The Mediating Role of Moral Self-Regulations between Automated Essay Scoring Adoption, Students' Character and Academic Integrity among Indonesian Higher Education Sector

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ARTICLE INFO	ABSTRACT
	Purpose: The primary objective of the current study is to determine how the utmost level of moral self-regulation influences and ensures academic integrity. The use of automated essay scoring techniques for exam evaluation is to prevent cheating. Assessing students' character developed throughout their careers is crucial in ensuring academic integrity. Academic and research dishonesty and lack of integrity have been reported in the Indonesian higher education sector; therefore, academic integrity must be addressed immediately. **Design/Methodology**: A questionnaire was utilized to obtain quantitative data for this study to assess the relationship between variables. The variables' measurement scales were adopted from previous research, and data were collected for analysis. The collected data was then analyzed using AMOS21, and the results were formulated.

Findings: The analysis results indicate that academic integrity is influenced by automated techniques and the students' character, developed throughout their entire educational career; therefore, higher education institutions should develop and implement programs that build character. The relationship between exogenous and endogenous constructs is mediated by moral self-regulation, which influences academic integrity. **Limitations of Research**: The research has numerous limitations. First, the study uses a cross-sectional design; future research should evaluate academic integrity using longitudinal analysis. The pre-and post-evaluation of such integrity and morality programs should be included.

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Introduction and Background

Students' educational performance is evaluated based on pertinent criteria involving humans, who play a crucial and significant role in assessment. Due to an increase in the number of students and the ratio between instructors and students, the current manual evaluation process has become irrelevant and convoluted. As it is presently implemented, the evaluation process is time-consuming and unreliable, among other issues. Existing tools, such as pen and paper, are progressively being replaced by online mechanisms due to their precision, speed, and efficiency. However, the current evaluation mechanism for online or computer-based exams only supports the multiple-choice format, and there is no suitable system for evaluating extended essays or short answers (Ramesh & Sanampudi, 2022). Due to the forced transition to online education necessitated by the covid19 pandemic, the online evaluation method had to be implemented to the circumstances. The entire education sector, from elementary schools to universities, was required to adopt the new education process online and the appropriate assessment method, which was one of the most difficult obstacles to overcome, given that existing online evaluation was limited to objective-based multiple-choice questions.

The situation between December 2019 and December 2022 necessitated the modernization of computer-based examinations and automated evaluation processes in the education domain, which involve natural language processing and machine learning techniques. Unresolved was the problem of evaluating brief and long essays written by students in an emerging situation by employing the appropriate tools or languages. Students' responses to the same essay question vary has been identified as a problem, and a system must be capable of evaluating disparate reactions to the same question. Ajay, Tillet, and Page (1973) introduced Automated Essay Scoring (AES), a computer-based evaluation system that assesses Grammarly, diction, construction, and sentence clarity. Later, Shermis et al. (2001) coined PEG (Project Essay Grader) with grammar checks and correlations between humans and systems. Foltz, Laham, and Landauer (1999) developed the Intelligent Essay Assessor (IEA) 1999, which could evaluate the content using semantic analysis to produce an overall score. Later, the AES system was developed using deep processing and learning techniques and syntactic and semantic features for better results (Dong, Zhang, & Yang, 2017; Marbun et al., 2020; Susilawati et al., 2022).

Adopting such automated assessment tools has always been a challenge for educational institutions; however, the computerized assessment is expected to maintain a consistent score for essays while achieving cost and time savings comparable to those of a human assessor. Utilization and comprehension of textual characteristics and cognitive skills, as well as assessment of written understanding using computer-based assessment tools, can provide numerous advantages to the educational community. The research on computer-based assessment tools will allow educational institutions to employ such tools with increased reading, writing, and communication capacities. The most effective and efficient technologies are for providing limitless electronic information, including search engines and a question-and-answer session system. Prior research has examined the characteristics of numerous systems, such as Project Essay Grade, Intelligent Essay assessor, Educational Testing Services, Electronic Essay Rater, C-Rater, BETSY, Intelligent Essay Marketing System, SEAR, Paperless School free text Marketing Engine, and Automark (Valenti,

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Neri, & Cucchiarelli, 2003). These systems are commercially available for research purposes, and various researchers have touted their valuable features.

Prior research has examined the various assessment tools, including AES, and articulated the six dimensions of the dataset, NLP techniques, model construction, grading models, evaluation, and model effectiveness. However, the researchers have omitted the methods for extracting features, and the pertinent challenges, but machine learning has been discussed in depth. According to Burrows, Gurevych, and Stein (2015), comparative analyses of AES systems based on feature extraction, model construction, level of relevance, cohesion, and coherence are lacking. Ke et al. report that comparative research on AES systems has not yet been conducted due to the lack of research on these systems, which encompassed only a few challenges. Amar and Pratama (2020); Hussein, Hassan, and Nassef (2019); Susilawati et al. (2022); Utami et al. (2019) have explained two categories of AES systems, including handcrafted features, neural network approach, and a few challenges, but have not covered extraction feature techniques and performance perspectives of AES model in detail. Prior research has included a detailed assessment of AES systems with categories and extracted essays, but not a comparative analysis and a discussion of the challenges to be overcome (Atrizka et al., 2020; Klebanov & Madnani, 2020; Pratama, Adam, & Kamardin, 2019).

Even though businesses of varying sizes encountered difficulties during the pandemic in continuing their operations, few took advantage of the opportunities to conduct their activities online. The food and beverage industry was severely impacted by the pandemic as a result of the general public's increased risk of consuming ready-to-eat products and food items to maintain their health and pay their domestic expenses (Sumarni, Melinda, & Komalasari, 2020). The restriction of social distancing in every sector and field compelled the organization to follow the instructions of governments and the health sector to protect the people, which resulted in the closure of businesses and educational institutes. However, companies strived and developed ways to conduct their business activities online whenever possible, and the education sector adopted various technologically advanced applications and platforms to achieve their educational activities. The situation compelled businesses and educational institutions to implement online platforms for their operations. Companies have incorporated digital marketing, web and online media promotion, and online transactions to adapt to the changing environment (Sumarni et al., 2020). Electronic marketing and commerce emerged during the pandemic due to their viability and acceptability. Subsequently, numerous businesses employed e-services permanently due to their long-term cost-cutting and efficiency advantages. By utilizing e-services, companies reaped innumerable benefits, including cost reduction, a reduction in the time required to complete a transaction, a reduction in expenses, the attraction of more customers, an increase in productivity, and a reduction in overall operational costs, all while ensuring greater customer satisfaction. However, developing nations were sluggish to adopt and implement technological solutions based on electronic services.

The pandemic compelled business owners to switch from traditional to digital marketing, promotion, and subsequent transactions through social media, as the number of social media subscribers has exploded in recent years. There have been reports of several obstacles, the perception of benefits of using technological advancements that the latest technology applications have the potential to bring a variety of benefits, the use of

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electronic means encourages the e-commerce platforms for time-saving, energy consumptions, and resource conservation, and online selling of goods and services to meet the needs of the current generation. It has been reported that several micro, small, and medium-sized businesses do not use the internet for their operations due to limited resources or a lack of internet access, as well as their myopic view of conducting business online to harvest the industry electronically (Ausat & Suherlan, 2021). As a result of a lack of security or trust online, various companies are hesitant to conduct online transactions, which is regarded as one of the primary reasons why people fear adopting online transactions (Ashari, 2018). Age of firms, firm experience, perceived usefulness, purchasing trends, firm preferences, human resource competency, innovation, economic growth, human resource capacity, lack of digital competitiveness, lack of investment, and adoption of electronic services for business activities. According to the world economies survey, Indonesia is ranked 59th out of 63 countries with a score of 44.225. However, Ukraine, Mongolia, Peru, and Venezuela outperformed Indonesia. According to the world competitiveness center, this is due to Indonesia's low digital competitiveness scores, low talent ranking, and failure to invest in developing human resources and technological advancements.

Due to the absence of physical presence, the role of a student's character in exam grading is crucial. The word character is defined in Greek as 'Charassein,' which means it develops with time, as a person's personality is not formed at birth. A lengthy procedure, process, and education are required to shape the personality and character. Character comprises an individual's positive personal habits, attitude, and morality; these aspects of personality play an essential role in shaping character, and education shapes students' character (Marini et al., 2020). Temperance, courage, sagacity, and justice are regarded as essential components of character, and researchers have also described the character as tenacity, fortitude, justice, responsibilities, respect, and honesty. The individual's personality in literary works, integrity, and socially positive or negative behavior define the individual's character. The student's character is exemplified by the following standards, principles, and values: regard for others, dependability, action, bravery, and honesty. There is a need to determine a person's character based on their competencies, positive attitude, behavior, and integrity in various situations (Suhardi, Komariah, & Kurniady, 2020).

Academic integrity is a crucial component of student character because it is the foundation of university education. The university's culture and reputation influence the shaping of a student's personality; therefore, academic integrity depends on the university's reputation and the students' personalities. Researchers have emphasized that learning culture plays a significant role in fostering students' character development. Students' sense of responsibility, respect, perspective, trustworthiness, and sincerity are evaluated to determine their integrity. Since a few years ago, academic dishonesty has recurred frequently among students, and research scholars have emphasized the importance of investigating the phenomenon. According to reports, there is an urgent need to research academic dishonesty among students and faculty because decision-makers must create a framework for addressing the issue of students' character to increase intellectual honesty. Digital technologies can potentially increase efficacy, improve the learning environment, and play a significant role in learning assessment and educational institutions. Consequently, the learning

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environment may be enhanced by the use of digital technologies (Shute & Rahimi, 2017). The feedback assessment automation ensures that the related firms, educational institutions, and stakeholders receive and present the information promptly for effective decision-making. Adoption and implementation of digital technologies in the higher education sector serve primarily to evaluate the higher education industry and students' performance, as well as their skills and work. Digital technologies allow for the efficient and effective evaluation of pupils in a shorter period and be more efficient and effective (Blundell, 2021).

Academic integrity is expected among university students and can be instilled through educational efforts; it is viewed as a symbol of academics' moral code or ethical policy; it also considers the value of honesty by avoiding cheating or plagiarism; and the maintenance of academic standards, the required discipline in academics plays an important role and encourages publication (Stephens, 2019). Academic integrity is essential for educational quality and the dependability of student achievement (Nesterova et al., 2019). Negative behaviors affecting academic performance have been identified and reported, including morale, disengagement, and deception. According to Krou et al. (2019), 49.1% of students in Indonesia were caught plagiarizing their research papers, and more than 50% of students were caught falsifying.

According to Winardi and Anggraeni (2017), 77.5 percent of accounting students in Indonesia engaged in deception and dishonesty in their educational pursuits. Multiple forgeries involving manipulation of student identification and attendance have occurred in Indonesian universities, indicating polarized work at the doctoral level involving graduates with official status. There have been multiple reports of academic dishonesty in Indonesian universities, with instructors and high-ranking officials submitting plagiarized research papers (Kurniawati, 2017). The Indonesian Ministry of Higher Education was concerned about academic misconduct in universities and research. The higher officials attempted to prevent and mitigate plagiarism by implementing various policies and checks; however, academic dishonesty and fraud-related issues and problems persist. To ensure academic integrity, the multiple universities of Indonesia have developed regulations regarding creating a code of conduct for students. It is widely acknowledged that academic dishonesty in the higher education sector of Indonesia is a severe problem that requires serious work to eradicate (Macfarlane, Zhang, & Pun, 2014). Various factors, including moral reasoning, judgment, cultural consequences, and goal orientation, can influence academic integrity (Sideridis & Stamovlasis, 2014).

This researcher intends to determine academic integrity because there is an urgent need to assess academic integrity in the Indonesian higher education sector. The researchers also included the adoption of automated essay scoring, as it is an emerging facility provided for educational purposes to improve performance. Consequently, the researcher intends to establish the connection between AES and academic integrity. To explain the relationship between students' character and intellectual integrity, the current research underemphasizes the essential aspect of students' personalities. This study also evaluates the mediation effect of moral-self regulations (MSR). It has been argued that MSR enables individuals to develop the courage to avoid dishonesty, character depravity, and lack of academic integrity.

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Literature Review

This study section explains the relationship between AES and academic integrity, students' character and intellectual integrity, AES and MSR, and students' character and MES between MSR and academic integrity.

Automated Essay Scoring, Moral Self-Regulation, and Academic Integrity

AES (Automated Essay Scoring) is a computer-based assessment system that enables educational institutions to evaluate student essays promptly using the most recent technological tools. It began in 1966 with the Essay Grader Project by Ajay et al. (1973). The PEG was equipped with grammar check, dictation, and sentence construction features for essay grading. The revised and improved version of PEG was developed with a focus on grammar checks and the correlation between human resource evaluators and the system. The Intelligent Essay Assessor (IEA) was designed to evaluate essay content using semantic analysis to generate an overall score. Also proposed were the E-rater, Intelli-metric, and Essay Test Scoring systems, which were based on natural language processing (NLP) techniques and focused on style and content to determine the essay score. The essay scoring systems adhered to traditional pattern matching and statistical analysis methods. Later, deep learning with syntactic and semantic features for the AES system proved superior (Dong et al., 2017).

The dependability and accuracy of various automated systems, including AES, for evaluating writing content have been investigated. It has been established that there is a significant correlation between human rates and the AES system, despite the absence of human intervention during the examination. The AES has attracted the interest of educators, academics, businesses, and higher education institutions despite the possibility of deception and other shortcomings (Klebanov & Madnani, 2022). In academics, a student's or individual's character is based on sincerity, integrity, values, norms, and justice, and fundamental qualities such as courage, respect, trust, fairness, honesty, and accountability are demonstrated. Integrity and honesty play a crucial role in the long-term success of pupils, as technology has altered the behaviors and personalities of young people and children. Students' careers and decisions are influenced by their character, and a lack of knowledge or awareness does not justify academic dishonesty or violations of academic integrity. Various studies have evaluated the impact of technologies, the utilization of tools, methodologies, and strategies on the quality of education and student character formation by assuring academic integrity. It has been suggested that online education should be emphasized using technological instruments to enhance academic integrity and shape character development (Rogerson, 2022).

The previous literature has stated the role of automated system in academic performance and integrity, the research has been conducted on the analysis and comparison of features of different automated scoring systems (Valenti et al., 2003), the systematic literature review has been conducted on the automated essay scoring (Ramesh & Sanampudi, 2022), another study conducted on online education services during covid19 and force shift was observed that explained the obstacles and issues related to implementation of latest technological-based tools for conducting online education activities (Ausat & Suherlan, 2021), another study conducted on the Indonesian school

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students to improve the writing skills through visuals and utilization (Sudarmaji, Mulyana, & Karsiyah, 2020), automated essay scoring system is explained and discussed in terms of its features and useability (Ifenthaler, 2022), another study has been conducted on the digitalization of business activities among Indonesian SMEs to improve the service quality (Djakasaputra et al., 2021), the quality of exams and education has been under focused in terms of its quality and assessment of essay through semantic textual similarity among Indonesian education sector (Nugroho, Hidayah, & Kusumawardani, 2022). However, no study has been conducted on the relationship between adopting AES and academic integrity. Therefore, this study aims to determine the relationship between AES and academic integrity in the Indonesian education sector to suggest policies to shape the students' character and ensure the integrity of education to improve the performance and quality of education.

Students' Character, Moral Self-Regulations, and Academic Integrity

This survey section describes students' academic integrity and character in the Indonesian education sector. Education influences the character of students (Marini et al., 2020). Character is defined as a person's positive habits and level of morality, as morality plays an essential role in forming character. The prior literature has also described tenacity, justice, forbearance, responsibilities, honesty, and respect. Literature has effectively conveyed the phenomenon of character, also referred to as a person's personality, integrity, and character, considered a person's act, behavior, and sentiments that influence decision-making. According to scholars, a person's character is determined by their behaviors' positive and negative patterns. A student's character is based on standards, principles, and values such as respect for others, action, fortitude, honesty, and dependability. Considered and required to determine a person's character based on their response to a given situation, the character is conveyed in terms of behavior, positive attitude, integrity, and competencies (Suhardi et al., 2020).

The character of a student is dependent on the education and training provided by educational institutions; therefore, improper and inappropriate education cannot foster character development. The educational institution plays a significant role in forming habits and molding behavior influenced by daily activities. In a nutshell, educational institutions play an important role in molding the character of students, as the literature defines the function of education in character development as preparing them to be productive members of society (AchmadKurniady & Rosalin, 2021). Effective teaching and learning can ensure Students' character development if they engage in moral behavior related to their beliefs and fundamental attitudes. According to Edwita et al. (2019), elementary school instructors are significantly more effective at character development and shaping positive student behavior. Through effective teaching and learning, students' positive character is fostered, as character development programs play a significant role in molding their positive behavior. Positive behavior and personality are influenced by additional factors, such as the teaching and learning process, the school's culture, extracurricular activities, community involvement, and character-building programs (Marini et al., 2020).

Prior studies conducted in religious schools in Indonesia to evaluate character development concluded that elementary and religious school instructors are more effective

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in shaping behavior and character development. Character education ensures religion, discipline, leadership, tolerance, cooperation, respect, cleanliness, courtesy, perseverance, neatness, responsibilities, justice, creativity, nationalism, diversity, and achievement rewards. The prior study also conducted a mediation analysis of student character between digital assessment, veracity, and academic performance; consequently, the results demonstrated a significant relationship and effect of student character (Susilawati et al., 2022). Educationist researchers and strategy developers have emphasized and concentrated on identifying student characteristics that influence academic performance and increase sector competition. According to decision-makers and experts who have examined the correlation between academic performance and character, character plays a role in academic performance. Academic integrity is an important factor and component of a person's character. Students' behavior and personality are shaped by what they learn on campus, and the university's reputation is linked to academic performance and integrity. It is considered an influential factor in overall performance. Educational institutions endeavor to cultivate the ideal culture for molding students' behavior and character development. To shape the students' character, respect, trustworthiness, sincerity, responsibility, and honesty are encouraged to be ingrained in them. Academic dishonesty is a concern for students in the higher education sector; therefore, the decision-makers in the higher education sector devise training and awareness programs for character development and to increase academic honesty. Digitalization has been implemented to ensure appropriate monitoring and control, promoting academic integrity and performance (Shute & Rahimi, 2017).

The preceding discussion demonstrated that students' character affects their academic performance; similarly, the researcher contends that the character of research affects academic integrity and moral self-regulation.

Moral self-regulations and Academic Integrity

This section describes the relationship between moral self-regulation and academic integrity among higher education students in Indonesia. Students in higher education are expected to maintain academic integrity, as character development occurs in all levels of education, from elementary institutions to colleges and universities. Academic integrity is viewed as the symbol of a moral code and ethical policy related to honesty, upholding academic standards, avoiding deception and plagiarism, discipline, and thoroughness in academic research and publication (Nesterova et al., 2019; Stephens, 2019). The researchers have accentuated the significance of academic integrity as it is regarded as the symbol of morality and ethical perspective for enhancing the educational quality and dependability of student accomplishments. Academic integrity has been linked to avoiding academic violations and four indicators, including honesty on tests, honesty in completing tasks, independence, and opposition to academic deception. Academic integrity is the commitment to bringing responsibility and courage to realize values in challenging circumstances (Bretag, 2016).

The literature demonstrates the significance of moral self-regulation in influencing the integrity concern of individuals working or studying in educational institutions. According to reports, goal orientation affects self-regulation; therefore, moral self-regulation is related to and influences potential outcomes such as performance or integrity. The previous

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research has demonstrated a stronger relationship between moral self-regulation, goal orientation, and integrity. In the current situation of the higher education sector of Indonesia, where academic dishonesty and lack of integrity remain a problem, there is a paucity of literature on the relationship between moral self-regulation and academic integrity; therefore, it is crucial to investigate the phenomenon of self-regulations and integrity (Suralaga et al., 2021). Therefore, this study aims to establish the connection between moral self-regulation and academic integrity.

Mediating Role of Moral Self-regulation

This study aims to introduce moral self-regulation as a mediator between AES, students' character, and academic integrity. This study argues that moral self-regulation mediates the relationship between exogenous and endogenous constructs.

The previous literature has incorporated the student character between the digital assessment method, truthfulness, and academic performance. The current study reported that digital assessment has a positive relationship with student character, as well as statistically significant results between digital assessment method and student character, as well as a positive influence of student character on employee performance. Researchers have identified sincerity, values, norms, justice, and integrity as the foundation of student character; academic integrity exemplifies the fundamental characteristics of valor, respect, honesty, trust, fairness, and accountability. These values play a significant role in developing students' character, impacting their long-term success. Character tends to influence career development decisions that contribute to the success of an organization. It has been stated that a lack of intent and knowledge is not an acceptable reason for an integrity violation; therefore, this study focused on the modern technologies and strategies for online education that contribute to the development of students' character. Academic institutions must provide the appropriate technological apparatus and online courses for character development and organizational goal achievement (Rogerson, 2022).

A student's academic integrity is determined by evaluating their assignments, which entails that the work submitted by students must be unique, of high quality, and original, and to prevent students from taking advantage of unfair means that contravene academic integrity. The student may violate academic integrity through illegal online courses or systems, misbehavior, conspiracy and falsification, cheating, plagiarism, bribery, misrepresentation, and duplication. Social media has enabled students to share information, most commonly study materials and exam answers. This indicates that their attitude toward deception or the use of unfair means has become more negative, but computerized systems can mitigate this and ensure proper behavior. The absence of effective surveillance and control results in systemic flaws that negatively impact students' character (Sabrina et al., 2022). It has been emphasized that there is an urgent need to develop a strong student character that will result in self-realization to maintain academic integrity and prevent academic dishonesty. Previously, the study has been conducted on encouraging student character development influenced by truthfulness and digital technology-based assessment to achieve academic performance. The study reported that digital technology-based assessment and truthfulness encourage student character development, affecting academic performance.

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The digital era and the emergence of IR 4.0 have altered business practices to improve quality and sales performance; digital marketing influences service quality and sales growth, and the study argues that digital marketing affects service quality and sales performance. The quality of services tends to mediate the relationship between digital marketing and sales growth. The study asserted and demonstrated this (Djakasaputra et al., 2021). The digital era and digital marketing influence quality and sales performance. The role of moral self-regulation as a mediator between enigma goal orientation, performance goal orientation, and academic integrity has been the subject of a second study. The study demonstrated that mystery goal orientation and performance goal orientation influence moral self-regulation, which affects academic integrity. Furthermore, moral self-regulation influences mystery and performance goal orientation, and moral self-regulation significantly mediates the relationship between study variables (Suralaga et al., 2021).

Similarly, the present study argues that moral self-regulation mediates the relationship between AES, student character, and academic integration, i.e., self-regulations influenced by student character and AES impact academic integration.

Hypothesized relationships

H1: *Moral self-regulations influence the academic integrity among students of the Indonesian higher education sector*
H2: *Automated Essay Scoring assessment influence Moral self-regulation among students of Indonesian higher education*
H3: *Student Character influence Moral Self-regulation among student of Indonesian Higher education*
H4: *Moral self-regulations mediate the relationship between AES assessment and academic integrity among the students of the higher education sector of Pakistan*
H5: *Moral self-regulations mediate the relationship between students' character and academic integrity among the students of the higher education sector of Pakistan*
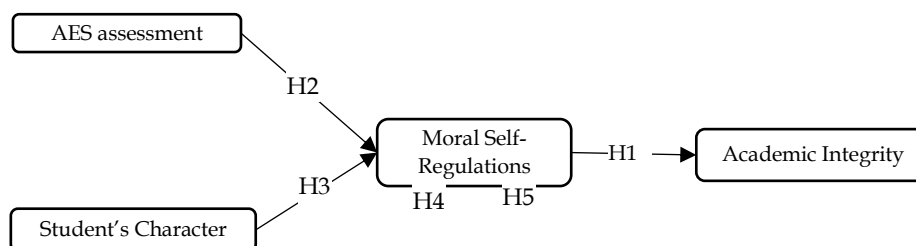
Research Framework

Figure 1. *Research Frame work*

Figure 1 depicts the hypothesized relationships between variables; hypothesis H1 depicts the relationship between moral self-regulation and academic integrity; hypothesis H2 depicts the relationship between AES assessment and moral self-regulation; hypothesis H3 depicts the relationship between students' character and moral self-regulation; and hypotheses H4 and H5 depict the mediating relationship between students' character and moral self-regulation.

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Research Methodology

This quantitative study utilizes cross-sectional methodology to assess the relationships and generalize the results. This study aims to acquire data from respondents to assess the influence of digital assessment tools on academic integrity, student character, and moral self-regulation. Individual units of analysis of Indonesian educational institutions were polled to collect data. Adopted from previous studies, questionnaires were distributed to participants using a straightforward random sampling technique, and data were collected from 200 participants. The questionnaires were disseminated to 450 faculty members, and 61% of them provided complete responses.

Measurement scale

This study adopted measurement scales from previous research; the seven-item AES assessment measurement scale was taken from Susilawati et al. (2022). The seven-item academic integrity measurement scale was incorporated from the study of Suralaga et al. (2021). The five-item scale of student character was adapted from Susilawati et al. (2022) research. The five-item moral self-regulation scale is incorporated from the study by Suralaga et al. (2021).

Data Analysis

The collected data was analyzed through AMOS and examined the validity and reliability. Further, the hypotheses testing was conducted through AMOS.

Confirmatory factor analysis

The CFA determines the consistency of the measurement scales for all constructs. Unlike factor analysis, which permits all loading to be arbitrarily varied, the CFA allows factor loading to be set to zero. AMOS 21 was used to test the model's goodness of fit to explain academic integrity. This study yields a high significance level ($X2$ = 658.849; degree of freedom = 629; probability level = 0.198), and distributional assumptions are met, so the model is accurate. The results indicate that model data is significant at the p>0.05 level. Chi-square divided by the degree of freedom is used to evaluate the CMIN/DF, while the CMIN/DF is the minimal sample discrepancy divided by the degree of freedom. This model yields $X2$ = 658.849 and DF = 629; therefore, CMIN/DF (658.849/629) = 1.047 (p>0.05), indicating an acceptable value (Cheung & Rensvold, 2002).

Table 1

Results for Model Fit Indices

Model Fit Indices	Values	Suggested Guidelines
X^2/df	1.047	Less than 3.0
CFI	0.991	Equals/be greater than 0.9
IFI	0.991	Equals/be greater than 0.9
GFI	0.883	Close to 1.0
AGFI	0.863	Close to 1.0
RMSEA	0.014	0.5 or below/Good Fit, below 0.08/Fair Fit

Model fit table: source (Arbuckle, 2006)

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Traditionally, the incremental Fit Index (IFI) value must remain greater than or equal to 0.9 for the model to be accepted. The IFI of this model was determined to be 0.991; the minimum CFI value required for model evaluation is 0.9. The Goodness Fit Index (GFI) was 0.833, and the Adjusted Goodness of Fit Index (AGFI) was 0.863, which indicates a moderate model fit and demonstrates a perfect fit (Thompson, 2000). RMSEA, meanwhile, is derived from the non-centrality parameter and provided for fit index precision within the construction of confidence intervals. The suggested value is 0.05 or less, which indicates a decent fit; below 0.08 means a fair fit. With an RMSEA of 0.014, the current analysis suggests a good fit. The values for model fit are presented in Table 1.

Figure 2 below presents the graphical representation of model fit. The figure is extracted from the output of AMOS21. The diagram entails the variables with the output path.
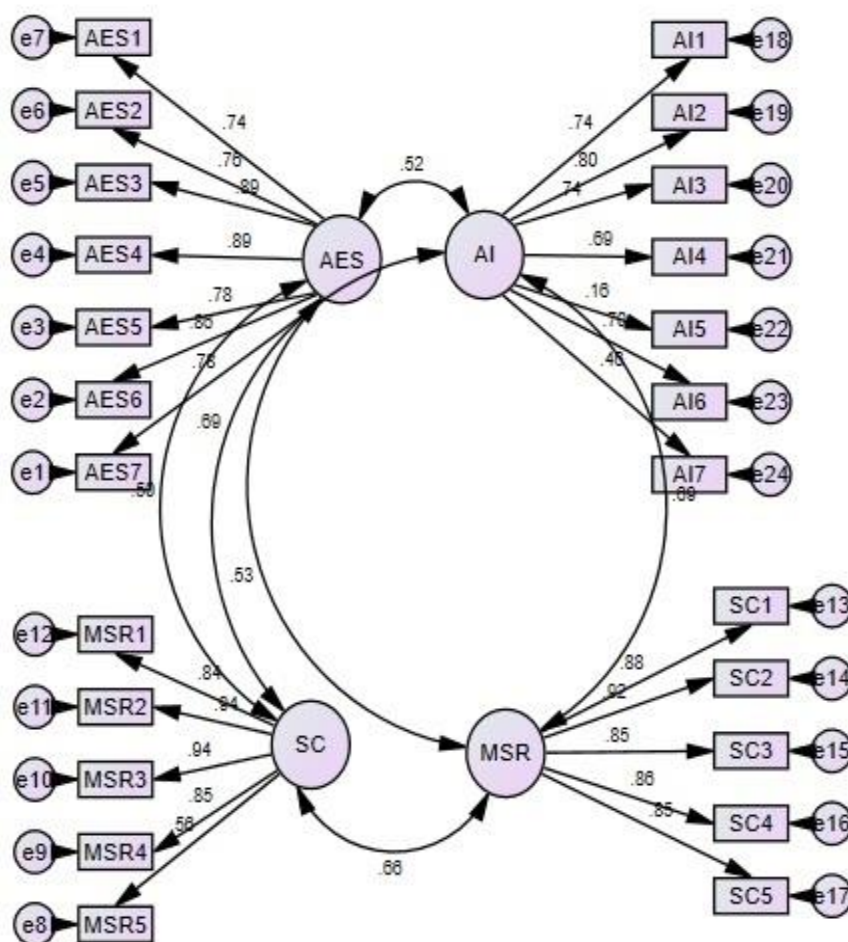

Figure 2. *Output path diagram*

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Table 2 demonstrates the values of factor loading and squared multiple correlations of the model

Table 2

Factor loading and Multiple Squared Multiple Correlation

Factors	Items	Standardized loading	Sq. Multiple Correlation R2
Academic Integrity	Item 1	0.771	0.594
	Item 2	0.789	0.581
	Item 3	0.767	0.541
	Item 4	0.747	0.592
	Item 5	0.753	0.601
	Item 6	0.837	0.552
	Item 7	0.813	0.581
Moral Self-Regulation	Item 1	0.738	0.503
	Item 2	0.671	0.435
	Item 3	0.701	0.427
	Item 4	0.753	0.448
	Item 5	0.672	0.577
Automated Essay Scoring Assessment	Item 1	0.654	0.517
	Item 2	0.712	0.545
	Item 3	0.761	0.603
	Item 4	0.719	0.456
	Item 5	0.791	0.567
	Item 6	0.878	0.454
	Item 7	0.777	0.411
Students' character	Item 1	0.711	0.666
	Item 2	0.793	0.452
	Item 3	0.761	0.503
	Item 4	0.701	0.444
	Item 5	0.713	0.491

Convergent and Discriminant Validity

Construct validity is determined by convergent and discriminant validity, with convergent validity demonstrated when each measurement item "correlates strongly with its assumed theoretical constructs" and discriminant validity demonstrated when each measurement item correlates (Gefen & Straub, 2005). Convergent validity can be evaluated using the Average Variance Extracted, which represents the amount of variance captured by the latent variable from its indicator relative to the amount due to measurement error. The discriminant validity can be evaluated by taking the square root of the AVE for a given construct, and the resulting value should be greater than the correlation between the construct and other variables. The discriminant validity is met according to the criteria of Fornell and Larcker (1981) because the square root of the AVE appears on the diagonal with the correlations between constructs in Table 3. All values on the diagonal exceed the correlation between constructs.

Table 3

Convergent and Discriminant Validity

	CR	AVE	AES	MSR	AI	SC
AES	0.832	0.501	**0.708**			
MSR	0.781	0.592	0.512	**0.769**		
AI	0.792	0.573	0.652	0.511	**0.757**	
SC	0.803	0.504	0.321	0.412	0.611	**0.711**

Note: Diagonal values in the table show the square root of AVE

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Structural Equation Modeling and Hypotheses Testing

This section assesses the relationship between variables and tests the hypothesized relationships. This study has three direct and 2 mediating hypotheses to assess between the variables, as depicted in Figure 1 of the research framework.

Hypothesis H1: *Moral Self-Regulation and Academic Integrity*
Regression analysis shows a significant relationship between moral self-regulation and academic integrity. The result shows that (β = 0.490) and (p-value<0.01) show the significance of the relationship.

Hypothesis H2: *AES and Moral Self-Regulations*
The regression analysis results found a significant relationship between variables, meaning the automated essay scoring assessment and willingness to utilize AES significant to moral self-regulation that leads to academic integrity. The results are (β = 0.265) and (p-value<0.01), which shows the significance of the relationship.

Hypothesis H3: *Students' Character and Moral Self-Regulations*
The regression analysis results reported a significant relationship between students' character and moral self-regulation. The results of the regression show that (β = 0.290) and (p-value<0.01) show the significance of the relationship.

Hypothesis *H4: Moral self-regulations mediate the relationship between AES assessment and Academic Integrity*
This relationship hypothesis assesses the mediating role of MSR between AES assessment and academic integrity. The result of regression analysis shows that (β = 0.132) and (p-value<0.05), hence the significance that MSR plays a significant mediation role between exogenous and endogenous variables.

Hypothesis H5: *Moral self-regulations mediate the relationship between Student's Character and Academic integrity*

This relationship hypothesis assesses the mediating role of MSR between students' character and academic integrity. The result of regression analysis shows that (β = 0.122) and (p-value<0.05), hence the significance that MSR plays a significant mediation role between exogenous and endogenous variables.

Table 4 presents the results of the hypotheses:

Table 4

Hypotheses Results

Hypotheses	Relationships	Estimate	SE.	CR.	P	Results
H1	MSR→AI	0.490	0.666	7.465	***	Supported
H2	AES→MSR	0.265	0.521	0.614	***	Supported
H3	SC→MSR	0.290	0.691	0.603	***	Supported
	Mediating Effect					
H4	AES→MSR→AI	0.132	0.621	0.701	***	Supported
H5	SC→MSR→AI	0.122	0.691	0.712	***	Supported

The results of the direct and indirect hypothesized relationships are presented in the table above. According to the study's findings, the assessment influences academic integrity through AES, the students' character, and their concern for moral self-regulation. The AES has a substantial effect on moral self-regulation. The students' character influences moral self-regulation, moral self-regulation influences academic integrity, and moral self-

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regulation mediates the relationship between the exogenous and endogenous constructs of the study.

Previous studies have discussed the characteristics of the AES, its influence on students' character, and the role of moral self-regulation in achieving academic integrity. The Indonesian education sector has been confronted with issues related to students' character, the adoption of automated essay assessment tools, and the morality of self-regulation has been called into question. The presence of the highest level of students' character ensures moral self-regulation while adopting technological tools for exam assessment ensures honesty and combats moral corruption and dishonesty; thus, the greater the use of AES, the greater the influence of moral self-regulation that leads to academic integrity.

Conclusion

This research investigates the crucial phenomenon of academic integrity in the Indonesian higher education sector, which has been criticized for lacking academic and research integrity. The study adopted and utilized automated essay assessment tools and techniques to avoid favoritism or dishonesty. It has been documented that the utilization of technological tools and techniques reduces the occurrence of negative behavior and ensures effective activity control. Moreover, the students' character plays an important role in their entire academic careers and the educational system, and it develops throughout their academic careers. Therefore, the students' character is one of the most significant factors that affect and influence the academic integrity. Morality is a significant and crucial factor in explaining academic integrity; consequently, moral self-regulation was discovered to be an effective mediator between exogenous and endogenous constructs, implying that moral self-regulation plays an important role in ensuring academic integrity. According to the study, academic integrity is influenced by AES, students' character, and moral self-regulation; therefore, the current research suggests ensuring the use of automated exams assessment techniques, building the character of students, and developing a higher level of moral self-regulation to ensure academic integrity in the higher education sector.

References

AchmadKurniady, D., & Rosalin, E. (2021). Strengthening Student Character Based on Sufism Values: An Insight into Ethical Leadership Practices *Turkish Journal of Computer and Mathematics Education, 12*(6), 3115-3123. https://turcomat.org/index.php/turkbilmat/article/view/7090

Ajay, H. B., Tillet, P., & Page, E. B. (1973). *Analysis of essays by computer (AEC-II).* Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education, National Center for Educational Research and Development.

Amar, S., & Pratama, I. (2020). Exploring the link between income inequality, poverty reduction and economic growth: An ASEAN perspective *International Journal of Innovation, Creativity and Change, 11*(2), 24-41. https://repo.uum.edu.my/id/eprint/27745

Arbuckle, J. (2006). *Amos 7.0 user's guide.* Amos Development Corporation: Spring House. PA. https://www.hsc.edu.kw/student/app_manuals/SPSS/Amos%207.0%20User's%20Guide.pdf

Ashari, R. A. (2018). *Analisis Faktor-Faktor Penggunaan E-Commerce Bagi Usaha Mikro Kecil Menengah Pada Pengusaha Perak Di Kotagede Yogyakarta.* (Undergraduate Thesis). Universitas Islam Indonesia. https://dspace.uii.ac.id/handle/123456789/8316

Evi Susilawati - Hasrita Lubis - Sapta Kesuma - Khalik Pratama - Imamul Khaira / Eurasian Journal of Educational Research 102 (2022) 54-71

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Atrizka, D., Lubis, H., Simanjuntak, C. W., & Pratama, I. (2020). Ensuring Better Affective Commitment and Organizational Citizenship Behavior through Talent Management and Psychological Contract Fulfillment: An Empirical Study of Indonesia Pharmaceutical Sector *Systematic Reviews in Pharmacy, 11*(1), 545-553. https://doi.org/10.5530/srp.2020.1.68

Ausat, A. M. A., & Suherlan, S. (2021). Obstacles and solutions of MSMEs in electronic commerce during covid-19 pandemic: evidence from Indonesia. *BASKARA: Journal of Business and Entrepreneurship, 4*(1), 11-19. https://doi.org/10.54268/baskara.4.1.11-19

Blundell, C. N. (2021). Teacher use of digital technologies for school-based assessment: a scoping review. *Assessment in Education: Principles, Policy & Practice, 28*(3), 279-300. https://doi.org/10.1080/0969594X.2021.1929828

Bretag, T. (2016). *Handbook of academic integrity.* Springer. https://doi.org/10.1007/978-981-287-098-8

Burrows, S., Gurevych, I., & Stein, B. (2015). The Eras and Trends of Automatic Short Answer Grading. *International Journal of Artificial Intelligence in Education, 25*(1), 60-117. https://doi.org/10.1007/s40593-014-0026-8

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating Goodness-of-Fit Indexes for Testing Measurement Invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(2), 233-255. https://doi.org/10.1207/S15328007SEM0902_5

Djakasaputra, A., Wijaya, O., Utama, A., Yohana, C., Romadhoni, B., & Fahlevi, M. (2021). Empirical study of Indonesian SMEs sales performance in digital era: The role of quality service and digital marketing. *International Journal of Data and Network Science 5*(3), 303-310. http://doi.org/10.5267/j.ijdns.2021.6.003

Dong, F., Zhang, Y., & Yang, J. (2017). Attention-based recurrent convolutional neural network for automatic essay scoring. In *Proceedings of the 21st Conference on Computational Natural Language Learning (CoNLL 2017)* (pp. 153–162). Association for Computational Linguistics. http://dx.doi.org/10.18653/v1/K17-1017

Edwita, D. S., Nuraini, S., Rihatno, T., Sudrajat, A., & Arita Marini, A. (2019). Six years old elementary school student character enhancement through implementation of character building based on stop motion animation. *International Journal of Advanced Science and Technology, 29*(8), 103-109. http://sipeg.unj.ac.id/repository/upload/jurnal/SIX_YEARS_OLD.pdf

Foltz, P. W., Laham, D., & Landauer, T. K. (1999). The intelligent essay assessor: Applications to educational technology. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning, 1*(2), 939-944. http://imej.wfu.edu/articles/1999/2/04/index.asp

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.1177/002224378101800104

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems, 16*(1), 91-109. https://doi.org/10.17705/1CAIS.01605

Hussein, M. A., Hassan, H., & Nassef, M. (2019). Automated language essay scoring systems: a literature review. *PeerJ. Computer science, 5*, e208. https://doi.org/10.7717/peerj-cs.208

Ifenthaler, D. (2022). Automated Essay Scoring Systems. In *Handbook of Open, Distance and Digital Education* (pp. 1-15). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-0351-9_59-1

Ke, Z., Inamdar, H., Lin, H., & Ng, V. (2019). Give me more feedback II: Annotating thesis strength and related attributes in student essays. In *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics* (pp. 3994-4004). Association for Computational Linguistics. http://doi.org/10.18653/v1/P19-1390

Evi Susilawati - Hasrita Lubis - Sapta Kesuma - Khalik Pratama - Imamul Khaira / Eurasian Journal of Educational Research 102 (2022) 54-71

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Klebanov, B. B., & Madnani, N. (2020). Automated Evaluation of Writing – 50 Years and Counting. In *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics* (pp. 7796-7810). Association for Computational Linguistics. http://dx.doi.org/10.18653/v1/2020.acl-main.697

Klebanov, B. B., & Madnani, N. (2022). Automated Scoring of Content. In *Automated Essay Scoring* (pp. 181-187). Springer International Publishing. https://doi.org/10.1007/978-3-031-02182-4_10

Krou, M. R., Acee, T. W., Pino, N. W., & Hoff, M. A. (2019). Rationalizing the Decision to Cheat: An Empirical Analysis to Determine Whether Social Rational Orientation Can Predict Academic Dishonesty. *Journal of College and Character, 20*(1), 9-24. https://doi.org/10.1080/2194587X.2018.1559196

Kurniawati, E. (2017). *Program pascasarjana bermasalah, UNJ rencanakan pembenahan*. Diakses.

Macfarlane, B., Zhang, J., & Pun, A. (2014). Academic integrity: a review of the literature. *Studies in Higher Education, 39*(2), 339-358. https://doi.org/10.1080/03075079.2012.709495

Marbun, D. S., Effendi, S., Lubis, H. Z., & Pratama, I. (2020). Role of education management to expediate supply chain management: a case of Indonesian Higher Educational Institutions. *International Journal of Supply Chain Management (IJSCM), 9*(1), 89-96. https://core.ac.uk/download/pdf/288291266.pdf

Marini, A., Safitri, D., Nuraini, S., Rihatno, T., Satibi, O., Wahyudi, A., & Jakarta, U. N. (2020). Applying model of mobile web based on character building in teaching learning process to improve student character. *International Journal of Advanced Science and Technology, 29*(6), 1121-1124. http://sipeg.unj.ac.id/repository/upload/jurnal/11737-Article_Text-17561-1-10-20200426.pdf

Nesterova, O., Nakaznyi, M., Berdnyk, L., Sorokina, N., Cherkashchenko, O., & Medvedovskaya, T. (2019). Responsibility Development as Academic Integrity Tool for Translation and Public Administration Students. *Cypriot Journal of Educational Sciences, 14*(3), 436-444. https://elibrary.ru/item.asp?id=43219437

Nugroho, A. H., Hidayah, I., & Kusumawardani, S. S. (2022). Transformer Model Fine-Tuning for Indonesian Automated Essay Scoring with Semantic Textual Similarity. In *2022 5th International Seminar on Research of Information Technology and Intelligent Systems (ISRITI)* (pp. 118-124). IEEE. https://doi.org/10.1109/ISRITI56927.2022.10052865

Pratama, I., Adam, N. C., & Kamardin, H. (2019). Corporate social responsibility disclosure (CSRD) quality in Indonesian public listed companies. *Polish Journal of Management Studies, 20*(1), 359-371. https://doi.org/10.17512/pjms.2019.20.1.31

Ramesh, D., & Sanampudi, S. K. (2022). An automated essay scoring systems: a systematic literature review. *Artificial Intelligence Review, 55*(3), 2495-2527. https://doi.org/10.1007/s10462-021-10068-2

Rogerson, A. M. (2022). Technology-based assessment and academic integrity: building capacity in academic staff. In *Handbook of Digital Higher Education* (pp. 299-309). Edward Elgar Publishing. https://doi.org/10.4337/9781800888494.00035

Sabrina, F., Azad, S., Sohail, S., & Thakur, S. (2022). Ensuring academic integrity in online assessments: a literature review and recommendations. *International Journal of Information and Education Technology, 12*(1), 60-70. https://doi.org/10.18178/ijiet.2022.12.1.1587

Shermis, M. D., Mzumara, H. R., Olson, J., & Harrington, S. (2001). On-line grading of student essays: PEG goes on the World Wide Web. *Assessment & Evaluation in Higher Education, 26*(3), 247-259. https://doi.org/10.1080/02602930120052404

Shute, V. J., & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning, 33*(1), 1-19. https://doi.org/10.1111/jcal.12172

Evi Susilawati - Hasrita Lubis - Sapta Kesuma - Khalik Pratama - Imamul Khaira / Eurasian
Journal of Educational Research 102 (2022) 54-71

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Sideridis, G. D., & Stamovlasis, D. (2014). The Role of Goal Orientations in Explaining Academic Cheating in Students With Learning Disabilities: An Application of the Cusp Catastrophe. *Ethics & Behavior, 24*(6), 444-466. https://doi.org/10.1080/10508422.2013.877393

Stephens, J. M. (2019). *Academic integrity: values, skills and action*. Auckland, New Zealand: The University of Auckland.

Sudarmaji, I, Mulyana, A., & Karsiyah, K. (2020). Applying digital storytelling to improve indonesian high school students' visual memory and writing skill *English Review: Journal of English Education, 8*(2), 255-264. https://doi.org/10.25134/erjee.v8i2.2987

Suhardi, D., Komariah, A., & Kurniady, D. A. (2020). State defense awareness program and strengthening of student character. *International Journal of Advanced Science and Technology, 29*(5s), 726-734. http://sersc.org/journals/index.php/IJAST/article/view/7745

Sumarni, T., Melinda, L. D., & Komalasari, R. (2020). Media sosial dan e-commerce sebagai solusi tantangan pemasaran pada masa pandemi covid-19 (Studi kasus: UMKM Warung Salapan) *ATRABIS: Jurnal Administrasi Bisnis (e-Journal), 6*(2), 163-171. https://doi.org/10.38204/atrabis.v6i2.489

Suralaga, F., Azkiyah, S. N., Dhowi, B., Nisa, Y. F., & Rahmawati, Y. (2021). The role of moral self-regulation in mediating the effect of goal orientation on academic integrity. *Cypriot Journal of Educational Science, 16*(2), 902-915. https://doi.org/10.18844/cjes.v16i2.5720

Susilawati, E., Lubis, H., Kesuma, S., & Pratama, I. (2022). Antecedents of Student Character in Higher Education: The role of the Automated Short Essay Scoring (ASES) digital technology-based assessment model. *Eurasian Journal of Educational Research, 98*(98), 203-220. https://ejer.com.tr/manuscript/index.php/journal/article/view/708

Utami, C. W., Sumaji, Y. M. P., Susanto, H., Septina, F., & Pratama, I. (2019). Effect of Supply Chain Management Practices on Financial and Economic Sustainable Performance of Indonesian SMEs. *International Journal of Supply Chain Management (IJSCM), 8*(1), 523-535. https://dspace.uc.ac.id/handle/123456789/2112

Valenti, S., Neri, F., & Cucchiarelli, A. (2003). An Overview of Current Research on Automated Essay Grading. *Journal of Information Technology Education: Research, 2*(1), 319-330. https://www.learntechlib.org/p/111481

Winardi, R. D., & Anggraeni, M. A. (2017). Academic dishonesty among accounting students: Some Indonesian evidence. *Jurnal Akuntansi Dan Keuangan Indonesia, 14*(2). https://doi.org/10.21002/jaki.2017.08