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## Role of Conjunctions and Students' Cognitive Characteristics in Argumentative Essay Writing

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**Abstract.** Most high school students are able to write arguments. However, most students are still unable to develop complex writing. The purpose of this research was to investigate the students' argumentative writing which displays various linguistic features and cognitive characteristics, and to investigate the conjunctions that fall into several categories (addition, opposition, causal, and time), which are markers of the complexity of the students' reasoning. The method used in this research was factorial analysis because it aimed to determine the students' linguistic and cognitive features in relation to improving the quality of the students' argumentative writing. The sample in this study was 350 high school students from grades 10 to 12. Analysis was carried out on the students' written argumentative essays which were written in the context of formal or academic language, transcribed and given an analysis code. The research findings show that students are able to demonstrate complex and high-level reasoning according to their use of conjunctions in their essays. The use of conjunctions based on class is relatively low in terms of the number of addition, contradiction, causal, and temporal conjunctions in each essay. The interclass correlation analysis shows that the essay length variable is in a stable condition, while student variability is higher in relation to the use of argument types and conjunctions. Based on the results following the testing of the predictability of conjunction use on argument sophistication, it was found that conflicting conjunctions contributed positively to argument sophistication apart from other variables (essay length, topic, gender, and student socioeconomic status). Contradictory conjunctions are the most complex conjunctions used by

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students using the integrative perspective. These conjunctions are also used to control the length and type of essay topic. Conjunctions can also contribute to the sophistication of the students' argumentative essays.

**Keywords:** writing ability; cognitive characteristics; linguistic features; argumentation essay; conjunctions

## 1. Introduction

Most students in Indonesia are not able to write well. This can be seen from the linguistic features and idea organization used. These two aspects of writing do not reflect education level. We still find there to be many high school students whose writing quality is the same as that of students at lower levels, such as elementary and middle school students (Hadianto et al., 2021b; Harris et al., 2019). Research on linguistic features and cognitive characteristics in writing is necessary so then teachers and students have guidelines for developing their writing skills. This research seeks to investigate the reasoning abilities and linguistic features of high school students (their ability to use conjunctions) in the context of argumentative essays. The researchers investigated the frequency of use of the types of conjunctions and the complexity of the conjunctions used. Through this research, teachers can determine the level of complexity of the developing students' reasoning abilities according to the linguistic features and organization of the students' ideas in the text. This is in accordance with argument scheme theory, which states that the complexity of the students' reasoning abilities can be determined from their use of language and the organization of ideas in their writing (Lehmann et al., 2019; Mateos et al., 2020). The researchers also investigated the relationship between conjunction use and argument complexity, as well as the overall cognitive ability found in the sampled student writing. Knowledge about the development of the students' linguistic and cognitive features can help teachers design teaching processes that are more effective at improving the students' argumentative writing abilities (Casado-Ledesma et al., 2021; Cheong et al., 2018). The conceptual framework used in this research was the concept of academic language development, and cognitive thinking and reasoning abilities (Casado-Ledesma et al., 2023; Miller et al., 2018).

The challenge of using academic language and developing literacy in argumentative writing skills today is related to the students' ability to determine a logical point of view of a problem and be able to maintain it until the final stage of their writing. The ability to maintain one's reasoning until the end requires very good cognitive thinking and reasoning skills (Kiuvara et al., 2023; Teng et al., 2022). The most difficult part of developing reasoning is that the general idea is translated into written form and must comply with the rules of that type of text. Many students are unable to master basic writing skills which causes them to be unable to write coherent and cohesive argumentative texts. Based on the survey results of previous research, student writing abilities at secondary school level have not shown a significant improvement in the last five decades. From the total data, only 20% of secondary level students are able to demonstrate writing skills in the good category based on data from the National Education Statistics Center (Sherman et al., 2022; Stuart et al., 2020). Writing argumentative texts requires cognitive and linguistic abilities at an advanced or very good level. Furthermore,

based on previous research, it is revealed that the writing abilities of high school students are very low. This is due to the demands of quite complex language and literacy skills and the ability to consider various points of view as part of strengthening the ideas in their writing (Latifi et al., 2023; Yaman, 2018). Students must have these abilities to be able to produce argumentative essays of good quality in terms of the language and reasoning they use.

Some of the challenges for students in producing argumentative essays include the ability to use vocabulary that has appropriate lexical meaning, both in the use of conjunctions and ordinary vocabulary. The use of conjunctions is one of the skills in academic language learning that can influence readers through the ideas they express (Sherman et al., 2022; Yang, 2022). Students at the elementary and intermediate levels are experiencing the development of their academic language skills. Previous research reveals that middle school students are in the right period to learn argumentative reasoning and master the ability to write arguments. Adolescence is the right phase to learn the characteristics and use of academic language for the next stage of habituation (Nussbaum et al., 2019; Miller et al., 2018). This research aims to examine the frequency of cognitive features (types of arguments) and the use of conjunction linguistic features in the argumentative essay texts of students. The hypothesis proposed is that conflicting conjunctions are the strongest predictor among other types of conjunctions of producing complex arguments (arguments with multiple and integrative perspectives). In this research, several research questions were formulated, namely 1) What is the composition of the use of arguments and non-arguments in argumentative essays? 2) What is the proportion of use of conjunctions in argumentative essays? 3) What is the relationship between the types of argument and conjunctions in various essay lengths and topics? and 4) How is the use of conjunctions related to the overall sophistication of the argument?

## **2. Literature review**

### **2.1 Learning to write arguments at school**

The term 'argument' tends to convey aggressive and opposing talk. However, in this research, arguments are written ideas that are combined to strengthen arguments, solve problems, or provide solutions to a written topic. This research not only focuses on the students' reasoning when writing argumentative essays but also on the collaborative and dialogic learning process used in vocabulary learning (Hadianto et al., 2022; Latifi et al., 2023). Argumentative essay texts are considered to be a medium for teachers to assess the complexity of student reasoning. This research uses argument scheme theory and the dialogic argumentation model. This theoretical model not only focuses on assessing the dialogical ability of arguments but also on the ability to develop argument schemes that are explained in the writing (Noroozi et al., 2020; Yaman, 2018).

The researchers have made observations regarding the discussions and debates on certain topics carried out as part of the learning process. An intervention was also carried out in the process of the students' academic vocabulary learning carried out in the school with the aim of improving the students' reading comprehension skills. The focus of this research is in accordance with argument scheme theory and the dialogic argumentation model which states that to produce

argumentative essays requires learning through regular discussions on controversial topics (Nagao, 2019; Sherman et al., 2022). Through this topic, teachers can investigate the students' argument movement strategies as part of strengthening their ideas. The next analysis was an analysis of each essay using an analytical scheme to investigate the rationalization of the arguments used by the students. Using this method, the researchers were able to classify the types of arguments used by the students. The researchers also adapted Crowell's coding scheme to assess the results of the analysis because this scheme can investigate the level of complexity of the students' argumentative essays and also assess the movement of the arguments they use as opposing arguments (Deane et al., 2021; Ollesch et al., 2021).

Through coding scheme analysis, the researchers were able to produce two similar analyses. First, the researchers were able to investigate the relationship between conjunctions and the frequency of the types of argument used in argumentative essays. Second, researchers can also assess the type of argument which shows the level of sophistication of the student's argument as a whole. Conjunctions are the characteristics of language use in argumentative essays that function to make the text cohesive by adding information or providing conflicting points of view.

## **2.2 Movements of reasoning that represent the complexity of an argument**

Detailed analysis can make it easier for researchers to obtain reliable information about the argumentation movements used by students. The majority's coding scheme and argumentation intervention were used in this analysis for the assessment. The score following this analysis can provide an overall summary of what is contained in the writing. Teachers can find individual ideas that can be coded reliably using one of four categories, namely irrelevant or repetitive arguments, arguments that only support their own ideas, arguments with a dual perspective containing both positive and negative arguments, and arguments with an integrative perspective or ideas that oppose their own arguments and support different ones (Li & Hebert, 2023; Teng et al., 2022). Arguments with multiple and integrative perspectives are arguments characterized by more complex reasoning compared to other types of argument. The assessment of the in-depth reasoning aspects of the students' argumentative essay writing will really help teachers understand the development of the students' writing abilities. Based on previous research, it was found that most teenage students tend to provide arguments that only support their own ideas and do not consider opposing arguments (Ferretti & Graham, 2019; van Driel et al., 2022). However, students in adolescence can also provide conflicting arguments if asked directly after following dialogue argumentation instructions as part of the learning process (Mierwald et al., 2022). This research was conducted on high school students because students at this time are able to demonstrate their ability to use complex reasoning when writing their arguments. In addition, middle school students are also involved in class discussions and debates which provide opportunities for students to develop their argument scheme skills. The researchers hope that through this research, they will be able to determine the indicators of sophisticated arguments and the linguistic and cognitive features used at each level.

### **2.3 Conjunctions in argumentative texts**

Research on academic language features in previous linguistic and educational research includes features of accuracy when using lexical words, for example, the ability to understand and use appropriate conjunctions. The correct use of these conjunctions will help students gain knowledge and the ability to understand more complex and longer academic texts (Matos, 2021; Haro et al., 2023). Conjunctions are language features used to make the resulting text cohesive and they have the function of connecting parts of the text. The function of conjunctions as connectors involves several categories, namely as connectors for addition, contradiction, cause and effect, and time or temporal sequence. Addition connecting conjunctions function to add words or phrases, for example, and, as well as, furthermore, and besides (Cheong et al., 2018; Lehmann et al., 2019). Contradictory conjunctions include although, even though, but, whereas, and however. Cause and effect conjunctions include therefore, because of that, and as a result. Connecting conjunctions include then, after that, before, and finally. Most of the previous research has shown that conjunctions are a challenging language feature and can predict students' reading comprehension abilities (Lotfi et al., 2019; Yaman, 2020). This research aims to explore the contribution of conjunctions in academic writing to the complexity of the students' argumentative reasoning. Research on the relationship between these two variables can provide implications for recommendations regarding teaching indicators and the evaluation of argumentative writing abilities. In addition, using media to evaluate the use of internal conjunctions in texts ensures that the assessments carried out are comprehensive and reliable. The medium used was automatic cohesion analysis. This media can analyze and classify the conjunctions used in writing. Automatic cohesion analysis can identify the proportion of the number of conjunction types used in an essay to produce a score that represents the density of each type of conjunction per essay (Lehmann et al., 2019; Li & Cui, 2021).

## **3. Methodology**

### **3.1 Method and sample**

The research design used in this research was factorial analysis with a quantitative approach because it aims to determine the contribution of the students' linguistic features and cognitive features in the students' argumentative essay writing to the complexity of the students' arguments. The participants involved in this research consisted of 350 high school students from three grade 10-12 schools. The participating schools were schools that have implemented school literacy programs established by the government. The evaluation has focused on academic vocabulary use and reading comprehension skills. The national curriculum incorporates the teaching of argumentative essays included in both Indonesian and English lessons, and this is carried out independently. The topics used are adapted to the school program, namely the natural sciences and social sciences. The demographic variables for the student participants based on class are given in Table 1. The data corpus was taken from 300-350 essays. Here, 4-5 essays were analyzed from the data corpus for each unit in the research. The students who participated in this study came from a variety of ethnic, socioeconomic, and native language backgrounds. The students are dominated by the Sundanese ethnicity because this research was carried out in the West Java

region, Indonesia. In addition, 50% of the students' socio-economic status came from both the upper and lower classes. Students who mastered English in this study also varied from beginners to advanced. However, there were also students who had only mastered Indonesian and Sundanese. Language identification was carried out to analyze whether there was a role held by language mastery in the ability to write argumentative essays.

**Table 1. Explanation of the participant's demographic variables**

Demographic	10th grade <i>n</i> (%)	11th grade <i>n</i> (%)	12th grade <i>n</i> (%)	All students <i>n</i> (%)
The number of students	50 (16)	50 (43)	100 (48)	150 (102)
Gender				
Woman	3 (45.5)	3 (13.6)	12 (56.7)	15 (41)
Man	5 (67.8)	15 (90.2)	9 (45.6)	31 (70)
Ethnicity				
Sunda	5 (71.8)	9 (52)	10 (61)	23 (54.6)
Non-Sundanese	2 (18.9)	6 (34.5)	4 (16.8)	10 (26.8)
English language skills				
Only able to speak English	4 (54)	6 (32.5)	7 (40.2)	16 (41.6)
Advanced level English	2 (18.9)	9 (53)	4 (17.8)	5 (12)
Redesigned. Fluent English	3 (34.5)	4 (20.1)	7 (34.5)	18 (51)
Limited English			3 (13.2)	6 (13.6)
Socioeconomic status				
Middle and upper socioeconomic status levels	3 (41.2)	8 (45.5)	10 (46)	19 (51)
Low socioeconomic status level	5 (68.2)	10 (61.2)	10 (52)	23 (61)
Achievement level Language standardized tests				
Advanced	6 (84.6)	6 (35.4)	10 (61)	20 (51.8)
Expert	2 (17.8)	6 (35.4)	8 (41.2)	14 (35.4)
Base		3 (15.2)	2 (6.7)	4 (8.4)
Below basic		3 (14.5)	2 (6.7)	3 (6.2)
Way below basic		2 (7.8)		3 (6.2)

### 3.2 Data corpus

The students involved in this research had previously received writing lessons as part of the national curriculum. Writing learning is included in both Indonesian and English subjects. Apart from learning to write, learning academic vocabulary and other forms of language are both also studied at the high school level. Overall, the students receive 4 essay topics during the 13 weeks of writing instruction. The essay topic used refers to the learning material, and the essays are written in Indonesian. The essays produced during this research totaled 350 essays from 3 schools starting from grades 10-12 at high school level. The students were

instructed to create an argumentative essay on a previously known topic. The validity and reliability of the instrument was tested empirically using samples and through expert judgment tests by those who have expertise in the field of argumentation writing. Based on these two tests, the instrument was determined to be suitable for use in this research. In the process of writing the essays, the teacher did not provide feedback so then there was no revision stage. This was able to guarantee the reliability of the data. The instructions given for each essay topic were made specific so then they were easy for the students to understand.

**Table 2.** Essay topics and instructions

Week number	Number of essays	Essay topics
14	350	Can the death penalty for corruptors be carried out?
17	350	Who is responsible for teenagers smoking?
20	350	Can smoking for students be legalized?
23	350	Who is responsible for students dropping out of school?

### 3.3 Data analysis

The data analyzed was in the form of argumentative essay texts written in MS documents. Word was used to make the coding process easy. The essays were transcribed and converted into plain text files using an automated cohesion analysis application to analyze the linguistic features of the conjunctions used by students. Next, proportion analysis for the type of argument (argument or non-argument) was carried out. In the final stage, the analysis was carried out in accordance with the proposed problem formulation. Covariate analysis was carried out to analyze both the essay and student characteristics. The length of the students' argumentative essays was grouped into T-Units to obtain the basic criteria for measuring the length of the essays created. The T-Unit includes independent and dependent clauses. The researcher first grouped the essays into T-Units. Next, re-verification was carried out. The type of essay topic was also considered, namely binary topics and open topics. The binary topic variable provided students with the opportunity to provide an attitude of agreeing or not with a value with a binary topic code of 1. Binary topic 0 explains that students provide open arguments and provide views or attitudes that contain many entities.

Based on the previous research evidence that the type of topic and instructions have an influence on aspects of writing, the author provided them with control in the analysis. The two binary essay topics were the death penalty for the corrupt and the contract system for the workforce. The two open topics were the prohibition on students smoking and who is responsible if students drop out of school. Gender was also used as a control in the analysis. The researcher involved a dummy variable to indicate that the student's gender was female using code female = 1 and male = 0. The determination of the students' socio-economic status was based on their parents' income. The parents of students with an income below 2 million per month were in the low category, while those with an income above 2 million were in the high category. Low socioeconomic status was code = 1, and

high socioeconomic status = 0. Conjunction analysis as a predictor was carried out using an automatic cohesion analysis application. This application processed the argumentative essay text file data and calculated the types of conjunctions used in the essays. This process was carried out to determine the conjunction density. The type of conjunction word was the frequency of conjunction use divided by the total number of words in the essay. This processing used an automatic cohesion analysis application based on theory and rhetoric. There were four types of conjunctions used as a basis for the analysis, namely additional conjunctions, contradictions, cause-effect, and time sequence.

### **3.4 Analysis of the type and sophistication of arguments**

The assessment of the type of argument was determined by assessing the effect of conjunctions on the type of reasoning used in the argumentative essays. Researchers coded the types of arguments based on the coding scheme by Kuhn and Crowell (2011). Argument coding was carried out on each T unit. There were four types of argument used in this research, including code 0 for a non-argument if the argument only stated an opinion without reinforcement, was unclear, and repeated the argument. Arguments that only contained one attitude or view were coded 1, if the author's argument was supported by a positive view. Arguments with multiple perspectives were coded 2 if the argument was supported by opposing arguments and is relevant to the opposing argument. An argument with an integrative perspective was coded 3 if the author's argument contained arguments that contradicted the author's own ideas and contained positive arguments for opposing ideas. Arguments with this type of double perspective were expressed using two T units or one T unit when the students were able to provide a complete argument and used free clauses. If the students used two T units to express an integrative perspective argument, then the code used was one unit.

The results of the descriptive analysis in this study were used to present the measures of essay length, conjunction, and the type of arguments used by the students. Differences in the variables in the essays according to grade level and the differences in the demographic variables were tested using post hoc matched means comparison tests. In addition, Tukey's significant difference test was also carried out if there were more than two groups. Correlational analysis was performed to assess the intraclass correlation coefficients. Correlation analysis also provided information regarding the construction of the regression analysis. The researchers made adjustments in the regression analysis to reveal the trends in the types of argument used. A regression analysis that positioned essay length and essay topic as the covariates of the essay features was conducted to investigate the predictive ability of conjunctions on the type of argument used. The results of the covariate analysis of essay features, gender characteristics, and socioeconomic status as the control variables were included in the final regression analysis. This was done to investigate the predictive ability of conjunctions related to the overall sophistication of the arguments in the students' argumentative essays.



## 4. Results

### 4.1 Descriptive analysis and correlational analysis on essay length, type of argument, and conjunctions

To answer the problem formulation of how to use argument type and conjunctions in relation to the essay data, the researcher calculated the percentage composition of the essays that contained at least one of each argument type code used. Based on the results of the analysis, 96% of the essays used non-argument codes, 85% one-sided argument codes, 50% argument codes with multiple perspectives, and 43% argument codes with an integrative perspective. The descriptive statistical data regarding length, type of argument, and conjunctions in the sample is presented in Table 3. The analysis findings show that the average essay in each of the ten T units per essay was 9.80 with a standard deviation of 5.60. Each essay contained around 5 non-argument statements (M=5.20) with SD: 4.30. In each essay, an average of almost 3 types of argument were found with only one party with a mean = 3.80 and SD = 3.51. Types of argument with multiple perspectives were also found, resulting in mean=1.45, SD=3.10). Finally, arguments with an integrative perspective had a mean = 0.54, SD=0.72). Furthermore, from the results of the analysis, it was found that the average use of conjunctions was quite low, including addition conjunctions at 7% per essay, conflicting conjunctions at 2%, causal conjunctions at 3%, and temporal conjunctions at 2%. The researchers analyzed the most advanced types of argument in the essays to determine the argument's overall sophistication. The descriptive statistics of the types of argument used are presented in Table 4. The findings show that arguments with multiple perspectives were the most common, with an average of 3.10. The tenth-grade essay score had a score below the multiple perspective argument score of code 2, and the value was 1.80. The grade 11 and 12 essay scores above the multiple perspective argument had values of 3.07 and 3.20.

**Table 3. Analysis results for the variables of essay length, type of argument, and type of conjunction (n=350)**

Linguistic features of the essay	M (SD)	10th grade M (SD)	11th grade M (SD)	12th grade M (SD)
<b>Essay features</b>				
Essay length in T units	10.81 (6.61)	7.62 (3.01)	11.82 (6.91)	10.03 (6.74)
<b>Argument features</b>				
Non-argument	6.20 (5.31)	4.20 (2.92)	6.87 (5.60)	6.3 (5.42)
One-sided argument	3.80 (3.51)	3.02 (2.52)	3.79 (3.62)	3.85 (3.72)
Dual perspective argument	1.45 (3.10)	.97 (2.71)	2.61 (1.90)	2.30 (3.10)
Integrative perspective argument	.54 (.72)	.53 (.80)	.48 (.72)	.63 (.81)
<b>Linguistic features of conjunctions</b>				
Addition conjunction	.06 (.03)	.05 (.03)	.06 (.04)	.06 (.03)
Contradictory conjunction	.02 (.03)	.02 (.02)	.02 (.02)	.02 (.02)
Cause and effect conjunction	.03 (.03)	.03 (.03)	.04 (.03)	.03 (.02)
Temporal conjunction	.02 (.02)	.02 (.02)	.02 (.02)	.02 (.02)

**Table 4. Results of the analysis of the types of argument with the highest frequency (n=350)**

Essay features	M (SD)	10th grade M (SD)	11th grade M (SD)	12th grade M (SD)
Essay features				
The argument with the highest intensity of use	3.10 (.91)	1.90 (.92)	3.07 (.90)	3.20 (.91)

The Tukey test of the pairwise mean comparisons was carried out to determine the differences that emerged in reference to the variables of length, the type of argument, conjunctions, and the level of argument types that were used. From the test results, it was found that there was a significant average difference in the essay length variable based on the class category, namely that class 11 contained more T units than class 12 with a value of  $t=4.31$ ;  $p=0.005$ . Class 12 showed more T units than class 10 with a value of  $t=3.70$ ;  $p=.03$ . Differences in essay length and argument type were also found based on the students' gender and socio-economic status. The female students' essays contained arguments with an integrative perspective more than the male students' essays, with a value of ( $t=1.89$ ;  $p=.05$ ). The essays of the students with a low socioeconomic status had a total of T units ( $t=-5.15$ ;  $p=.000$ ), had non-argument statement types ( $t=-4.42$ ;  $p=.001$ ), and arguments with an integrative perspective ( $t=-3.20$ ;  $p=.03$ ). All findings for the types of argument for the students with a low economic status were determined to be worth less than the types of arguments that did not meet the criteria. However, no differences were found based on the level of language proficiency in relation to the aspects of essay length and the type of argument used.

Significant differences appeared in the use of conjunctions based on the class and sociodemographic variables. The grade 11 students' essays contained fewer causal conjunctions than the grade 10 students' essays ( $t=-.3.80$ ;  $p=.008$ ). Furthermore, no differences were found for the variables of argument sophistication based on class and language skills. However, the female students' essays had stronger arguments overall than the male students' essays with a score of ( $t=3.90$ ;  $p=.005$ ). The essays written by students with a low socioeconomic status showed weaker arguments than those written by the students with a low socioeconomic status). high socio-economic value ( $t=-3.72$ ;  $p=.009$ ). Based on the data presented, it is necessary to control the aspects of essay length and essay topic type for the regression analysis.

Regression analysis using the aspects of length and the type of essay topic as the research controls was conducted because there were no differences found in the argument and conjunction variables to answer the second problem formulation. The second problem formulation examined what the relationship is between the types of argument used and conjunctions based on the variables of length and essay topic. To answer the third problem formulation, namely how conjunctions are related to the sophistication of the argument as a whole, regression analysis was undertaken by controlling aspects of the student's characteristics. This was done because there were significant differences in the sophistication of the arguments based on gender and socioeconomic status. The researchers also used

Huber-White adjustments (robust standard errors) in the subsequent regression analysis.

**Table 5. Correlation analysis of the argumentative essay features**

	1	2	3	4	5	6	7	8	9	10
Number of T- units	1									
Binary topics	.061	1								
Non-argument type	.891***	-.042	1							
One-sided argument	.457***	-.389***	.173*	1						
Dual perspective argument	.423***	.581***	.261	-.462***	1					
Integrative perspective argument	.182*	.070	.041	.042	.050	1				
Addition conjunctions	.132	-.150	.045	.215*	-.015	.070	1			
Causal conjunction	.042	.134	-.031	-.014	.172*	-.016	-.045	1		
Contradictory conjunctions	.091	.094	.125	-.074	-.042	.389*	.389*	-.120	1	
Temporal conjunction	.002	.142	-.042	.046	.071	-.089	.040	-.089	-.092	1

**Table 6. Results of the intraclass correlation analysis**

Essay features	Rho coefficient	Standard error
Global features		
Essay length in T units	.71	.07
Argument features		
Non-argument	.61	.09
One-sided argument	.10	.09
Dual perspective argument	0	
Integrative perspective argument	.18	.09
Linguistic features of conjunctions		
Addition conjunction	.31	.10
Contradictory conjunction	.04	.09
Cause and effect conjunction	.13	.09
Temporal conjunction	.07	.08

#### 4.2 Contribution of conjunctions to argument type

To answer the second problem formulation, namely how conjunctions contribute to the type of argument, multiple linear regression analysis was used. Modeling the predictability of conjunctions related to argument types was carried out separately, where essay length and topic type were controlled, and Huber-White adjustments were carried out to minimize the likelihood of biased data. Based on the research results presented in Table 7, the predictor variables of essay and binary topic type have a significant correlation with the types of argument,

specifically non-arguments, one-sided arguments, and arguments with multiple perspectives. However, this does not correlate with integrative perspective arguments. Additive conjunctions predict non-argument type negatively and appears significant with a value of ( $\beta=-19.452$ ;  $p=.04$ ) based on the overall model. The additive conjunction was also able to explain 83% of the variance in the essays significantly. Conjunctions did not significantly predict one-sided arguments but the overall model appeared significant, explaining 35% of the variance in the argumentative essays. The conflicting conjunction was able to predict the type of dual perceptive argument with a significantly negative value ( $\beta=-24.780$ ;  $p=.05$ ). The overall model for oppositional conjunctions appears significant by being able to explain 45% of the variance in the essays. The conflicting conjunction was also significantly able to predict the type of argument from the integrative perspective positively with a value of ( $\beta=22.24$ ;  $p=.007$ ). In addition, it was able to explain 11% of the variance in the essays. The correlation between causal and temporal conjunctions was found to be unable to predict the type of argument used by the students.

**Table 7. Regression model analysis of the contribution of conjunctions to argument sophistication**

Argument type	Variable	$\beta$	Robust standard error	$p$	$R^2$
Non-arguments	Total T units	.791	.042	< .0002	.83***
	Essay binary topics	-.912	.41	.016	
	Addition conjunction	-19.452	9.278	.04	
	Causal Conjunctions	-9.467	8.468	.372	
	Contradictory conjunction	35.42	19.89	.089	
	Temporal conjunction	-6.110	10.40	.691	
	Constant	-.389	.542	.515	
	One-sided argument	Total T units	.201	.05	
Essay binary topics		-1.562	.492	.002	
Addition conjunction		14.130	9.689	.140	
Causal Conjunctions		.689	9.782	.950	
Contradictory conjunction		-29.82	20.420	.156	
Temporal conjunction		12.920	9.682	.189	
Constant		1.07	.630	.062	

Dual perspective argument	Total T units	.089	.03	< .0001
	Essay binary topics	3.431	.372	< .0001
	Addition conjunction	6.894	5.653	.189
	Causal Conjunctions	8.842	6.852	.214
	Contradictory conjunction	- 24.780	12.746	.06
	Temporal conjunction	- 3.821	7.947	.789
	Constant	- .962	.324	.005
Integrative perspective arguments	Total T units	.020	.012	.09
	Essay binary topics	.062	.120	.751
	Addition conjunction	- .7561	3.724	.912
	Causal Conjunctions	.052	3.881	.992
	Contradictory conjunction	22.24	7.842	.007
	Temporal conjunction	- 5.10	4.945	.387
	Constant	.191	.182	.350

### 4.3 The contribution of conjunctions to the sophistication of arguments

The third problem formulation was how the use of conjunctions contributes to the sophistication of arguments in the student essays on several topics. This research has tried to focus more on investigating the type of sophisticated argumentative reasoning as a result of the students' cognitive abilities in their writing rather than the structure of the argumentation or the quality of the writing. Regression model analysis was carried out, involving essay length and binary topic variables as the controls for the essay features, while the gender and socioeconomic status variables were used as control characteristics. The four types of additive, contradictory, causal, and time conjunctions were the independent variables used in this research. Based on the results of the linear regression analysis in Table 8, it was found that the conjunction type of variable was able to explain 26% of the variability in the sophistication of the arguments used by students, meaning that the essays tended to be filled with personal arguments. The results of the analysis show that the essay length variable is a significant predictor. Apart from that, the binary topic variable was also a positive and significant predictor of its contribution to the sophistication of the students' arguments and grade ( $\beta=.621$ ;  $p=.002$ ). The female students' essays have a positive and significant relationship with argument sophistication and grades ( $\beta=0.541$ ;  $p=0.003$ ). The conflicting

conjunction was found to be a positive and significant predictor of argument sophistication ( $\beta=18.346$ ;  $p=.035$ ).

**Table 8. Predictors of overall argument sophistication**

Variable	$\beta$	Overall argument sophistication	
		Robust standard Error	$p$
Essay length	.017	.014	.342
Binary topics	.621	.156	.002**
Female	.541	.130	.003**
Socioeconomic status	-.380	.151	.072
Addition conjunction	-3.914	3.824	.421
Contradictory conjunction	18.346	8.172	.035*
Causal conjunction	4.421	4.315	.414
Temporal conjunction	-4.819	5.472	.480
Constant	1.734	.372	.000***
			.27***

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## 5. Discussion

Essay coding was carried out in this study for the types of arguments that the students used. This research also used an automatic cohesion analysis tool to analyze the use of conjunctions in the argumentative essays. The results showed that all types of argument were used at least once in the students' essays. Apart from that, the students were also able to show complex and high level reasoning through the use of conjunctions in their essays. The use of conjunctions based on class was relatively low in relation to the addition, contradiction, causal, and temporal types of conjunction in each essay (Hand et al., 2021; Harris et al., 2019). The interclass correlation analysis showed that the essay length variable was in a stable condition, while student variability was higher related to the use of argument type and conjunction. Separate regression analyses were conducted to investigate the contribution of conjunction use and the formation of various types of argument in the students' essays. The results show that addition conjunctions have a negative correlation with non-argument types, and that conflicting conjunctions have a negative correlation with dual perspective argument types but contribute positively to the formation of arguments from an integrative perspective (Granado-Peinado et al., 2019). Furthermore, based on the results from testing the predictability of conjunction use on argument sophistication, it was found that conflicting conjunctions contributed positively to argument sophistication apart from other variables (essay length, topic, gender, and student socioeconomic status). The findings of this research are in accordance with the previous research which has revealed that students in the adolescent phase can make complex arguments that can be identified quantitatively (Memiş & Akkaş, 2020; Mateos et al., 2020). This research is also in accordance with the theory that

the complexity of a person's argument is greatly influenced by the use of linguistic features, one of which is the use of conjunctions (Granado-Peinado et al., 2019; Lin et al., 2020).

The next finding is that students in the teenage or middle school phase tend not to be able to accept arguments that contradict their ideas but middle school students will be able to provide contradictory arguments if instructed or given an intervention first. Middle schools tend to use more dual perspective reasoning and integrative perspective reasoning. This theory is strengthened by the findings of this research, namely that arguments with multiple perspectives often appear at least once in half the essays studied (Newell et al., 2019; Yoon, 2021). Additionally, the integrative perspective argument type appeared at least once in 43% of the essay samples. The researchers claim that language learning can improve the students' reasoning abilities. The students' ability to use the linguistic feature of conjunctions in essays can contribute to the complexity and sophistication of the arguments used. Language learning time, especially learning writing, takes up 30-45 minutes a day and of course, this has an impact on the students' ability to use linguistic features when writing argumentative essays. The complexity of student arguments is proven by the student's ability to use complex reasoning by assessing other people's points of view and the point of view of the student concerned. This finding is strengthened by the theory that when students are able to provide views or arguments that conflict with their ideas, these students are considered capable of using complex reasoning in their writing (Allagui, 2021; Yaman, 2020). This is in contrast to students who are only able to provide one-sided arguments, as these students are not yet able to use complex arguments. The ability to make complex arguments can be trained through debates and class discussions on controversial topics that encourage students to think critically and provide arguments. The findings strengthen the argument scheme theory which states that a strong argument is a dialogical argument, also known as an argument that is able to provide views from several perspectives (Cheong et al., 2018; Lehmann et al., 2019).

In addition to the students' argument type, the use of the linguistic feature of conjunctions has also been explored. The results show that conjunctions have a significant relationship with the types of argument the students used in their essays. This finding is strengthened by the previous research which has revealed that conjunctions play a very important role in writing argumentative and narrative texts (Matos, 2021; Mierwald et al., 2022). From the research results, it was found that the students' use of conjunctions was at a fairly low proportion among addition, conflict, causal, temporal, and continuous conjunctions. This research is in line with the current research which has found that the use of conjunctions in middle class argumentative essays is still quite low (Miller et al., 2018). The findings of this research also reveal that conjunctions in argumentative essays act as significant predictors of certain types of argument. The results of the research show that there is a negative correlation between addition conjunctions and non-argument student statements, with addition conjunctions getting stronger, and there being very few non-argument statements. This happens because the addition conjunction provides additional information. T units were coded as non-arguments when the essay did not contain a specific type of

reasoning or there was repetition of the argument. This means that an essay using additional conjunctions is a sign that the argument is weak and non-substantive. Furthermore, it was found that there was a negative relationship between adversative conjunctions and dual perspective arguments. The more intentional the use of adversative conjunctions, the less common the use of dual perspective arguments (Ferretti & Graham, 2019; van Driel et al., 2022). Another finding is that there is a positive relationship between adversative conjunctions and integrative perspective arguments. This shows that the more intense the use of adversative conjunctions, the greater the presence of integrative perspective arguments in the students' argumentative essays (Ollesch et al., 2021; Weston-Sementelli et al., 2018).

Intermediate level students can provide opposing arguments to their point of view without using opposing conjunctions in controversial essay topics. They can also combine two opposing arguments with an opposing conjunction. This is a sign that the argument being made is a complex argument. These findings are in accordance with the theory that the relationship between conflicting conjunctions and complex reasoning tends to be found in students at a high level, or among adult students (Deane et al., 2021; Hadianto et al., 2021a). The student's age greatly influences their mastery of the use of linguistic features in their argumentative essays because their ability to use language is influenced by the language learning experiences they have had, both at school and outside of school. The use of language and complex reasoning is a two-way relationship. The cognitive and linguistic features used by students are different when the topics used are different too. The essay topic greatly influences the students' language use because their individual mastery of each topic is different. This finding is in accordance with the theory that the use of language both orally and in writing is greatly influenced by the mastery of the content of the topic being used because it is closely related to the vocabulary and linguistic features that are unique to each topic (Sherman et al., 2022; Stuart et al., 2020).

## 6. Conclusion

Complex and independent reasoning abilities can be generated through learning linguistic features, specifically academic vocabulary. One way to do this is through learning contradictory conjunctions which makes a strong contribution to complex reasoning and the sophistication of the arguments used when writing argumentative essays. The use of conjunctions based on class is relatively low in terms of the use of addition, contradiction, causal, and temporal conjunctions in each essay. The interclass correlation analysis shows that the essay length variable is in a stable condition, while student variability is higher related to the use of particular argument types and conjunctions. Separate regression analyses were conducted to investigate the contribution of conjunction use to the formation of various types of argument in the students' essays. Addition conjunctions have a negative correlation with non-argument types, and conflicting conjunctions have a negative correlation with the formation of dual perspective argument types but contribute positively to the formation of arguments with an integrative perspective. Based on the results testing the predictability of conjunction use on argument sophistication, it was found that conflicting conjunctions contribute positively to argument sophistication apart from other variables (essay length,



topic, gender, and student socioeconomic status). The finding on complex reasoning in the students' argumentative essay samples illustrates that learning how to apply academic language in writing will greatly support the quality of the students' essay writing.

This research has put forward the implication that learning to write must be carried out by strengthening the mastery of linguistic features such as conjunctions and academic vocabulary to improve the quality of the students' academic writing. Learning academic language in the context of language learning will support the students' ability to make complex and sophisticated argumentative statements so then they are able to produce various types of quality writing. This research encountered several limitations, including that the research only focused on intermediate level students, that it only focused on the level of sophistication of arguments related to the use of conjunctions and not on the structure of the arguments used, and that this research does not provide a prior intervention but relies on the results of learning vocabulary, conjunctions, and other linguistic features from the language learning that has already been carried out. This research also only focused on the linguistic features of conjunction use, rather than involving other linguistic features. The researcher recommends including a sample of students at the higher education level to explore the ability of these students to use higher and more complex linguistic features. Future research should be better provided with interventions that can support the quality of argumentative essay writing, rather than just relying on the learning that has been done at school. Investigations into other linguistic features also need to be carried out in the future which can support the quality of argumentative essay writing. Future research also requires there to be more comprehensive research on the development of academic language, especially what is needed in terms of student writing skills.

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