0.798	
$X2._4$			0.766	
$X2._5$			0.369	
$X2._6$			0.784	
$X3._1$				0.730
$X3._2$				0.671
$X3._3$				0.632
$X3._4$				0.588
$X3._5$				0.741
$X3._6$				0.771
$X3._7$				0.696
$Y1._1$	0.678			
$Y1._2$	0.801			
$Y1._3$	0.841			
$Y1._4$	0.822			

The table above reveals that the outer loading values for indicators $X_{1.1}$, $X_{1.2}$, $X_{1.6}$, $X_{2.5}$, $X_{3.2}$, $X_{3.3}$, $X_{3.4}$, and $Y_{1.1}$ are below 0.7, so the indicator is removed from the model and calculated in step 2.

After the second stage of the analysis, the loading values obtained for all indicators already have an outer loading value above 0.7 so a structural analysis model can be carried out.

Structural Model Analysis (Inner Model)

The inner model analysis, also known as structural model analysis, is conducted to test the research hypothesis. In this analysis, the coefficient of determination (R Square) is examined to test the hypothesis.

The collinearity test assesses the strength of the correlation between latent or construct variables. If a strong correlation is found, it indicates methodological issues in the model, which can affect the estimated statistical significance. This issue is referred to as collinearity. To analyze collinearity, the Variance Inflation Factor (VIF) value is considered (Purwanto & Sudargini, 2021). If the VIF value exceeds 5.00, it indicates the presence of a collinearity problem, whereas a VIF value below 5.00 suggests no collinearity problem(Sarstedt et al., 2022).

Table 7. Collinearity

Indicator		VIF	Indicator	VIF	Indicator	VIF	Indicator	VIF
$X_{1.1}$		1.270	$X_{2.1}$	1.528	$X_{3.1}$	1.692	$Y_{1.1}$	1.264
$X_{1.2}$		1.534	$X_{2.2}$	1.849	$X_{3.2}$	1.668	$Y_{1.2}$	1.856
$X_{1.3}$		1.514	$X_{2.3}$	1.898	$X_{3.3}$	1.482	$Y_{1.3}$	2.152
$X_{1.4}$		1.656	$X_{2.4}$	1.827	$X_{3.4}$	1.330	$Y_{1.4}$	1.721
$X_{1.5}$		1.581	$X_{2.5}$	1.118	$X_{3.5}$	1.816		
$X_{1.6}$		1.518	X2.6X2.6	1.866	$X_{3.6}$	1.808		
$X_{1.7}$		1.674			$X_{3.7}$	1.532		

From the above data, it can be described that all indicators have a VIF of less than 5. Thus, from the data above, the structural model, in this case, does not contain collinearity problems

Testing the Significance of the Structural Model Path Coefficient

The test comprises two stages: examining the hypothesis of direct effect and examining the hypothesis of indirect effect. The image below contains the path coefficients for hypothesis testing.

The purpose of conducting significance testing on the path coefficients of the structural model is to assess the significance of the relationships within the structural model. The objective is to test the significance of all relationships or hypotheses.

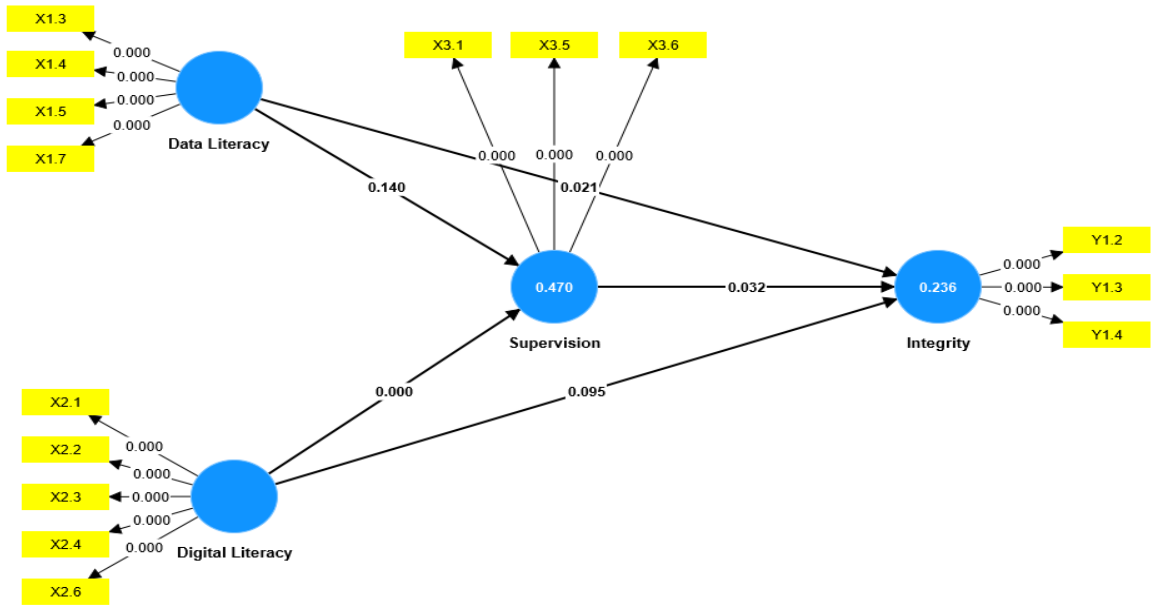

Figure 1. Hypothesis test

Direct Effect Testing

The objective of testing the direct effect hypothesis is to demonstrate the impact of a variable on other variables directly (Setyorini & Syahlani, 2019). A positive path coefficient value indicates that an increase in one variable corresponds to an increase in the other variable. Conversely, a negative path coefficient value suggests that an increase in one variable leads to a decrease in the value of the other variable.

If the probability value (p-value) is less than the significance level (Alpha) of 0.05, the null hypothesis (Ho) is rejected, indicating a significant influence of the variable on other variables. On the other hand, if the probability value (P-Value) is

greater than Alpha (0.05), the null hypothesis (Ho) is not rejected, implying that the effect of the variable on other variables is not significant. (Ni Luh Putu Suciptawati, 2016).

Table 8. Path Coefficient

Relationship between Variable	Original sample (O)	T statistics	P-values
Data Literacy -> Integrity	0.191	2.307	0.021
Data Literacy -> Supervision	0.114	1.477	0.140
Digital Literacy -> Integrity	0.170	1.671	0.095
Digital Literacy -> Supervision	0.610	8.212	0.000
Supervision -> Integrity	0.209	2.147	0.032

The direct impact of data literacy on integrity is represented by a path coefficient of 0.191, indicating that an increase in the data literacy variable leads to an increase in the integrity variable. The effect of data literacy on integrity is statistically significant with a p-value of 0.021, which is less than the significance level of 0.05. Hence, it can be inferred that data literacy has a notable impact on integrity.

Similarly, the direct impact of data literacy on supervision is demonstrated by a path coefficient of 0.114, suggesting that an increase in data literacy corresponds to an increase in supervision. However, the effect of data literacy on supervision is not statistically significant, as indicated by a p-value of 0.140, which is greater than the significance level of 0.05. Thus, it can be stated that data literacy does not have a significant effect on supervision.

The direct impact of digital literacy on integrity is represented by a path coefficient of 0.170, indicating that an increase in digital literacy corresponds to an increase in integrity. However, the effect of the digital literacy variable on integrity is not statistically significant, as indicated by a p-value of 0.095, which is greater than the significance level of 0.05. Thus, it can be stated that there is no significant effect of digital literacy on integrity.

On the other hand, the direct impact of digital literacy on supervision is demonstrated by a path coefficient of 0.610, suggesting that an increase in digital literacy leads to an increase in supervision. The impact of digital literacy on supervision is highly significant, as indicated by a p-value of 0.000, which is below the significance level of 0.05. Hence, it can be inferred that digital literacy has a substantial influence on supervision.Similarly, the direct effect of supervision on integrity is represented by a path coefficient of 0.209, indicating that an increase in supervision corresponds to an increase in integrity. The effect of supervision on integrity is statistically significant with a p-value of 0.032, which is less than the significance level of 0.05. Hence, it can be inferred that supervision has a significant effect on integrity.

Discussion

The influence of data literacy on student integrity

Data literacy can affect students' academic integrity. Data literacy is the ability to collect, understand and analyze data effectively. In an academic context, students who have a higher level of data literacy will be better able to evaluate the resources and information they use in their assignments and research(Hossain & Researcher, 2021). They will also be better able to gather accurate and reliable data to support their arguments.When students have good skills in data literacy, they are better able to understand and identify unethical academic practices such as plagiarism and data manipulation. Therefore, high data literacy can help encourage higher academic integrity. In the research conducted, data literacy has A significant positive effect on student academic integrity. This shows that increasing the level of data literacy in students can help improve their academic integrity.

Chemistry education has an important role in shaping scientific integrity `Therefore, the influence of data literacy on integrity can be seen from a chemistry education perspective, namely (1) Increasing understanding of the scientific method: Data literacy can help students understand how data is collected, analyzed, and used to develop scientific arguments(Gibson & Mourad, 2018). This can help students understand the scientific method and give them a solid foundation for conducting research. (2) Develop analytical skills: Data literacy can help students develop the analytical and critical skills needed to evaluate scientific arguments(Harahap et al., 2020). This can help students understand how

important accurate and reliable data is in making scientific decisions(Suban et al., 2021). (3) Improving academic integrity: Data literacy can help students understand the importance of academic integrity and how to report data properly(Anohina-Naumeca et al., 2020). This can help students to avoid plagiarism and mistakes in their research reports. (4) Strengthen critical thinking skills: Data literacy can help students to strengthen critical thinking skills so that they can make better decisions based on accurate and reliable data(Fitriani et al., 2020). It can also help students in understanding how important transparency is in scientific research. So the effect of data literacy on integrity from a chemistry education perspective can help students understand how data can be used to support scientific arguments, improve analytical and critical skills, strengthen critical thinking skills, and strengthen academic integrity. Therefore, data literacy should be an important part of the chemistry education curriculum to help students understand how important accurate and reliable data are in making scientific decisions(Jgunkola& Ogunkola, 2013).

The influence of digital literacy on student integrity

Digital literacy refers to the skill of utilizing information and communication technology proficiently and thoughtfully, which can also affect students' academic integrity(Razak et al., 2022).

In today's digital era, students often collect and use information from online sources such as databases, electronic journals, and websites. Therefore, students who have a good level of digital literacy will be better able to evaluate the reliability, authenticity, and credibility of the resources they use in their assignments and research.In addition, digital literacy can also assist students in maintaining their academic integrity by avoiding unethical behavior such as plagiarism and data manipulation(Blau& Eshet-Alkalai, 2017).

Students who are able to use software to manage data and write effectively, for example, will be better able to avoid plagiarism and ensure the integrity of their assignments and research. In the research conducted, digital literacy was also found to have a significant positive effect on students' academic integrity. Therefore, increasing digital literacy in students can help improve their academic integrity.

The results of this study indicate that digital literacy has no effect on students' academic integrity. Digital literacy refers to a person's ability to use digital technology to search, evaluate, process, and communicate information effectively and in a timely manner. This ability is important in facing A world that is increasingly dependent on digital technology. However, digital literacy does not directly affect one's integrity.

Integrity refers to being honest, fair, and impartial, and being consistent in one's actions and words. Academic integrity, in particular, refers to a person's ability to behave honestly and fairly in an academic context, such as in carrying out assignments, examinations, and theses. Academic integrity also includes adherence to established academic rules and standards(Tauginienė et al., 2019).

The influence of data literacy on lecturer supervision

The findings of the study indicate that there is no impact of student data literacy on lecturer supervision. Student data literacy and lecturer supervision are two different things but are interrelated in an academic context. Data literacy refers to a person's ability to access, understand, evaluate, and use the information contained in data. While lecturer supervision refers to the lecturer's role in ensuring that students study honestly and have good academic integrity(Patak et al., 2021). Even though good data literacy can help students understand the information needed in the learning process, data literacy itself does not directly affect the lecturer's supervision of students. Lecturer supervision has more to do with monitoring student performance and providing feedback to ensure students study well and honestly.

However, good data literacy can help students carry out their academic tasks more effectively, obtain accurate and relevant information, and prevent plagiarism or other academic fraud. Lecturers can also assist students in improving their data literacy through mentoring and feedback on their academic work. In this case, student data literacy and lecturer supervision are interrelated in an academic context, but data literacy itself does not directly affect lecturer supervision of students. However, students who have good data literacy can benefit from the learning process and improve their overall academic performance.

The influence of digital literacy on lecturer supervision

The results of this research show that digital literacy has a significant influence on lecturer supervision. This could be

caused by:

Students' digital literacy can influence how they access, process, and utilize digital resources in their learning. Students who have a high level of digital literacy may be better able to use digital tools and resources to support their learning(Bahri et al., 2022). In this context, lecturers can respond by providing learning materials that are more sophisticated, technology-based and more interactive.

Students who have good digital literacy may be more likely to engage in online courses, e-learning platforms, or distance learning. Lecturers who supervise students in this context must understand and support students' technology needs and ensure that online teaching runs well(Otto et al., 2023).

Students' ability to communicate and collaborate in a digital environment can also impact faculty supervision. Students who are skilled in using digital communication and online collaboration tools can participate more actively in class discussions, group projects, and interactions with lecturers. Lecturers may need to manage this communication and collaboration effectively(Haleem et al., 2022).

Digital literacy impacts students' ability to conduct online research, find digital resources, and evaluate the reliability of the information they find. In a supervisory role, lecturers can guide students in using digital resources effectively for their research(Farihin, 2022).Lecturers can also provide technology support to students with lower levels of digital literacy. This may involve providing guidance on the use of specific devices and software or helping students overcome technical problems they may experience in their learning.

Students with good digital literacy can contribute to learning innovation. They can propose or adopt new technologies that can improve their and their peers' learning experiences. Lecturers can take these ideas to improve their teaching methods(Chan et al., 2017).

In order to achieve effective lecturer supervision and quality teaching, it is important for lecturers to understand students' digital literacy levels and adapt their teaching and supervision approaches according to students' needs and abilities in the context of digital technology.

The influence of lecturer supervision on student integrity

The results of this study show that lecturer supervision has an effect on students' academic integrity. Lecturer supervision of students affects the academic integrity of students because lecturers act as supervisors and assessors in the learning and assessment process(Sariasih& Tisnawijaya, 2019). Lecturers have an important role in ensuring that students learn honestly and have good academic integrity. When a lecturer provides supervision, he can monitor and check student work regularly, and identify and prevent acts of plagiarism or other academic fraud. Lecturers can also provide feedback and guidance to students to ensure that their academic work reflects their abilities and knowledge.

In the supervision process, lecturers can also help students understand the values of academic integrity which are important in the learning process, such as honesty, responsibility, and openness(Almutairi, 2022). Lecturers can guide students to develop good academic and ethical skills so that they can learn the right way and have strong academic integrity. In this case, lecturer supervision has an important role in establishing and maintaining student academic integrity.

By ensuring that students learn the right way and have strong academic integrity, lecturers can help students to succeed in the academic and professional worlds.Some of the influences of lecturer supervision on student integrity from a chemistry education perspective are: (1) Lecturer supervision can help students understand ethical values in research and conducting experiments, such as integrity, honesty, and transparency(Artanti, 2013). This can help students to build strong ethical attitudes in their academic careers. (2) Lecturer supervision can strengthen students' awareness of the importance of integrity in all aspects of research and experiments that they carry out. By emphasizing the importance of integrity in supervision, students become more alert and careful at every stage of research. (3)Lecturer supervision can also help students understand what is needed to do good research and how to do research with ethics and integrity(Attribution-noncommercial-no, 2012). This can help students to develop the skills and knowledge necessary to conduct good research and contribute to a wider scientific field. (4) Lecturer supervision can also help students strengthen their analytical skills in understanding data and how data can be used to support their arguments(Fhonna, 2020).

This is important in developing critical analytical skills and building a strong foundation for conducting research. Thus,

lecturer supervision has a positive influence on the integrity of students in chemistry education. Supervision can shape ethical attitudes, strengthen awareness of integrity, encourage understanding of good research, and strengthen students' analytical skills. Therefore, good and structured lecturer supervision must be an important part of the chemistry education curriculum to help students understand how important integrity is in research and experimentation

Conclusion

This study resulted in the conclusions (1) There is a direct impact of data literacy on academic integrity, (2) Data literacy has no effect on lecturer supervision, (3) Digital literacy has no effect on academic integrity, (4) Digital literacy has an effect on supervision, and (5) Lecturer supervision has a direct influence on student academic integrity.

Based on the research results you have mentioned, we can identify several implications and future directions that may be relevant:

1) The first results show that data literacy has a direct influence on academic integrity. This highlights the importance of developing data literacy among students and educators. Colleges may consider providing specific courses or training in data literacy to help improve academic integrity.

2) The fifth result shows that lecturer supervision has a direct influence on student academic integrity. This shows that the role of lecturers in supervising and guiding students in academic assignments and projects is very important. More attention could be paid to developing lecturers' supervision and guidance skills.

3) Higher education institutions can consider integrating data literacy in their curriculum. This could include increasing data literacy content in existing courses or even developing a course specifically on data literacy. This can help students understand and apply data better in their academic work.

4) Further research can be conducted to better understand why digital literacy has no effect on academic integrity, while data literacy has a significant effect. This can reveal specific factors that influence academic integrity and help design more effective interventions.

5) Universities can provide additional training to lecturers to improve their ability to provide effective supervision to students. This may include developing communication skills, understanding academic integrity issues, and more effective methods of supervision.

6) Colleges may consider developing policies that promote academic integrity, including appropriate sanctions for academic integrity violations. This policy must be implemented consistently and supported by education on academic ethics.

Credit Statements

Theauthorconfirmssoleresponsibilityforthefollowing:studyconception and design, data collection, analysis and interpretation ofresults,andmanuscriptpreparation.

Declarationsofinterest

The author declared no potential conflicts of interest with respect totheresearch,authorship,and/orpublicationofthisarticle

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