The Influence of Grit on Students' Academic Achievement: Mediated by Online Learning

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Abstract— **Recognizing factors that influence student academic achievement is crucial for higher education institutions as proof of concern for the quality of students, particularly on the aspect of academics. This research has the objective of understanding the direct impact of grit and online learning on student academic achievement, as well as the indirect effect of grit on student academic achievement mediated in online learning. The unit analysis was students of 13 private STMIKs in Indonesia, with a total sample of 395 people. The method of analysis used was SEM-AMOS. The results showed that grit and online learning held a positive impact on students on their academic achievement. Moreover, online learning has been proven to mediate the indirect effect of grit on student academic achievement. The statistical test presented the increase of grit that put an influence on the improvement of academic achievement by 72.7%, meanwhile the increase of online learning influences academic achievement by 12.0%. Thus, it is fundamental for tertiary institutions in encouraging students to eagerly be keen on achieving their goals. Further, higher education institutions require to prioritize students' involvement through online learning due to grit and online learning's influence on student academic achievement.**

Keywords—**grit, online learning, academic achievement, SEM-AMOS, STMIK.**

I. INTRODUCTION

The ability of a person to value their goal either individually, socially, or globally depends on their educational level [1]. The nature of tolerance in mutual respect is a tangible manifestation of education in society. The Indonesian government through its policies in the education sector continues to encourage people to obtain higher education [2], as many believe that people's educational level is a contingent factor to their welfare [3][4]. Therefore, universities as higher education providers must put efforts to improve student academic achievements. In the end, these achievements contribute to upgrading the quality of the institution. Academically, student academic achievement can be viewed through the attainment of grades [5]. A Grade Point Average (GPA) is a student academic achievement measurement [6][7] that reflects the success of the learning process [8]. In Indonesia, GPA has become an academic dimension for student achievement [9]. Universities must ensure students obtaining their optimum performance [10].

The accomplishment of tertiary institutions in improving student academic achievement can expand universities' reputations within communities and industries [11]. However, many universities put their target on the number of students in the aspect of quantity instead of the quality aspects, so that, they contribute to the increasing number of unemployed graduates [12]. In Indonesia, the quality of higher education graduates based on their competitiveness in the industry sector either in ASEAN or at the global level has been far from satisfactory. [13]. The Education Index released by the 2020 ASEAN Human Development Reports showed the highest grade of the educational system achieved by Singapore at the score of 0.938. Following were Brunei Darussalam, Malaysia, and Thailand with scores of 0.838, 0.810, and 0.777 respectively. Indonesia took fifth place with a score of 0.718. This indicates that Indonesia's educational system has fallen behind the four other ASEAN countries. Thus, it obliges a driving force to raise students' awareness ensuring their high enthusiasm for school achievement. As many universities have applied a new learning method, namely online learning, STMIK Indonesia also implemented this method.

The Indonesian government through its regulation (PERMENDIKBUD No. 109/2013) has supported the existence of distance learning. This has triggered numerous higher education organizations to conduct online learning competitively [14]. The method has offered further experiences for several parties such as students, education providers, teaching staff, and communities [15]. Moreover, online learning provides a constructive impact on student academic achievement once they manage it productively [16]. Also, online learning is extremely relevant for scholars, because the recent information technology offers flexible learning schemes with various options in almost unlimited access to information [17]. The teaching practices based on Learning Management Systems (LMS) have brought significant advantages for those parties [18]. The utilization of LMS allows lecturers to improve teacher-student communication accordingly to create a beneficial learning process [19]. In this way, online learning is no longer an option. Instead, it is inevitably a necessity [20]. This, particularly amid the COVID-19 pandemic, must be understood to carry out the learning activity online [21][22].

Undergraduates are required to develop a qualified personal character to reach their success. One of the elements that contributes to learning success is grit, which is described as students' passion and persistence in achieving their long-term goals [23]. Fostering scholars' enthusiasm and self-confidence will increase their academic achievement [24].

Students are required to maintain their persistence effortfully to obtain satisfying learning outcomes, as grit becomes part of an individual's personality trait that determines how individuals should interact in a diverse environment [25]. Grit has a vital role in achieving success [26] and has put a significant impact on learning achievement [27]. Thus, grit is incredibly important to attain student academic achievement. The success itself is influenced by the nature of persistence and the consistency in accomplishing long-term goals [28][29][30]. Students require to take advantage of the existing resources. In the end, students' higher achievement in various areas of life including in the assessment of online learning has been influenced by grit's possession [31].

This study distinguished student academic achievement as an indicator of measurement in students' success through the higher education learning process [32]. Therefore, it is crucial to identify factors that affect student academic [33]. Numerous previous researches have been carried out that examined the direct effect of online learning and grit on student academic achievement. However, none has been observed for the indirect effect of grit on student academic achievement mediated by online learning. This research was conducted to determine the direct and indirect effect of the grit variable on students' academic achievement through online learning mediation. The results of this study are expected to evident direct and indirect impacts of grit and online learning empirically on student academic achievement. These results also can be utilized by management as a reference in optimizing student academic achievement policy.

II. Research Method

This research used a quantitative method in the approach of a survey to present an overview of the relationship between variables studied [34]. The survey was conducted from February 2020 to March 2020. The data collected was in numbers and was analyzed in statistics. The number of populations in this study amounted to 29,394 undergraduates of 13 private STMIKs in Indonesia who have implemented Moodle-based e-learning in the discourse activities. The distribution of questionnaires was attempted only once in the format of google form. The sampling method used Proportionate Stratified Random Sampling. The samples from 395 people were analyzed using the Structural Equation Modeling (SEM) model with the support of the Analysis of Moment Structure (AMOS) computer program in the data processing. The questionnaire employed a 6-point Likert scale, namely, 1 = Strongly Disagree, 2 = Disagree, 3 = Tend to Disagree, 4 = Tend to Agree, 5 = Agree, 6 = Strongly Agree. The use of this scale appeared to provide greater data accuracy by excluding the doubt factor [35].

III. Result And Discussion

This paper has been addressed to find out: (a) the direct effect of grit on student academic achievement; (b) the direct effect of grit on online learning; (c) the direct effect of online learning on student academic achievement; and (d) the indirect effect of grit on student academic achievement through online learning. The Structural Equation Modeling (SEM) analysis used in this study utilized the IBM SPSS AMOS 23. The theoretical model described in the path diagram will be analyzed based on the distributed questionnaires from 395 data. Prior to examining the measurement model and structural model test, this research conducted a descriptive analysis of the respondents. Table I described the respondent data from thirteen STMIKs in Indonesia.

TABLE I. Respondent Data by Institution

No.	Private Universities in Indonesia	Sample	Participant
1	STMIK Atma Luhur	19	19
2	STMIK Dipanegara Makassar	52	52
3	STMIK Banjarbaru	19	19
4	STIKOM Bali	75	75
5	STMIK Amikom Purwokerto	37	37
6	STMIK Tasikmalaya	26	26
7	STMIK Bina Sarana Global	23	23
8	STMIK Hang Tuah Pekanbaru	7	7
9	STMIK Indonesia Padang	21	21
10	STMIK Royal Kisaran	51	51
11	STMIK Widya Cipta Dharma	27	27
12	STMIK AMIK Riau	20	20
13	STMIK Pontianak	18	18
Total		**395**	**395**

Source: Research Compilation, 2021

The data presented in Table I above revealed thirteen participating STMIKs with the total number of participants each university filled out all the questionnaires (100%). STIKOM Bali has been ranked the highest number of participants with 75 people, while STMIK Hang Tuah has been ranked the lowest number of participants with only 7 people. The significant difference in population numbers has presented a different number of samples for each university. The highest percentage of samples collected (100%) has evidenced the compelling engagement of the respondents into this research. Following is Table II that described the respondent data based on semester.

TABLE II. Respondent Data by Semester

Semester	Total Respondent	Percentage
2	156	39.5%
4	125	31.6%
6	98	24.8%
8	16	4.1%
	395	100.0%

Source: Research Compilation, 2021

By taking the semester as a benchmark to differentiate the distribution of respondents, Table II exposed the highest number of respondents was in the 2nd semester, and the lowest number was in the 8th semester with the amount of 156 and 16 people respectively. The presence of the 2nd, 4th, 6th, and 8th-semester respondents has demonstrated students' participation in the existing semester, despite some uneven distribution being identified. The following is Table III that exhibited respondent data by province.

TABLE III. Respondent Data By Province

No.	Province	Sample	Percentase
1	Bangka Belitung Island	19	4.8%
2	South Sulawesi	52	13.2%
3	South Kalimantan	19	4.8%
4	Bali	75	19.0%

5	Central Java	37	9.4%
6	West Java	26	6.6%
7	Banten	23	5.8%
8	Riau	27	6.8%
9	West Sumatera	21	5.3%
10	North Sumatera	51	12.9%
11	East Kalimantan	27	6.8%
12	West Kalimantan	18	4.6%
Total		395	100.0%

Source: Research Compilation, 2021

By taking province as a benchmark, Table III has shown that respondents from Bali Province have the highest number of participants with a total of 75 people out of 395 total respondents. Meanwhile, the respondent from West Kalimantan took the least number of participants with a total of 18 respondents. The coverage of 12 provinces in the distribution of respondents in Indonesia indicated sample sufficiency as it reached numerous students from various private universities and provinces in Indonesia. A large number of samples was strongly influenced by a large number of the student population at the college, especially those who came from the same province. Take the example of STMIK Hang Tuah Pekanbaru and STMIK AMIK Riau where are originated from the same province, namely Riau Province.

A. Measurement Model Test

The measurement model shows how manifest variables (indicators) represent the latent variables tested by examining validity and reliability latent variables through confirmatory factor analysis. This study observed construct validity by viewing the convergent validity. The convergent validity was obtained by observing the factor loading value. This assessment aimed at confirming a dimension or a factor based on its empirical indicators. The analysis of the measurement model used Secondary Order Confirmatory Factor Analysis (CFA) with the assumption of indicators used and developed variables were based on theoretical frameworks and previous researches. The confirmatory analysis was conducted on exogenous constructs (i.e. grit) and endogenous constructs (i.e. online learning and academic achievement). The purpose of a validity test using CFA was to measure whether the construct (indicator) is capable to reflect the latent variable. The indicator can be declared valid if the Critical Ratio (CR) of the regression weight was above 2.0 with a p-value was less than 0.05 [36]. Fig. 1 displayed a measurement model based on the calculation of all respondent data using AMOS 32 software.

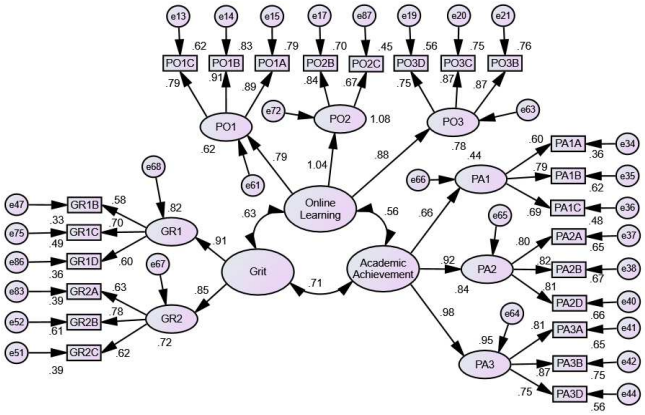

Fig. 1. Measurement Model

Fig. 1 above pictured the results of the confirmatory factor analysis on exogenous and endogenous variables. Of each latent variable, the indicator showed a significant result due to its probability value which was less than 0.05. This finding confirmed evidence that latent variables were reliable forming indicators or dimensions as a measuring tool. Furthermore, Reliability examination using Construct Reliability (CR) test is an assessment to examine the reliability and consistency of data. The data fits the criterion if CR> 0.7 and the variance extracted value> = 0.50. The value of CR between 0.6 and 0.7 is considered acceptable if the construct validity is in a good condition [37]. The following Table IV showed the results of the Construct Reliability test on construct and dimension aspects.

TABLE IV. CR DAN AVE TEST ON CONSTRUCT & DIMENSION ASPECTS

Construct	Dimension	Factor Loading	C.R	AVE
Grit	Passion Consistency	0.828	0.87	0.77
	Perseverance	0.828		
Online Learning	Peer Collaboration	0.739	0.93	0.83
	Learning Management	1.040		
	Cognitive Problem Solving	0.899		
Academic Achievement	Academic Skill	0.655	0.90	0.75
	Leadership Skill	0.869		
	Communication Skill	0.998		

Source: Research Compilation, 2021

The results of reliability testing (Table IV) on the measurement model path diagram exhibited all constructs and dimensions as valid because the Construct Reliability (CR) value was > 0.60 and the Average Variance Extract (AVE) value was > 0.5. The following construct test was to evaluate discriminant validity (cross-loading) by comparing the value of AVE root with the correlation among constructs. The following Table V showed Cross Loading Average Variance Extract.

TABLE V. CROSS LOADING AVERAGE VARIANCE EXTRACT (AVE)

Construct	Grit	Online Learning	Academic Achievement
Grit	**0.9**		0.7
Online Learning	0.6	**0.9**	0.6
Academic Achievement	0.3	0.6	**0.9**

Source: Research Compilation, 2021

A discriminant validity test is a concept of examination to obtain the level of differentiation of an indicator in measuring instrument constructs. Discriminant validity can be considered valid if the indicator loading value is greater than the value of the loading of the other variable. This test can be completed by comparing the coefficient of AVE Root (√AVE) of each variable with the correlation value between variables in the model. The indicator appears to be valid if the square root of the Average Variance Extracted (√AVE) value of each variable is greater than the correlation value between the latent variable and other latent variables with the minimum value is 0.5 [38]. Based on the results of the discriminant validity test, the AVE value of each latent variable correlation in this study was greater than the other latent variables with a minimum value of 0.90. From the Cross Loading diagram above, it can be claimed that all indicators have a greater correlation coefficient, which each construct has been compared to the correlation coefficient indicator of the constructing block in the other columns. Thus, it can be concluded that each indicator in the block appears to be the construct constituent in the column.

B. Structural Model Test

A structural model is a causal relationship (cause-effect), between constructs that consist of independent (exogenous) variables and dependent (endogenous) variables [39]. Unlike the measurement model which treats all variables (construct) as independent variables. The significance test of this structural model employed the Goodness of Fit Index (GOFI) criterion [40]. The structural model is a relationship between constructs that have a causal relationship (cause-effect), thus, a structural model consists of independent (exogenous) variables and dependent (endogenous) variables [41]. Structural model represents the relationship between latent variables only [42], as shown in Figure 2:

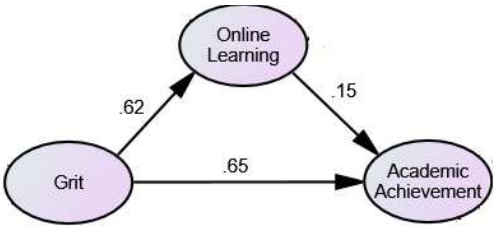

Fig. 2. Structural Model

The GOF (Goodness of Fit) measurement results are the same as the suitability test for the measurement model, therefore it can be said that the model is good because there is no significant change between the two models. The following Table VI exhibited Model Fit Indices.

TABLE VI. MODEL FIT INDICES

Goodness of Fit Measure	Cut Off Value	Index Value	Description
χ^2 *(Chi Square)*	≤ 553.80	387,65	Good Fit
Cmin/DF	≤ 2.00	1.77	Good Fit
Significance probability (p)	≥ 0.05	.00	Poor Fit
Adjusted Goodness of Fit (AGFI)	≥ 0.90	.90	Good Fit
Goodness of Fit Index (GFI)	≥ 0.90	.92	Good Fit
Comparative Fit Index (CFI)	≥ 0.90	.96	Good Fit
Tucker Lewis Index (TLI)	≥ 0.90	.96	Good Fit
Root Mean Square Error of Approximation (RMSEA)	≤ 0.08	.04	Good Fit

Source: Research Compilation, 2021

Table VI showed the goodness of fit measurement, where one criterion out of the other eight criteria used, appeared to be categorized unfit, that was the probability criterion. The more models fit the criteria, the more suitable they are for the data or sample. In assessing the feasibility of a model, the use of 4 - 5 goodness of fit criteria has been considered adequate, as long as their criteria, namely absolute fit indices, incremental fit indices, and parsimony fit indices are well-represented. Moreover, the significance parameter test on the latent variable is required to observe whether the estimated value of the indicator (first-order) and dimension (second-order) measure the tested latent variable empirically. Therefore, the indicator or dimension is declared as significant if p-value ≤ 0.05 or C.R. ≥ 1,967 (C.R. = t-count). The following Table VII described the Variable Significance Test:

TABLE VII. VARIABLE SIGNIFICANCE TEST

Path Significance Test	C.R.	P-Value	Description
Grit → Online Learning	7.72	0.001	Significant
Grit → Academic Achievement	6.55	0.001	Significant
Online Learning → Academic Achievement	2.02	0.043	Significant

Source: Research Compilation, 2021

The CR (Critical Ratio) value presents its significance of the independent variable (grit) to the dependent variable (online learning and Academic Achievement). The results of the significance test in Table VII showed that all variables have a higher C.R value than the t-Table at 1.96. Moreover, the probability value of all indicators was below 0.05. So, it can be inferred that all variables exhibited positive and significant outcomes. The coefficient determination (R2) test was employed to measure the ability of the model in defining the dependent variable variation [43]. The value of the coefficient determination contributed to predicting simultaneously the influence of variable X to Y. Further, the coefficient determination (R2) measured how far the model can describe the endogenous variation [44]. The following Table VIII presented the coefficient determination:

TABLE VIII. COEFFICIENT OF DETERMINATION

Direct Impact	Estimate	S.E	R-Square (Coefficient Determination)
Grit → Online Learning	0.86	0.11	
Grit → Academic Achievement	0.73	0.11	55.9%
Online Learning → Academic Achievement	0.12	0.06	

Source: Research Compilation, 2021

The statistical test resulted that the P-value on each variable was 0.001, which was less than 0.05. It appeared that grit and online learning have given a significant influence on academic achievement. Its huge impact can be viewed in the amount of path coefficient. Therefore, these findings revealed that the improvement of grit and online learning affected to the increasing academic achievement by 72.7%, and 12.0% respectively. The coefficient determination value was 55.9%, which meant that of 100%, 55.9% of the diversity of academic achievement scores can be elaborated by grit and online learning variables, meanwhile, the remaining 44.1% were clarified by other variables.

C. Path Coefficients

The structural equation model combines factor analysis and path analysis into a comprehensive statistical method [45]. The amount of influence of an exogenous variable on an endogenous variable is dependent on the value of the path coefficient. The path coefficient is utilized to describe each independent variable's influence on that of the dependent variable. The following Table IX described the Path Coefficient Value:

TABLE IX. PATH COEFFICIENT VALUE

Path	Estimation	P-Value
Grit → Online Learning	0.62	0.001
Grit → Academic Achievement	0.65	0.001
Online Learning → Academic Achievement	0.15	0.043

Source: Research Compilation, 2021

Table IX exhibited the results of the significance test, in which the p-value amounted to less than 0.05. This indicated grit and online learning have given significant effects on academic achievement. Therefore, these findings have revealed that the improvement of grit in students and online learning as a learning method have direct effects in increasing academic achievement by 65% and 15% respectively. Meanwhile, the rose of grit has a direct impact on online learning by 0.65 (65%).

The size of direct impact is dependent on the amount of the standardized path coefficient (Standardized Regression Weights). Whereas, the size of the indirect effect of the independent variable to the dependent variable is dependent on mediating variable, using the Sobel test formula. The following Table X showed the Path Coefficient of Direct and Indirect Impact:

TABLE X. PATH COEFFICIENT DIRECT & INDIRECT IMPACT

Path	Impact	
	Direct	Indirect
Grit → Online Learning	0.62	
Grit → Academic Achievement	0.65	
Online Learning → Academic Achievement	0.15	
Grit → Online Learning → Academic Achievement		1.97

Source: Research Compilation, 2021

In standardized direct effects, the direct effect of grit on online learning amounted to 0.62. By witnessing the path coefficient value, this can be interpreted that grit has a great and significant influence on online learning. It suggested that the level of success in assessing online learning related to the level of students' persistence. Further, the value of grit path coefficient to the academic achievement was 0.65, which means that grit has high and significant effects on students' academic achievement. It indicated that students who possess higher grit can achieve optimal academic results. Moreover, the online learning to academic achievement's path coefficient was 0.15. This explained that online learning has a less significant impact on academic achievement. The increase in the online learning process provided only a modest contribution to academic achievement. Furthermore, grit in online learning provided a significant indirect effect on academic achievement. Online learning was considered capable of contributing grit to provide a great impact on academic achievement. A surge improvement of grit in students had indirectly increased student academic achievement by 19.7%. Thus, it claimed that mediated online learning strengthens the influence of grit on academic achievement.

IV. CONCLUSION

This study examined the direct effect of grit and online learning on student academic achievement as well as the indirect effect of grit on student academic achievement through mediated online learning. The statistical test revealed that grit and online learning held positive and significant direct effects on student academic achievement. Likewise, grit in online learning also held a significantly positive indirect effect on academic achievement. Therefore, it is evidenced that mediated online learning strengthened the grit effect on academic achievement. The previous research found that grit and online learning provided a positive contribution in influencing students' academic achievement, however, this study discovered that online learning mediation has strengthened grit effect on students' academic achievement. The results of this study generated a positive contribution to schools' management, especially in managing the indirect effect of grit on students' academic achievement. Strong passion and Persistence are the key determinants of students' success academically. Higher educational institutions must maintain students' enthusiasm in attaining their academic achievement. The higher the student's grit, the higher their involvement in online learning are. Thus, it improves students' academic achievement. The research has a limitation. Since the data collection was carried out in a limited area of institutions, which were among private STMIKs in Indonesia, the results cannot be generalized broadly at various universities and other tertiary institutions. However, it is necessary to consider the use of concurrent triangulation design method in future research, by collecting quantitative and qualitative data parallelly to improve the results of the analysis.

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