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Influence of Student Interaction on Academic Performance Online Learning Student Mediated by Student Satisfaction and Moderated by Student Engagement

I Kadek Dwi Nuryana[1*], Purwanto Purwanto[2], R. Rizal Isnanto3

[1]Doctorate Program of Information System School of Postgraduate Studies, Universitas Diponegoro Semarang, Indonesia*

Information System Program Faculty of Engineering, Universitas Negeri Surabaya, Indonesia

[2]Doctorate Program of Information System School of Postgraduate Studies, Universitas Diponegoro Semarang, Indonesia

Department of Chemical Engineering Faculty of Engineering, Universitas Diponegoro Semarang, Indonesia

[3]Department of Computer Engineering, Universitas Diponegoro Semarang, Indonesia

Abstract:- The aims of this research is to measure the influence of student interaction on academic performance mediated by student satisfaction and moderated by student engagement. This Quantitative research involving 200 respondents. All responders are 2023/2024 engineering students from Surabaya State of University. This study collected data using questionnaires. SmartPLS version 3.3 examined the research data utilizing SEM PLS analysis. According to this study, we conclouded that Student interaction have positive effect on academic perfomance, students who interact well during online learning tend to have good academic performance, while students who interact less in online learning tend not to achieve good academic performance.The next analysis result show that student engagement moderated the influence of student interaction on academic performance, student engagement strength the influence of student interaction on academic performance, Students who have good interactions during online learning and have high engagement with lectures tend to have high academic performance compared to students who interact well during online lectures but are less connected to the courses they are taking. The next analysisis show that stident satisfaction medating the indirect effect student interaction on academic performance, directly, student interaction can indeed influence academic performance, but if it is mediated by student satisfaction, the influence of student interaction on academic performance is greater, meaning that student interaction that can increase student satisfaction has a higher effect of increasing academic performance than student interaction that only running well without creating satisfaction in students.

Keyword : Student Interaction, Student Engagement, Student Satisfaction, Academic Performance

1. Introduction

Online learning is currently widely carried out in higher education, this is a new innovation in the world of education which really supports the continuity of the learning process even though lecturers and students cannot meet directly in learning classes for certain reasons. [1]. Online learning is convenient, promotes student participation and caters students' needs. Meanwhile, this also discovered lack of interaction among students, unclear assessment strategy, lack of precise feedback and support from lecturers, and lack of interest in learning [2]. Online learning is an innovation in learning mode brought by the inevitability of information and communication technology. Online learning is argued to have positively affected students' autonomy, motivation, and collaboration skills while providing flexible learning for the students. The abundance of online sources, tools, and networking enables students to navigate their learning. [3] on this research imply that teachers, educators, and students should embrace online learning and its supporting applications to improve learning processes and student

academic performance. The present study contributes to the limited literature on a general overview of online learning benefits seen from the students' side.

Even though online learning provides many benefits, in practice lecturers and students face many obstacles during the implementation of online learning. One of the main problems is the low level of student interaction both with lecturers, interaction with other students and student interaction with the content discussed in online learning [4] . Online learning can be carried out well and produce good outcomes if students can interact well during online learning [5]. Teachers and universities must be able to develop strategies so that students can interact well during online learning [6]. Teacher–student interaction directly affects students' learning effects [7]. In this research, student interaction encompasses three types of interaction: instructor-student, student-content, and student-student [8], [9]. The first type of interaction is interaction between the student and the content or subject of study. This is a defining characteristic of education. Without it there cannot be education, since it is the process of intellectually interacting with content that results in changes in the student's understanding, the student's perspective, or the cognitive structures of the student's mind [9]. The second type of interaction-regarded as essential by many educators, and as highly desirable by many students-is interaction between the student and the expert who prepared the subject material, or some other expert acting as instructor. In this interaction, distance instructors attempt to achieve aims held in common with all other educators. First having planned or been given a curriculum, a program of content to be taught, they seek to stimulate or at least maintain the student's interest in what is to be taught, to motivate the student to learn, to enhance and maintain the student's interest, including self-direction and self-motivation. Then instructors make presentations-or cause them to be made. These may be presentations of information, demonstrations of skill, or modelling of certain attitudes and values. Next instructors try to organize students' application of what is being learned, either the practice of skills that have been demonstrated, or manipulation of information and ideas that have been presented. Instructors organize evaluation to ascertain if students are making progress, and to help decide whether to change strategies. Finally, instructors provide counsel, support, and encouragement to each student, though the extent and nature of this support varies according to educational level of the students, the teacher's personality and philosophy, and other factors [9]. The next type is interaction between student and student, this type is a new dimension of distance education, that will be a challenge to our thinking and practice in the 1990s. This is inter-student interaction, between one student and other students, alone or in group settings, with or without the real-time presence of an instructor. Through the history of education the class or educational group has more often than not been organized for reasons that have nothing to do with students' needs. At present many classes are organized because the class is the only organizational form known to most teachers and because in the short term-though not usually the long term-it is the cheapest way of delivering the teaching acts of stimulation, presentation, application, evaluation, and student support. However, student-student interaction among members of a class or other group is sometimes an extremely valuable resource for learning, and is sometimes even essential.

Student interaction is one of the success factors of online learning. Students who can interact well during online learning tend to have their needs met when studying, so their satisfaction with lecturers, group friends and the material discussed during learning tends to be high, this indicates that the better students can interact during online learning, the higher their satisfaction with the implementation of learning. Students' interactions (student-student, student-teacher, and student-content) had positive effects on students' satisfaction and perceived progress in an online class and that satisfaction significantly played a mediating role in the relationship between interactions and perceived progress. Student–teacher interaction had the highest loading on interactions which in turn had a strong positive effect on both students' satisfaction and perceived progress [10]. Teacher – student interaction on online leraning had a positive effect on student satisfaction, therefore, under the condition of limited equal resources, online teachers may give priority to the teacher-student interaction factors that have the greatest impact on the satisfaction of international students, carefully design teacher-student interaction activities, and maximise the satisfaction of international students [11]. Instructors of online learning must create an online classroom environment conducive to improving online students' satisfaction, interaction, internet self-efficacy and self-regulated learning, because good interaction between lacturers and the student will improove th student satisfaction [12]. The relationship between student interaction and student satisfaction has also been studied by

previous researchers as in the research results [13], [14], [15], [16], In this research, it is stated that the better student interaction in online learning has an influence on student satisfaction with the implementation of learning. Student satisfaction and academic performnace have positive relationship [17]. High student satisfaction with the implementation of learning can influence their academic performance, students who are satisfied with the implementation of learning tend to achieve high academic performance, conversely student dissatisfaction with the implementation of learning can hinder achieving good academic performance [18], [19], [20], [21]. Based on this description, we can see a relationship between student interaction, student satisfaction and academic performance. So There is a suspicion that online learning outcomes can be achieved from good student interaction and student satisfaction with the implementation of online learning. Therefore, this research will examine the influence of student interaction on academic performance with student satisfaction as a mediator.

Surabaya State University is one of the state universities in Indonesia that carries out a lot of online learning. This is because one of the principles at the university is that even though face-to-face learning cannot be carried out, learning must still take place even if it is done online. One of the courses that most often implements online learning is the digital literacy course, with a study group of 10 groups with each group consisting of 40 students, so each lecture must be carried out face to face, on the other hand, digital literacy It is also a course that prioritizes students' ability to carry out digital literacy obtained online, so that the implementation of online learning is also expected to hone students' ability to receive material online. The problem is, currently the majority of students at Surabaya State University at undergraduate level belong to generation Z, where this generation has its own specificities in behavior related to digital. Learning problems in generation Z are more complex than learning in subsequent generations, especially in terms of student engagement. In several studies, the phenomenon has been found that Gen Z tends to have low student engagement, especially for material that they find boring, while material that is often seen on social media is felt to be more interesting and easy for Generation Z students to understand [22]. Research conducted by [23] also shows that fostering engagement in a traditional setting with Generation Z learners was difficult enough; to do so online, while most educators are battling with technology, poses an even harder challenge amid the pandemic. In an unconventional assignment, students were asked to create an Internet meme to explain any immunology class themes. [24] stated that Collaborative learning is found to be an effective method in enhancing learning among Gen Z engineering students, with a positive correlation between collaborative learning and student performance and the assessment parameters of the presentation indicate that the participating students actively, where this collaborative learning involves a lot interaction between students and teachers, fellow students and content, therefore in this research, student engagement will be tested for its role as a moderating influence of student interaction on academic performance. Therefore, this research will examine the influence of student interaction on academic performance mediated by student satisfaction and moderated by student engagement..

2. Objectives

Student Interaction

There have been many research on interaction in online learning environments in promoting learning [9], [25]. In line with developments in technology and the internet, a lot of our daily routines involve online interactions. In education, interaction is essential. Previous research had shown that students' interaction with instructors and peers could improve learning [26],[27],[28]. The more the students interact the more it could contribute to learning. In an online learning environment, students' learning process could be triggered through sharing perspectives and information, seeking feedback and clarifying ideas through interaction with instructor and peers [28]. Students and instructors today can take the advantage of continuous connectivity to the internet as a medium for interactivity as well as maintaining their engagement to the learning environment. [29] suggested that the interaction in an online learning environment must be structured and systematic in order to achieve defined learning outcomes. Students' learning are not necessarily measured based on their number of interactions only. They added that interaction for learning in online environment must go beyond simple exchange of information by including various combinations of interaction. The work is in line with [29] where it was argued that interaction by itself is not a guarantee that students are engaged cognitively in the learning through online environments.

However, [28]did mention that interaction is a crucial variable in online learning. In addition, by providing the students with proper structure and guidance through interaction, they will be able to maintain engagement and be responsible for their learning. Furthermore, the students themselves need to engage themselves with the discussions, reflecting and construct meaning to produce understanding, which can be achieve in online learning through interactions. Active interactions will allow the construction of new ideas and concepts thus enabling learning to occur [28]. Student interaction encompasses three types of interaction: instructor-student, student-content, and student-student [8], [9], so in this research, measurement of student interaction in based on three dimension, dimensions interaction between student and their lecturers, interaction between student and their friend and interaction between student and content.

Academic Performance

Many of the universities there do not provide their students with the information-seeking capabilities and reliable sources of information they need to effectively use digital information to improve their learning experiences. Access to international academic databases and reliable sources of scholarly information is still perceived as a luxury in several universities in developing countries. In this study, we refer to such universities as “marginal” because this phenomenon poses a social identity threat to students from universities in developing countries. It undermines the legitimacy of the university and the academic competency of the students. Academic performance of a student can be measured using various variables [30].

Academic performance include the performance of students in standardized tests, their grades and GPA in university courses, the rate of graduation, the rate of class participation, entrance tests of colleges, the overall class performance of students, blogging, reading, writing, communication skills, and patterns of grades received in different courses . Additionally, demographic, family, and student-specific factors such as parent education, family support, socio-economic characteristics, student habits, health issues, well-defined academic goals, student focus, and self-confidence levels also play a significant role in measuring academic success . Data mining software and predictive methods like linear regression, machine learning techniques, deep learning techniques, Artificial Neural Networks, and Convolutional Neural Networks are used to predict student performance and improve decision-making in educational settings. There are three indicator to measure academic performance, first indikactor is about how student perform better in courses where they relied more on digital information resources; the next indicator is about perception of student about their academic performance which increased since they started using information obtained digitally and the last indicator is how they think about their performance in school will improve if they use digitally-obtained information to learn [31].

Student Satisfaction

Student satisfaction is a complex construct. Some factors that have the potential to infuence student satisfaction in online learning environments identifed in the literature are active and authentic learning, autonomy, computer and internet self-efcacy, course design, community, fexibility, instructional materials, instructor behaviors, interaction, outcomes, platform interface, technology reliability, self-efcacy, social and technical ability or preparedness, student factors, support services, presence, and usefulness [32], [33], [34]. Online student satisfaction has been studied by a larger number of researchers between the years 2010 and 2019. [35] examined key factors for determining student satisfaction in online courses, and investigated student satisfaction in undergraduate and doctoral courses. Similarly, [36] investigated instructor and student attitudes toward distance learning whereas [32] examined instructor-learner interaction in online courses. Some researchers focused on developing a scale for measuring online student satisfaction. [34]focused on the development of an online course satisfaction scale and [37]developed an evaluation of the web-based e-learning system based on learner satisfaction. [38] examined constructs of student-centered online learning on learning satisfaction. Other researchers have studied satisfaction as an important variable when investigating the efectiveness of online education. [39] examined students’ perceived satisfaction, behavioral intention, and efectiveness of e-learning. [40] studied Interaction, Internet self-efcacy, and self-regulated learning as predictors of student satisfaction in online education courses. Researchers have also worked on building frameworks and models to study online

student satisfaction. [41] focused on building a social and motivational framework for understanding satisfaction in online learning. [42] proposed a distance education student satisfaction model.

Student Engagement

Student engagement has been defined as students willingness, need, desire, and compulsion to participate in, and be successful in, the learning process [43] . Course delivery in online classes requires pedagogical strategies that will create as many learning and engagement opportunities as possible. Looking beyond cognitive skills learned or mastered, engagement focuses on individuals' dispositions or attitudes about classroom experiences and life-long learning [44]. Student engagement has also been described as the level of interest demonstrated by students, how they interact with others in the course, and their motivation to learn about the topics [45]. There are several affective factors related to student engagement which include attitude, personality, motivation, effort, and self-confidence [44]. By evaluating the level of student engagement and considering these affective aspects, instructors can more effectively plan lessons and activities that will encourage students to be more active participants in their learning and coursework [44]. When students are motivated to do well in their courses, involved or invested in their desire to learn, and willing to exert the effort expected by their instructors, they are more likely to be engaged in their education [44]. Course engagement extends beyond the traditional ways of measuring instructional effectiveness include student mastery of course learning objectives, retention, and students perceptions of satisfaction, whereas consideration of the impact of instructional activities on student engagement provides a more complete picture of the teaching-learning dynamic [44]. Measuring levels of student engagement allows instructors to adapt their instructional practices in response to changes in students' motivation, involvement, and attitude about their course and educational pursuits [44]. In online learning environments there are many tools available for instructors to gather informal data about student participation in the course. Instructors can review log-in data, number of minutes online, views of learning modules or course content, and self-reported information from students by using surveys, reflections, discussions, and other formative tools. It is important to assess the level of academic challenge of each course based upon the effort exerted, time invested, opportunities for interaction with faculty and other students, active and collaborative learning, and enriching educational experiences for students. This can be achieved by surveying students informally or formally and analyzing the results in order to improve instructional practices for future students. [45] developed an assessment of student engagement that investigates four types of engagement: skills, emotional, participation/ interaction, and performance. The Student Course Engagement Questionnaire (SCEQ) includes items for each of the four kinds of engagement and provides self-reported results that extend what can be observed in classroom interactions [46]. In reviewing both informal and formal assessments of student engagement faculty are able to more effectively evaluate student perceptions of their engagement and course effectiveness that "support and sustain learning across courses, programs, and beyond the collegiate experience [44] .

Relationship between Student Interaction, Student Satisfaction, Student Engagement and Academic Performance

Academic performance is one of the outcomes of the learning process. Previous research has proven that the success of learning is determined by the interaction between students and their teachers and the social interaction of students with their peers, while in the current era, in online learning, student interaction with content is also a measure of whether student interaction is good or bad in online learning [47], [48], [49], [50], [51]. Meanwhile, in several previous studies it has also been proven that academic performance in online learning is also determined by student satisfaction with the implementation of learning, students who are satisfied with the learning process tend to achieve high academic performance [17], [18], [19], [20], [21], [52]. On the other hand, currently online learning encounters many obstacles, especially for students in generation Z, where engagement is an important problem in the learning process. Based on previous research findings, students with low engagement tend not to be interested in studying teaching materials well so their academic performance is low. Based on this description, the hypothesis in this research is:

H1 Students interaction directly effect on academic performance

H2 Student instruction indirectly effect on academic performance, mediated by student satisfaction

H3 Student engagement strength the influence of student interaction on academic performance

3. Methods

The population in this study were all 2023/2024 engineering students from Surabaya State of University, wich totaling 400 student consitt of 10 stucy group or in Indonesia we call it rombel. Using the Slovin formula at a significance level of 5%, minimum sample of this research was 200 respondents. However, during the data collection process, 250 questionnaires were successfully collected, by filtering the questionaire, the number of research samples is 200 respondents. This study's respondents were male students (84%), all student take digital literacy course on their study.

$$n = N/(1 + (e\text{^}2.N)) = 400/(1 + (e\text{^}2.400)) = 200 \quad (1)$$

The research questionnaire consists of two parts. The first part contains questions related to the demographics of the respondents, such as gender, age and domicile, while the second part contains questions related to the respondents' perceptions of the research variables. This research instrument adopted from previouse research. Table 1 Show the reference of each instrument.

Table 1. Reference of The Research Instruments

Variable	Number of Item	Reference
SI (Student Interaction)	15	[53]
SS (Student Satisfaction)	5	[53]
SE (Student Engagement)	17	[54]
AP (Academic Performance)	3	[31]

Instrumen of Student interaction adopted from [53], its consist of 15 item, 5 item in from dimension student-instructur interaction, 5 item from dimension student-student interaction and 5 item from dimension student - content interaction. Student satisafction consist of 5 item, adopted from [53]. Student engagement have 17 item, adopted from [54]. Then, academic performance consist of 3 item questions adopted from [31]. All instruments utilize the Likert scale, with 1 = Strongly Disagree, 2 = Strongly Agree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Before the questionnaire was used, expert judgment was conducted on four experts. The results of the approved questionnaire were then tested on 30 students. The results of filling out the questionnaire were then tested using the Corrected Item Total Correlation validity test, and a reliability test was carried out using the Aplha Cronbachs reliability test. The results of the validity and reliability tests show that all instruments are valid and can be used as research instruments. The data collection results in this study had a response rate of 95%, which means that this survey is included in the good survey category, so there is no need to add samples again. The research data were analyzed using the SPSS and SmartPLS programs. SPSS is used to test the validity and reliability of the instrument, description the characteristics of the respondents and used to calculate the average score of the respondents' answers to see how far the respondents' perceptions of the research variables are, while SmartPLS is used to measure the relationship between research variable and used for hypothesis testing in this research. The research design model framework can be seen in Figure 1.

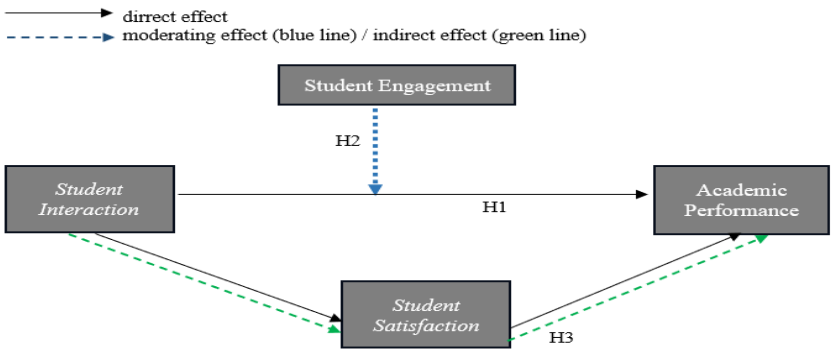

Figure 1: Research design model framework

Results

Demographics

This research involved 200 respondents who were all students of the Faculty of Engineering at the University of Surabaya (UNESA) for the 2023/2024 academic year. This study's respondents were male students (94%). All of them were students taking digital literacy courses.

Reliability and Validity Instrument Test

The results of the validity test in Table 2 show that all items are valid, indicated by the value of r count > r table (n = 30), and all reliable instruments are indicated by alpha cronbachs > 0.7. The employability skill instrument has a Cronbachs alpha value of 0.971, the soft skill instrument has a Cronbachs alpha of 0.948, the hard skill has a Cronbachs alpha of 0.965 and work readiness instrument has a Cronbachs alpha of 0.933.

Table 2: Item reliability and validity: corrected item – total correlation and alpha crombachs

Variable	Number of Item Valid	Result Validity Test	Result of Reliability Test
SI	15	r statistics : 0,543 - 0,890	Cronbachs Alpha 0,946 > 0,7
SS	3	r statistics : 0,402 - 0,791	Cronbachs Alpha 0,793 > 0,7
SE	17	r statistics : 0,625 - 0,955	Cronbachs Alpha 0,970 > 0,7
AP	5	r statistics : 0,706 - 0,944	Cronbachs Alpha 0,934 > 0,7
Note: validity test based on corrected item – total correlation, r table 0.361 (n = 30; sig. level 5%); reliability test based on cronbachs alpha value (cut value 0.7). SI = Student Interaction, SE = Student Engagement, SS = Student Satisfaction, AP = Academic Performance)			

PLS SEM on Hypothesis Testing
There are two stpes on PLS-SEM analysis technique, outer model test and inner model test. Outer model test will eavluate the validity and reliability of all indicator on each construct, then inner model test will measure the relationship between two or more construct on SEM PLS model. Outer model step on reflective indicator consist of convergent validity, descriminant validity and reliability, then inner model test consist of goodness of fit model test, direct and indirect effect test, moderation effect test and measure the determination coeefficient of all endogenouse constructs on this model.

Table 2: Outer Model Test (Convergent Validity; Descriminant Validity and Composite Reliability)

Latent Variable	Indikator	Loading Factor (Cut Value 0.7)	AVE (Cut Value 0.5)	HTMT (<0.9)	Composite Reliability (Cronbachs Alpha); Cut Value >0.7
Academic Performance	AP1	0.780 (valid)	0.884	0.354 - 0.690 (valid)	0.711 (0.834) ; reliable
	AP2	0.733 (valid)			
	AP3	0.905 (valid)			
Student Engagement	SE1	0.941 (valid)	0.911	0.352 - 0.868 (valid)	0.819 (0.899) ; reliable
	SE10	0.991 (valid)			
	SE11	0.756 (valid)			
	SE12	0.760 (valid)			
	SE13	0.713 (valid)			
	SE14	0.765 (valid)			
	SE15	0.732 (valid)			
	SE16	0.768 (valid)			
	SE17	0.864 (valid)			
	SE2	0.880 (valid)			
	SE3	0.858 (valid)			
	SE4	0.885 (valid)			
	SE5	0.826 (valid)			
	SE6	0.776 (valid)			

	SE7	0.743 (valid)			
	SE8	0.767 (valid)			
	SE9	0.727 (valid)			
Student Interaction (SI1 – SI5 – dimension student lecturers interaction) (SI6 – SI10 – dimension student student interaction) (SI11 – SI15 – dimension student content interaction)	SI1 1st order	0.785 (valid)	0.906	0.345 - 0,799 (valid)	0.719 (0.804) ; reliable
	SI1 2nd order	0.767 (valid)			
	SI10 1st order	0.781 (valid)			
	SI10 2nd order	0.767 (valid)			
	SI2 1st order	0.864 (valid)			
	SI2 2nd order	0.856 (valid)			
	SI3 1st order	0.868 (valid)			
	SI3 2nd order	0.858 (valid)			
	SI4 1st order	0.886 (valid)			
	SI4 2nd order	0.868 (valid)			
	SI5 1st order	0.818 (valid)			
	SI5 2nd order	0.802 (valid)			
	SI6 1st order	0.865 (valid)			
	SI6 2nd order	0.848 (valid)			
	SI7 1st order	0.750 (valid)			
	SI7 2nd order	0.745 (valid)			
	SI8 1st order	0.765 (valid)			
	SI8 2nd order	0.761 (valid)			
	SI91st order	0.745 (valid)			
	SI9 2nd order	0.828 (valid)			
	SI11 1st order	0.791 (valid)			
	SI11 2nd order	0.737 (valid)			
	SI12 1st order	0.784 (valid)			
	SI12 2nd order	0.886 (valid)			
	SI13 1st order	0.838 (valid)			
	SI13 2nd order	0.833(valid)			
	SI141st order	0.819 (valid)			
	SI14 2nd order	0.811 (valid)			
	SI15 1st order	0.814(valid)			
	SI15 2nd order	0.911 (valid)			
Student Satisfaction	SS1	0.863 (valid)	0.870	0.388 - 0.811 (valid)	0.735 (0.811); reliable
	SS2	0.825 (valid)			
	SS3	0.725 (valid)			
	SS4	0.925 (valid)			
	SS5	0.929 (valid)			

Convergent validity testing evaluates each indicator-latent concept connection. An indication is legitimate if its loading factor is > 0.7 and each construct has an AVE > 0.5. The outer model test in Figure 2 shows that all indicators in the PLS model are legitimate construct measures since they already have a loading factor > 0.7 and each construct has an AVE > 0.5. Discriminant validity ensures that each latent variable model is unique. The indicator meets discriminant validity requirements if the HTMT between constructs is below 0.9. Each construct meets discriminant validity since the HTMT value between constructs is below 0.9. All indicators and constructs passed the discriminant validity test, HTMT, between constructs <0.9. Composite reiability evaluates a variable's absolute dependability, whereas Crombach Alpha assesses its lower bound. In construct reliability measurement, Cronbach alpha and composite reliability must be > 0.7. The construct reliability test shows that all constructs in the PLS-SEM model are trustworthy since their Cronbach alpha and composite reliability values are more significant than 0.7.

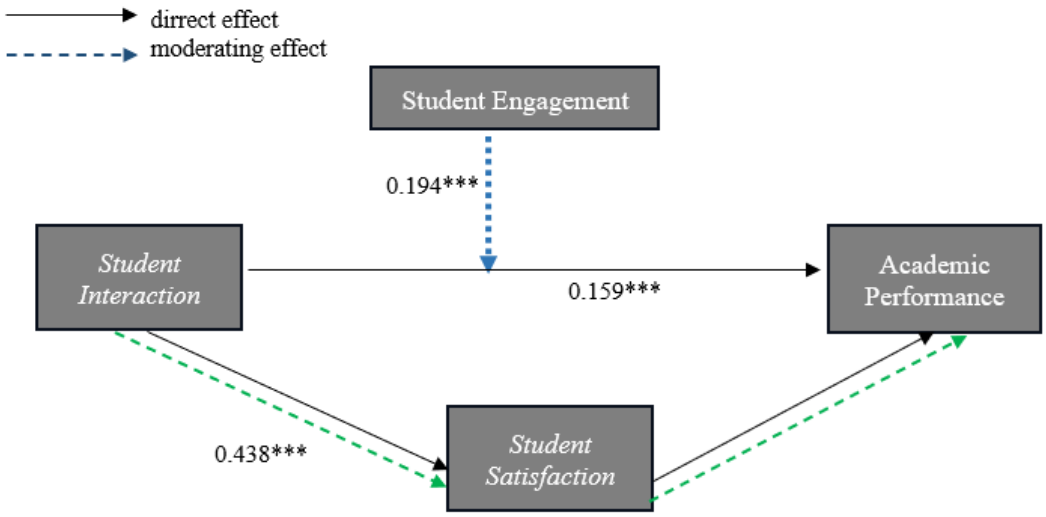

Figure 2: Estimation results of the PLS model
(*** show that path coeeficient significant on sig. level 1%)

Testing the inner model involves assessing the structural model's quality of fit, path coefficient, relevance of exogenous factors' partial influence on endogenous variables, and coefficient of determination. Test the study hypothesis using these results. R Square, Q Square, and SRMR model values indicate PLS-SEM model fit. The R square value shows how well the model predicts endogenous variables. The R Square value is 0-1 and classified as strong, moderate, or weak. According to Chin (1998), the R square value > 0.67 indicates the PLS model is robust, 0.33 - 0.67 suggests moderate, and 0.19 - 0.33 indicates weak. The model's Q Square value shows predictive usefulness. Q square values range from 0.02 to 0.15, 0.15 to 0.35, and > 0.35. The SRMR model relates to the ability of the sample to explain the population. SRMR values are categorized into two categories: perfect fit models if SRMR < 0.08; the model is fit if the SRMR is between 0.08 – 0.10; and the model is not fit if the SRMR is > 0.10. The results show that the estimated PLS-SEM model fits with the analyzed data because it has strength in the moderate category (firm enough) and considerable predictive relevance, and the model's SRMR value is in the fit criteria. Therefore, this model can be considered feasible to test research hypotheses. The estimation results of the PLS model can be seen in Figure 2 and result of test hypothesis can be seen in Table 3.

PLS-SEM analysis evaluate the direct effect between two variables from the p-value and T statistics, its also to evaluate moderation effect from moderator variable. At a significant level of 5%, we conclude that exogenous variables have a significant effect on endogenouse variable if the p-value is <0.05 or t statistic > 1.65 (one tail) and t statistic > 1.96 (two tails). Then, the direction of influence (positive effect/negative effect) is assessed from the sign accompanying the path coefficient.

Table 3: Test of hypothesis

Hypothesis	Correlation Between	Result	Supported by significance
1	*SI → AP*	P value 0.004; t 2.872; path coefficient 0.159	Yes
2	*SE*SI → AP*	P value 0.000; t 4.100; path coefficient 0.194	Yes
3	*SI → SS → AP*	P value 0.000; t 8.074; path coefficient 0.438	Yes
Note: path coefficient with p value star; Star of p value: *) sig. level 10%; **) sig. level 5%; ***) sig. level 1%, *SI = Student Interaction, SE = Student Engagement, SS = Student Satisfaction, AP = Academic Performance)*			

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4. Discussion

Result analysis on Tabel 3 show that Student interaction have positive effect on academic perfomance (p value 0,004 < 0,05, t statistics 2,872 > 1,96, positive path coeeficent 0,159), it's mean that students who interact well during online learning tend to have good academic performance, while students who interact less in online learning tend not to achieve good academic performance. Its accepted Hypothesis 1 on this research.Academic performance is one of the outcomes of the learning process. Previous research has proven that the success of learning is determined by the interaction between students and their teachers and the social interaction of students with their peers, while in the current era, in online learning, student interaction with content is also a measure of whether student interaction is good or bad in online learning [47], [48], [49], [50], [51].

The next analysisis on Table 3 show that stident satisfaction medating the indirect effect student interaction on academic performance (p value 0.000; t statistics 8.074>1.96 and positive coefficient 0,438). It's mean that directly, student interaction can indeed influence academic performance, but if it is mediated by student satisfaction, the influence of student interaction on academic performance is greater, meaning that student interaction that can increase student satisfaction has a higher effect of increasing academic performance than student interaction that only running well without creating satisfaction in students. Its acepted second hypothesis on this research. Its also support by previouse research, in several previous studies it has also been proven that academic performance in online learning is also determined by student satisfaction with the implementation of learning, students who are satisfied with the learning process tend to achieve high academic performance [17], [18], [19], [20], [21], [52].

The next analysis result on Tabl3 3 show that student engagement moderated the influence of student interaction on academic performance (p value 0,000; t statistics 4.100 > 1.96; positive path coefficient 0,194), it's mean that student engagement strength the influence of student interaction on academic performance, Students who have good interactions during online learning and have high engagement with lectures tend to have high academic performance compared to students who interact well during online lectures but are less connected to the courses they are taking. Its accepted the third hypothesis on this research, this is the novelty of this resarch, no one previouse research prooven this result.

Result analysis show that Student interaction have positive effect on academic perfomance, students who interact well during online learning tend to have good academic performance, while students who interact less in online learning tend not to achieve good academic performance.The next analysis result show that student engagement moderated the influence of student interaction on academic performance, student engagement strength the influence of student interaction on academic performance, Students who have good interactions during online learning and have high engagement with lectures tend to have high academic performance compared to students who interact well during online lectures but are less connected to the courses they are taking. The next analysisis show that stident satisfaction medating the indirect effect student interaction on academic performance, directly, student interaction can indeed influence academic performance, but if it is mediated by student satisfaction, the influence of student interaction on academic performance is greater, meaning that student interaction that can increase student satisfaction has a higher effect of increasing academic performance than student interaction that only running well without creating satisfaction in students.

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