THE ROLES OF IT SKILL AND GRIT IN ACADEMIC ACHIEVEMENTS MEDIATED BY ONLINE LEARNING AND COLLABORATIVE LEARNING

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ABSTRACT

It is essential for a university to recognize factors which influence learners' academic achievement. The aim of this inquiry to analyze the influence of technology information skills to online learning, the indirect influence of technology information skills to learns' online learning academic achievment, the indirect influence of technology infmation skills to learns' academic achievment through collabortive learning, the influence of collabortive learning through learns' academic achievment, influence of grit to collabortive learning, grit effect to learns' academic achievment and grit effect to online learning. The data collection method for the quantitative calculation is conducted through one snapshot cross-sectional survey or only conducted 1 (one) time at a certain time. The survey begins in April 2020 until June 2020. Proportional stratified random sampling method is used for sampel collecting, and 394 samples are situated proportionally. This study sums up that 3 hypothesis do not influence either direct or indirect, while 5 others hypothesis proven to be effective influence. Two things as the research results, namely theorities and managerial implications. Though the data source are from STMIK through Indonesia, this inquiry result can be implemented to other University in Indonesia.

Keywords: *IT Skill, Grit, Academic Achievements, Online Learning, Collaborative Learning.*

1. INTRODUCTION

As a higher education institution, colleges must perform an institutional transformation to produce academic values and to achieve the quality of human resources [1],[2]. Universities must take demonstrate their responsibility of increasing student's academic achievements [3]. Academic achievement is the most important indicator of student success in educational activities [4] which can be measured by an average score (GPA) [5]. Innovation in the learning system is needed to improve students' abilities. One of the innovations that can be done is the use of information technology. Thanks to the rapid advancement of technology, online learning has become a part of educational institutions. The COVID-19 crisis, has fueled the increase online learning [6]. Online learning has advantages [7] and is able to improve student academic achievement [8].

Student's active engagement in online learning activities also plays an important role in obtaining satisfying learning results [9]. Comprehending the group's dynamics and individual engagement pattern in online learning may help instructors in arranging and directing subject matters more efficiently, thus elevating learning [10]. Collaborative learning possesses a positive impact not only on an individual's learning behavior but also on student's academic results [11]. Collaborative learning reinforced with technology has become one of the most influential learning paradigm [12]. Collaborative learning is required in an effort to produce more interactive learning to increase contentment and to encourage students to stick with their learning [13]. Technology as a tool for teaching and learning has been made into a necessity for students to obtain information technology skills so that they can fully interact with education [14].

In learning activities, persistence and passion is an essential to obtain satisfactory results. This condition is because the grit is a part of individual personality traits that determine how individuals interact in various environments [15]. In the science of psychology, grit is a tendency to maintain persistence and passion for long-term goals that are challenging [16]. There are two important components in Grit, namely consistency of interest and persistence of effort. Grit has shown a positive result in academia where grit is used as a predictor and grit has given significant impacts on educational achievements [17]. Perseverance and consistency towards a goal could facilitate better student's academic results [18].

Private STMIK (Colleges of Informatics and Computer Management), which is one of the higher education institutions in the field of information technology, has implemented information technology namely uses LMS in integrating lectures. In terms of if it is viewed from the form of education and teaching and learning providers based on information technology, private STMIK in Indonesia should be able to produce students with better achievement levels. This research was conducted on students of private STMIK in Indonesia on the grounds of looking at the use of information technology in online learning activities such as the use of e-learning. Through this research, it is hoped that it can provide clear answers to how information technology skills, online learning, and grit can contribute to students in achieving their academic achievements. Identifying the factors that can affect student academic achievement is considered very important [19]. Especially there are still few studies exploring the relationship between online learning and student academic achievement. Likewise, although grit has a correlational relationship with academic achievement and has been proven to improve student academic achievement, specifically in Indonesian universities there is still little literature that reveals this fact. This research formulates several research objectives, namely, (1) analyzing the impact of IT skills on online learning; (2) analyzing the indirect impact of IT skills on student's academic achievement through online learning; (3) analyzing the indirect impact of online learning on student's academic achievement through collaborative learning; (4) analyzing the impact of online learning on collaborative learning; (5) analyzing the impact of collaborative learning on student's academic achievement; (6) analyzing the impact of grit on collaborative learning; (7) analyzing the impact of grit on student's academic achievement; and analyzing the impact of grit on online learning.

2. RESEARCH METHOD

This study uses a quantitative method with survey research [20], which begins with a "one snapshot" - cross-sectional survey design, which means that the distribution of the questionnaire is carried out only 1 (one) time at a certain time. The survey activities in this study were carried out starting from April 2020 until Desember 2020. The variables used in this study included independent variables such as Information Technology Skills (X1) and Grit (X4), the dependent variable was student academic achievement (Y), and the mediation variable such as Online Learning (X2) and Collaborative Learning (X3). The population in this study were 29,394 active undergraduate students from 13 private STMIKs in Indonesia and 394 sampel size. in determining the sample, this study uses the Slovin formula with a significance level of 5%. To support the data needs in this study, it was carried out by referring to the information on private PTS STMIK in Indonesia which has implemented LMS-based e-learning (Learning Management System) in lecture activities. The software used to support the implementation of e-learning is Moodle [21]. Sampling in this study using the Proportionate Stratified Random Sampling method. The questionnaire was filled out by students online using Google Form where all data is collected and data processing uses a 6-point Likert scale, Strongly Agree (SA), Agree (A), Tend to Agree (TA), Tend to Disagree (TD), Disagree (D), and Strongly Disagree (SD) to measure 52 indicators. Structural Equation Modeling (SEM) analysis methods and Analysis of Moment Structure (AMOS) in data processing.

3. RESULTS AND DISCUSSION

The questionnaire is distributed in the form of google form to respondents who have involvement as students of the Computer and Informatics Management College (STMIK). The number of samples that are fit to be processed is at least 5 times the number of question indicators on the research questionnaire [22]. The number of indicators used in the study was 52, so the recommended sample size was at least 260. In terms of quantity, the total sample of 351 has fulfilled the SEM criterion and the Maximum Likelihood requirement of 100-200 samples. In detail, the profiles of respondents are presented in Table 1.

Table 1: Profile Of Respondents By College.

Private Institute	Frequency	Percentage
STMIK Atma Luhur	16	84.2
STMIK Dipanegara Makassar	52	100
STMIK Banjarbaru	19	100
STIKOM Bali	42	56
STMIK Amikom Purwokerto	37	100
STMIK Tasikmalaya	19	73.1
STMIK Bina Sarana Global	23	100
STMIK Hang Tuah Pekanbaru	7	100
STMIK Indonesia Padang	21	100
STMIK Royal Kisaran	51	100
STMIK Widya Cipta Dharma	27	100
STMIK AMIK Riau	19	95
STMIK Pontianak	18	100

There are differences in the number of samples from each university due to the number of populations that are significantly different. The large number of samples collected 100% indicates that there is a strong desire from the respondents to be involved in this study.

Table 2: Profile Of Respondents By College.

Semester	Respondent	Percentage
4	157	44.7
6	97	27.6
8	90	25.6
10	6	1.7
12	0	0
14	1	0.3

Based on the data on the distribution of respondents based on semesters in Table 2 above, it can be explained that the most respondents were in semester 4 (four) which amounted to 157 people and the least respondents were in semester 14, namely 1 person, while in semester 12 there were no respondents. The existence of respondents from semesters 4, 6, 8, and 10, this proves the participation of students from each current semester.

2.1 Measurement Model Results

This research model consists of 2 (two) latent exogenous variables, namely the Information Technology skills variable, and the grit variable. Furthermore, latent intervening variables are online learning and collaborative learning. Meanwhile, the latent endogenous variable is student academic achievement. Analysis of the measurement model is carried out using Secondary Order Confirmatory Factor Analysis (CFA) because there is an initial assumption between the indicator relations used and the variables and the hypothesis model is developed based on theoretical frameworks and previous research used as a reference. The validity test with the CFA test or construct validity test (indicator) is to measure whether the construct (indicator) is able or not to reflect the latent variable. In this analysis phase, the validity test will be carried out with the convergence validity test and the discriminant validity test. The validity test is intended to test the construct (indicator) to ascertain whether it has a high proportion of variance or not. The validity of an indicator can be declared valid if the indicators used can measure certain constructs when the Critical Ratio (CR) of the regression weight shows a value above 2.0 with a p-value less than a value of .05 [23]. The results of the confirmatory factor analysis on exogenous and endogenous variables show that each indicator or dimension forming each latent variable shows a high significance. Thus, it can be said that the indicators forming latent variables are good indicators or dimensions as a measuring tool (see Table 3).

Table 3: Regression Weights Measurement Model

Indicator	Variable	C.R	P-Value
Information and Internet Skill	IT Skill		
Analysis and Development Skill	IT Skill	9.43	0.0
Problem Solving Skill	IT Skill	9.28	0.0
Peer Collaboration	Online Learning	13.85	0.0
Learning Management	Online Learning	10.53	0.0
Cognitive Problem Solving	Online Learning		
Interaction with Peers	Collaborative Learning		
Interaction with Instructor	Collaborative Learning	13.18	0.0
Student Engagement	Collaborative Learning	11.64	0.0
Passion Consistency	Grit	7.25	0.0
Perseverance	Grit		
Academic Skill	Academic Achievement	7.97	0.0
Leadership Skill	Academic Achievement		
Communication Skill	Academic Achievement	12.26	0.0

Table 3 above shows that all indicators are said to be valid because they have a Critical Ratio (CR) value that is twice the standard error value. The probability value of each indicator is also good because it is less than .05. Evidence from this data

indicates that all variable indicators have met the validity requirements of the constructs.

Table 4: Results Of The Cfa Measurement Model For All Major Constructs.

Construct	Composite Reliability	AVE
IT Skill	.95	.87
Grit	81	.69
Online Learning	.93	.81
Collaborate Learning	.90	.76
Academic Achievement	.89	.73

Table 4 above are the results of the CFA measurement model for all major constructs and dimensions. The construct has valid reliability if the value of Construct Reliability (CR)>=.70 and the value of variance extracted >=.50. Interpretation of the reliability construct measure can be said to be good if the value is more than .40 [24]. Based on the results of reliability testing on the measurement model path diagram, it shows that all items are valid because of Composite Reliability (CR)>.60. Consistency of Interests (Passion) has a value of construct reliability below .60. However, it can be concluded that all constructs in this study are feasible to be used in the model. Furthermore, the validity test with the average variance extract (AVE) test is a confirmatory test by looking at the average of the variance extract between indicators of a latent variable. It is said to be eligible if the AVE value is >0.5. The next construct reliability test is to evaluate discriminant validity which includes cross-loading and comparing the AVE root value with the correlation between constructs.

Table 5: Cross Loading Average Variance Extract (AVE).

Construct	IT Skill	Grit	OL	CL	AA
IT Skill	.91				
Grit		.92			
Online Learning (OL)	.48	.51	.9		
Collaborate Learning (CL)	.41	.36	.80	.87	
Academic Achievement (AA)	.52	.65	.52	.56	.85

The validity test is with discriminant validity, which is measuring how far an indicator (construct) is completely different from other indicators. The indicator is said to be valid if the square root of average variant extracted (√AVE) value of each variable is greater than the correlation value between the latent variable and other latent variables and the minimum value is 0.5. Based on the results of the discriminant validity test, the AVE value of each latent variable correlation is greater than the other latent variables with a minimum

value of 0.85. Cross Loading above can be concluded that all indicators have a greater correlation coefficient with each construct than the indicator correlation coefficient value in the constructing block in the other columns. Thus it can be concluded that each indicator in the block is the constituent of the construct in the column.

2.2 Assessment Of Structure Model

After analyzing the measurement variable measurement, each model has been fit into one full model for measuring the SEM structural model. The structural model is a relationship between constructs that have a causal relationship (cause-effect), thus, the structural model consists of independent (exogenous) variables and dependent (endogenous) variables. This is different from a measurement model which treats all variables (construct) as independent variables. Structural Model that connects between latent variables through a system of simultaneous equations. Testing the significance of this structural model uses the Goodness of Fit Index (GOFI) criteria [25]. The structural model is the relationship between constructs that have a causal relationship (cause-effect).
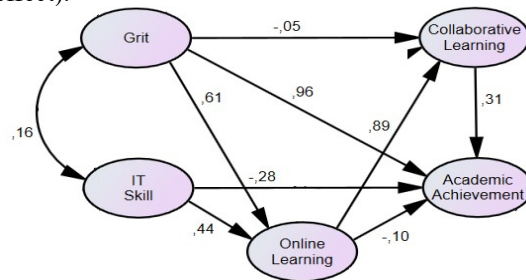

Fig. 1 Structural Model

The structural equation consists of two exogenous variables, namely IT skills and grit, and three endogenous variables, namely collaborative learning, online learning, and academic achievement. Collaborative learning and online learning in the structural equation above act as mediating or intervening variables because they have antecedents (variables that precede) and consequences (variables that follow).

Table 6: Model Fit Index.

Goodness of Fit Measure	Cut Off Value	Index Score	Description
χ^2 (Chi Square)	≤ 553.80	1449.036	Poor Fit
Cmin/DF	≤ 2.00	1.82	Good Fit
Significance probability (p)	$\geq .05$	.00	Poor Fit
Adjusted Goodness of Fit (AGFI)	$\geq .90$	.81	Marginal Fit

Goodness of Fit Index (GFI)	≥ .90	.84	Marginal Fit
Comparative Fit Index (CFI)	≥ .90	.92	Good Fit
Tucker Lewis Index (TLI)	≥ .90	.92	Good Fit
Root Mean Square Error of Approximation (RMSEA)	≤ .08	.05	Close Fit

The 8 (eight) criteria, there is only one criterion that is not fit. The criteria with a fit model are 6 (six) and represent the criteria of goodness of fit, namely absolute fit indices, incremental fit indices, and parsimony fit indices. These results explain that the SEM model developed in this study is considered good. The recommended AGFI value for an indication of a fit model is ≥.90 [26]. Based on the test results, it shows that the AGFI value is .81 and this shows that the level of conformity is at a fairly good criterion. GFI (goodness fit index) includes the model fit index which is often used as a reference for assessing fit models. The test results that have been obtained indicate that the GFI value is .84. The GFI value is .84, which explains that the level of conformity is in the good-enough criteria. CFI (comparative fit index) is the value of comparison of models prepared with an ideal model. The expected CFI value is above .90 [27]. Based on the test results, it shows that the CFI value is .924 and this shows that the level of conformity is in good criteria. A good TLI value is TLI≥.90. Based on the test results, it shows that the TLI value is .92 and this shows that the level of conformity is in good criteria. The RMSEA value ≤ .05 indicates close fit, whereas if the value is in the range .05≤ RMSEA< .08 it indicates that the model can still be accepted as a good fit model. The test results get an RMSEA value of .05. The RMSEA value of .05 proves that the level of conformity is in good criteria.

To test whether the estimated value of indicators (first order) or indicators and dimensions (second order) measures empirically the latent variable being tested; a parameter significance test is carried out on the latent variable. The test at this stage is carried out to find out whether the indicator or dimension can measure or reflect the latent variable being tested. If the result is p value ≤ 0.05 or C.R. ≥ 1,967 (C.R. = t_{count}) then the indicator or dimension is declared significant.

Table 7: Variable Significance Test.

Path Significance Test	Estimate	C.R
IT Skill → Online Learning	.44	1.58
Grit → Online Learning	.614	2.28
Online Learning → Collaborative	.894	9.58

Learning		
Grit → Collaborative Learning	-.05	-.39
IT Skill → Academic Achievement	-.28	-1.16
Online Learning → Academic Achievement	-.10	-1.10
Grit → Academic Achievement	.96	3.55
Collaborative Learning → Academic Achievement	.31	3.90

The results of the calculation of the significance test of variables show that there are 3 (three) parts whose estimation value is negative, namely the effect of Grit on Collaborative Learning (-.05), the influence of Information Technology Skills on Academic Achievement (-.28) and the effect of Online Learning on Academic Achievement (-.10). This negative value proves that the relationship between these variables has a negative effect. Based on the results of the significance test in Table 5 above, it shows that not all variables have a C.R value that is greater than the t-table value, namely 1.96. Information Technology Skills on Online Learning with a C.R value of 1.58≤1.96. Grit for Collaborative Learning, the value of C.R is -.39≤1.96. Information Technology Skills on Academic Achievement with a C.R value of -1.161≤1.96. Online Learning on Academic Achievement with a C.R value of -1.10≤1.96. Likewise with the probability value that not all indicators are below the value of .05 or less than the value of .05. So it can be concluded that not all variables have a positive and significant effect.

Analysis of the effect of determination in SEM analysis is used to determine the contribution of exogenous variables to endogenous variables, which can be seen from the adjusted R square. Coefficient of determination description of the magnitude of the influence given by the independent variable or independent variable (X) on the dependent variable or dependent variable (Y). The coefficient of determination is used to determine how much influence the independent variable contributes simultaneously (together) to the dependent variable. The coefficient of determination (R2) essentially measures how far the model can explain endogenous variations.

Table 8: R-Square (Coefficient Of Determination).

Direct Influence	Path Coefficient	Standard Error	R-Square
IT Skills towards Online Learning	.44	.28	.29 (29.0%)
Grit towards Online Learning	0.61	.27	
Online Learning towards Collaborative Learning	.88	.09	.65 (65.3%)

Grit towards Collaborative Learning	-.05	.12	
IT Skills towards Academic Achievement	-.28	.24	
Online Learning towards Academic Achievement	-.10	.09	
Grit towards Academic Achievement	.96	.27	.60 (60.5%)
Collaborative Learning towards Academic Achievement	.31	.08	

Based on Table 8 above, the r-square value of the Online Learning variable was 29.0%, the r-square for the Collaborative Learning variable was 65.3% and the r-square for the Academic Achievement variable was 60.5. From the results of the determination analysis, it is concluded that the influence of the Information Technology Skills and Grit variables on Online Learning is 29.0%, the influence of the Online Learning and Grit variables on Collaborative Learning is 65.3% and the influence of the Information Technology Skills, Online Learning and Collaborative Learning variables on achievement Academic at 60.5%. Determination coefficient from Table 8 above it can be concluded that Information Technology Skills and Grit can explain variations of Online Learning variables by 29.0%, Online Learning and Grit can explain variations of Collaborative Learning variables by 63.3% and Information Technology Skills, Online Learning and Grit are able explains the variation of the Academic Achievement variable by 60.5%.

2.3 Path Coefficient Value

In this study, to determine the magnitude of the indirect relationship or the relationship through a mediating variable using the Sobel test formula. All path coefficient values from the indirect relationship are generated from the single test calculation (see Table 9).

Table 9: Direct And Indirect Path Coefficient.

Path	Impact	
	Direct	Indirect
IT Skill → Online Learning	.44	
IT Skill → Online Learning → Academic Achievement		-.91
Online Learning → Collaborative Learning → Academic Achievement		3.61
Online Learning → Collaborative Learning	.88	
Collaborative Learning → Academic Achievement	.30	
Grit → Collaborative Learning	-.06	

Grit → Academic Achievement	.70	
Grit → Online Learning	.61	

Based on the analysis of the research path diagram, it shows (a) a direct effect of IT Skills on online learning with a path coefficient of .44; (b) indirect influence between IT Skills on Academic Achievement through online learning with a path coefficient of -.91; (c) the indirect effect of online learning on academic achievement through collaborative learning with a path coefficient of 3,61; (d) the direct effect of online learning on collaborative learning with a path coefficient of 0.88; (e) direct effect of collaborative learning on academic achievement with a path coefficient of 0.30; (f) the direct effect of Grit on collaborative learning with a path coefficient of -0.06; (g) direct effect of Grit on academic achievement with a path coefficient of 0.70; and (h) the direct effect of Grit on online learning with a path coefficient of .61.

2.4 Hypothesis Test

This hypothesis testing is based on processing research data using SEM analysis by analyzing the regression value. Hypothesis testing in this study uses regression weight Analysis of Structural Equation Modeling. The criteria for testing the hypothesis according to [28] that if the Critical Ratio (CR) value is > 1.96 or p-value with a comparison of the significance level ($a = 5\%$) or < 0.05 then the exogenous variables affect endogenous variables, but if the Critical Ratio (CR) <1.96 or p-value > 0.05, then the exogenous variables do not affect endogenous variables.

Table10: Variable Significance Test.

Path Significance Test	C.R	P-value	Description
IT Skill → Online Learning	1.58	.113	Not Significant
Grit → Online Learning	2.28	.023	Significant
Online Learning → Collaborative Learning	9.58	.001	Significant
Grit → Collaborative Learning	-0.39	.695	Not Significant
IT Skill → Academic Achievement	-1.16	.246	Not Significant
Online Learning → Academic Achievement	-1.10	.269	Not Significant
Grit → Academic Achievement	3.55	.001	Significant
Collaborative Learning → Academic Achievement	3.90	.001	Significant

Hypothesis 1 Test: Hypothesis 1 (one) test in this study is that there is a direct and positive influence between the IT skills variable on the online learning variable. This means that in the implementation of online learning involving technological media, a student needs sufficient

information technology skills to maximize teaching and learning activities. Based on the results of data processing, it is known that the Critical Ratio (CR) value of the IT skills variable to the online learning variable is 1.58 with a Probability (P) value of .113 (see Table 10). These two values provide information that IT skills have no positive and significant effect on online learning variables. Thus it can be said that hypothesis 1 in this study is rejected.

Hypothesis 2 Test: Hypothesis test 2 (two) in this study is that there is an indirect and positive influence between the IT skills variable on the academic achievement variable through online learning. This means that combining IT skills with online learning can play a separate role in achieving good student academic achievement. Based on the results of data processing, it is known that the z-Sobel value of the IT skills variable on the academic achievement variable through the online learning variable is -.91 (see Table 9). This value provides information that the IT skills variable does not have a direct and insignificant positive effect on the student's academic achievement through collaborative learning. Thus it can be said that hypothesis 2 in this study is rejected.

Hypothesis 3 Test: Hypothesis test 3 (three) in this study is that there is an indirect and positive influence between online learning variables on academic achievement variables through collaborative learning. This means that online learning by involving the interaction and involvement of a student with other students will further increase their academic achievement. Based on the results of data processing, it is known that the z-sobel value of the online learning variable on the academic achievement variable through collaborative learning is 3,61 (see Table 9). This value provides information that online learning variables have a positive and significant effect on student academic achievement through collaborative learning. Thus it can be said that hypothesis 3 in this study is accepted.

Hypothesis 4 Test: Hypothesis test 4 (four) in this study is that there is a direct and positive influence between online learning variables on collaborative learning variables. This means that through online learning, students can collaborate or work together. Based on the results of data processing, it is known that the value of the Critical Ratio (CR) of the online learning variable against the collaborative learning variable is 9,58 with a Probability (P) value of 0.001 (see Table 10). These two values provide information that online learning variables have a positive and significant effect on

collaborative learning variables. Thus it can be said that hypothesis 4 in this study is accepted.

Hypothesis 5 Test: Hypothesis test 5 (five) in this study is that there is a direct and positive influence between collaborative learning variables on academic achievement variables. This means that collaborative learning can facilitate students in working together as a team which in turn can improve student academic achievement. Based on the results of data processing, it is known that the Critical Ratio (CR) value of the collaborative learning variable on the student academic achievement variable is 3,90 with a Probability (P) value of 0.001 (see Table 10). These two values provide information that the collaborative learning variable has a positive and significant effect on the student academic achievement variable. Thus it can be said that hypothesis 5 in this study is accepted.

Hypothesis 6 Test: Hypothesis test 6 (six) in this study is that there is a direct and positive influence between the grit variable on the collaborative learning variable. This means that collaborative learning by students requires persistence, hard work, and resilience to achieve academic success. Based on the results of data processing, it is known that the value of the Critical Ratio (CR) of the grit variable on the collaborative learning variable is -.39 with a Probability (P) value of .69 (see Table 10). These two values provide information that the grit variable has no negative and insignificant effect on the collaborative learning variable. Thus it can be said that hypothesis 6 in this study is rejected.

Hypothesis 7 Test: Hypothesis test 7 (seven) in this study is that there is a direct and positive influence between the grit variable on the academic achievement variable. This means that high enthusiasm and business persistence in students can achieve good academic achievements. Based on the results of data processing, it is known that the value of the Critical Ratio (CR) of the grit variable on the student's academic achievement variable is 3,55 with a Probability (P) value of 0.001 (see Table 10). These two values provide information that the grit variable has a positive and significant effect on the student academic achievement variable. Thus it can be said that hypothesis 7 in this study is accepted.

Hypothesis 8 Test: Hypothesis test 8 (eight) in this study is that there is a direct and positive influence between the grit variable on the online learning variable. This means that online learning requires students to be disciplined, resilient, obedient, and aware. The nature of grit in

students is believed to provide better grades and provide a stronger focus which in turn provides greater opportunities for completion of online learning. Based on the results of data processing, it is known that the value of the Critical Ratio (CR) of the grit variable to the online learning variable is 2,28 with a Probability (P) value of .023 (see Table 10). These two values provide information that the grit variable has a positive and significant effect on online learning variables. Thus it can be said that hypothesis 8 in this study is accepted.

Table11: Variable Significance Test.

Hypothesis	Statement	Description
H1	There is a direct and positive influence between the IT skills variable on the online learning variable	Hypothesis not accepted
H2	There is an indirect and positive influence between the IT skills variable on the academic achievement variable through online learning	Hypothesis not accepted
H3	There is an indirect and positive influence between online learning variables on academic achievement variables through collaborative learning	hypothesis accepted
H4	There is a direct and positive influence between online learning variables on collaborative learning variables	hypothesis accepted
H5	There is a direct influence between collaborative learning variables on students' academic achievement variables	hypothesis accepted
H6	There is a direct and positive influence between the grit variable on the collaborative learning variable	Hypothesis not accepted
H7	There is a direct and positive effect between the grit variable on the student's academic achievement variable	hypothesis accepted
H8	There is a direct and positive influence between the grit variable on the online learning variable	hypothesis accepted

To see if there are differences in students' information technology skills based on semester groups, it is necessary to test the mean (average) of the group. The test of the mean uses One Way Analysis of Variance (ANOVA). The use of ANOVA is not in-depth but is only used to test the difference in grades (IT skills) of each semester group.

Table12: Description Of It Skill.

Semester	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
4	15	5.01	0.53	4.93	5.09
6	9	4.96	0.74	4.81	5.11
8	90	5.17	0.58	5.04	5.29
10	6	4.20	1.04	3.11	5.29
Total	350	5.02	0.63	4.96	5.09

Based on the output of SPSS Descriptives, it can be seen that the average difference in IT skills from the five semesters of students with details are (1) the average IT skill in semester 4 is 5.01; (2) the average IT skills in semester 6 is 4.96; (3) the average of IT skills in semester 8 is 5.17; (4) and the average IT skills in semester 10 is 4.20. Thus, descriptively, it can be concluded that the highest average IT skill is in semester 8, which is 5.17.

Table13: It Skills Analysis Of Variance (Anova) Test.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.287	4	1.572	4.121	0.003
Within Groups	131.956	346	0.381		
Total	138.243	350			

The basis for decision making with ANOVA analysis is if the significance value (Sig)>0.05, then the average is the same and if the significance value (Sig)<0.05, then the average is different. Based on the Anova output in Table 13, it is known that the significance value is 0.003 <0.05, so it can be concluded that the average IT skills of the four semester groups are significantly different.

There is a difference in the IT skill level of lower semester students and upper semester students. Lower semester students are less skilled in IT compared to upper semester students. This condition has provided empirical evidence that IT skills have no effect on student academic achievement due to the lack of understanding of 4th semester students (fourth) of IT skills. Taking into account the 4th semester respondents, which amounted to 157 out of a total of 351 respondents, the 4th semester students really gave a significant influence on the non-influence of IT skills on student academic achievement. The higher a student's semester, the information technology skills will also be better.

The average IT skills among 4,6,8 and 10 semester students are also significantly different. This difference in skills can be the cause of the ineffectiveness of IT skills on student academic achievement through online learning. Based on the indicators that exist in online learning such as

learning together, sharing knowledge, establishing relationships, problem analysis and information literacy, it is more technical in using online learning media so that it does not have a significant effect on academic achievement. It is important for higher education managers to focus more on efforts that can support students' understanding of information technology skills. Early semester students need to be given material that is more oriented to the cultivation of information technology skills so that they can use these skills to achieve academic achievement from the first semester to the final semester.

Based on the SPSS output from the Homogeneity of Variance Test, the data variance is homogeneous or the data variance is the same. This is evidenced by a significance value of 0.627 which is greater than 0.05 (see Table 14). Homogeneous data cannot have a significant effect on the variables it influences. In this context, grit cannot have a significant effect on collaborative learning because the average grit value between 4, 6, 8 and 10 semester students is significantly the same.

Table14: Est Of Homogeneity Of Variances.

		Levene Statistic	Df1	Df2	Sig.
Value Grit	Based on Mean	.619	3	346	.603
	Based on Median	.346	3	346	.792
	Based on Median and with adjusted df	.346	3	316.45	.792
	Based on trimmed mean	.582	3	346	.627

Based on Table 14, the homogeneity test of the average grit between 4, 6, 8 and 10 semester students, the data distribution is homogeneous. This homogeneous data distribution is not able to significantly influence grit on collaborative learning. Furthermore, based on the one way ANOVA test, there is no significant difference in grit values between semesters 4, 6, 8 and 10 (see Table 15).

Table15: GRIT ANALYSIS OF VARIANCE (ANOVA) TEST.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.642	3	.214	.585	.625
Within Groups	126.490	346	3.66		
Total	127.132	349			

Based on Table 15, the one way ANOVA test on the average grit of students can be explained

that the significance value of 0.625 is greater than 0.05. This proves that there is no significant difference in grit scores between semesters 4, 6, 8 and 10. This condition also causes grit to not have a significant effect on collaborative learning. If we look at the indicators of grit, there are several indicators on the grit variable that are not directly related to collaborative learning, such as indicators that are not easy to change and are not easily distracted from other goals. In collaborative learning, students are required to be able to accept the opinions and ideas of others in discussion forums. Students must be flexible and not rigid and not impose ideas or ideas on others. Other indicators such as commitment to work, persisting in challenges and obstacles, working hard and being diligent are more directed towards long-term goals that are less influential with collaborative learning activities that require more time to solve problems.

This study has proven that student academic achievement is related to grit. The achievement of academic achievement by a student cannot be separated from how diligent the student is in learning to pursue goals. Consistency of interest also plays a very important role in academic achievement. When students have an interest or love for a job, then the student can complete the job well even when faced with various challenges in doing it. Positive academic achievement can be achieved if a student has grit because only with persistence and consistent interest can a goal be achieved [29]

Success in online learning is strongly influenced by the grit factor which includes persistence of effort and consistent interest. The success of student online learning activities includes self-discipline, obedience and awareness [30]. It is believed that grit in students can give students better grades and provide a stronger focus which in turn provides greater opportunities for completing online learning [31]. Students who fail are generally due to decreased motivation, lack of initiative and the ability to build their own knowledge.

4. CONCLUSION AND FUTURE RESEARCH

This study concluded that the results of data analysis showed that 3 hypotheses did not affect, either directly or indirectly, while the other 5 hypotheses were proven to affect. The results of the data analysis there is no influence on the IT skills on the online learning. These results provide an understanding that online learning does not require

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information technology skills as measured by information and internet skills, analysis and development skills and problem solving skills. Likewise, the IT skills variable on the student academic achievement variable through online learning has a negative effect. The results of this hypothesis illustrate that students explain that students' IT skills do not have an impact on academic achievement. Through testing the mean using One Way Analysis of Variance (ANOVA), there is a descriptive difference in average IT skills between students semesters. Lower semester students are less skilled in IT compared to upper semester students. This condition has provided empirical evidence that IT skills have no effect on student academic achievement due to the lack of understanding of 4th semester students (fourth) of IT skills. It is important for university managers to focus more on efforts that can support students' understanding of information technology skills. Early semester students need to be given material that is more oriented to the cultivation of information technology skills so that they can use these skills to achieve academic achievement from the first semester to the final semester. Meanwhile, between online learning variables and student academic achievement variables through collaborative learning, indirect and positive influences have been found. The results of this study support the hypothesis which means that student academic achievement is increasing through collaborative learning. Likewise, online learning influences collaborative learning. This result is the same as the hypothesis which means that the increase in student activity in collaborative learning cannot be separated from the support for the use of online learning. The same finding is in the collaborative learning variable which influences student academic achievement. The results of this study are the same as the hypothesis which means that the achievement of student academic achievement is due to student activity in collaborative learning.

On the other hand, research shows that grit has no effect on collaborative learning variables. These results explain that student success through collaborative learning does not depend on student interest and persistence. Grit has more influence on student achievement variables and this result is the same as the hypothesis. This means that to achieve good student academic achievement requires long-term attention and interest. Grit also influences online learning variables and this result is the same as the hypothesis. This means that in online learning activities through the support of

information technology, students must be diligent and have a high interest in being able to achieve success.

This study has limitations on the sample used, which is only carried out at universities that provide education in the field of information technology, namely private STMIK in Indonesia. However, the results of this study can be applied in various public and private universities that carry out online learning activities. Data analysis only uses quantitative data analysis techniques so that concluding is only based on quantitative data processing which includes data tabulation, statistical calculations, and statistical tests.

For further research, checking the data to gain confidence in the validity of the data should use a combination method, namely Concurrent Triangulation Design (a balanced mix of quantitative and qualitative). Data that is declared valid through triangulation will provide confidence to the researcher about the validity of the data, so there is no doubt in making conclusions about the research conducted.

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