Grammatical and Lexical Cohesion in Students' Scientific Work

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ABSTRACT

This study analyzes grammatical and lexical cohesion in students' scientific works. Cohesion as an important aspect in academic writing plays an important role in creating *coherence* so that the writing becomes easy for readers to understand. This study describes the tools of grammatical cohesion (*references, substitutions, ellipsis, conjunctions*) and lexical cohesion (*reiteration and collocation*) in the context of student scientific writing, as well as reviews theoretical studies, analytical methods, and empirical findings from various previous studies. This study uses a descriptive and qualitative approach that describes the analysis related to the data that has been obtained. The results of the analysis showed that students tended to use lexical references and repetition more often than other cohesion devices. It was concluded that mastery of cohesion tools is very important to improve the quality of students' scientific work and needs to be improved through special learning interventions.

Keywords: Grammatical, Lexical Cohesion, Students Scientific Work

INTRODUCTION

Writing cohesion scientific papers is one of the crucial factors that help writers connect ideas systematically and logically (Pristiwati, 2011). Cohesion is differentiated into grammatical cohesion, which deals with grammar, and lexical cohesion, which deals with the choice and relationship of words in the text. Both play a role in building a continuity of meaning between sentences and between paragraphs so that the writing becomes complete and easy to understand. Student scientific writing is often faced with challenges in maintaining the cohesion of discourse. Not a few theses, theses, dissertations or student papers are less cohesive so that scientific messages are difficult to fully grasp by readers. This issue is rooted in the weak mastery of the cohesion apparatus and the lack of intensive training in the use of grammatical references and varied lexical choices. Strengthening cohesion tools is an important aspect to improve the quality of scientific work and the competitiveness of students in the international arena. This research aims to; (1) identify the types of grammatical and lexical cohesion used in students' scientific papers, (2) reveal the frequency and patterns of use of each cohesion device, (3) analyze factors that affect the tendency to use certain cohesion devices, (4) provide recommendations for improving cohesion skills in writing student scientific papers.

LITERATURE REVIEW

Cohesion as a device that connects parts of the text formally and semantically. According to Halliday and Hasan, cohesion

creates 'texture', which is the relationship between the elements of the discussion in a single text. Meanwhile, grammatical cohesion consists of several devices, including: (1) Reference: The use of pronouns and pronouns to refer to other elements in the text (e.g., he, that, the). (2) Substitution: The replacement of one element with another corresponding element (e.g. the use of 'do' in place of the previous verb). (3) Ellipse: The omission of elements that can be understood because they have been mentioned before. (4) Conjunctions: The use of conjunctions that govern the logic between sentences or between paragraphs (e.g.: but, then, therefore). Lexical cohesion is realized through the relationship between words based on meaning, including: (1) Reiteration: The repetition of words, the use of synonyms, antonyms, hyponyms, superordinates, or paraphrases. (2) Collocation: A word relationship that often appears together associatively (e.g., 'doctor' and 'hospital'). The Role and Strategy of Cohesion in Scientific Writing is Cohesion helps readers understand the structure and meaning of the text efficiently, facilitates the emphasis of main ideas, ensures clarity and effectiveness of arguments, and provides a smooth writing flow. The use of good and correct language must meet the requirements of discourse. These requirements include cohesion and coherence (Santoso et al., 2020).

Cohesion and coherence in the use of language can be achieved by using a truly harmonious coherence tool. Also text (especially written text) needs textual elements. Coherence is one of the most important elements that make up a text (Mulatsih et al., 2023). Textual elements distinguish a series of sentences as textual or non-textual (Edward et al., 2022). To do this, language users need the ability to select and use language that connects the propositions expressed to the sentences they use. The coherence of discourse is characterized by the use of formal signs (Hanafiah, 2014; Mandia, 2017). Form markers used as a means of communication are often called tools or coherence markers (Candrawati & Luh, n.d.; Lestari, 2019). Markers connect what is said with what was said earlier in the conversation. In addition, markers connect and shape the integrity of discourse based on grammatical or lexical elements. The element of cohesion consists of two pillars, namely grammatical and lexical cohesion (Azis, 2015; Sanajaya et al., 2021). The subject of this research is Grammatical Coherence. This grammatical coherence was used as an object of research because it is suspected that students often use different grammatical coherence when writing scientific papers. There are several commonly used grammatical coherence devices, namely references, substitutions, ellipticals, conjunctions, inversions, sentence pacifism, and nominalization. (Ali, 2010; Harahap, 2018).

Students pour their thoughts into language codes in the form of sentences in the form of text. This series of sentences is then interpreted by the reader according to its meaning. Discourse analysis work is text-related work (Algouzi & Hazaea, 2023; Puukko, 2024). Only through the text of the analysis of verbal discourse can grammatical coherence in the text of the research report be done (Li & Zhong, 2022; Coins & Yao, 2022). Papers are also a type of scientific work. A report is a part of a research paper written based on material obtained from the results of the research. The use of grammatical coherence in student writing is not only limited to the use of syntactic units in sentences. However, the use of grammatical coherence can also be found in the use of discourse units. To find out the extent to which students understand the phenomenon of grammatical coherence when writing a paper, it is necessary to conduct a grammatical coherence study of published papers.

MATERIALS & METHODS
The research method used is a qualitative method that describes analysis related to the data that has been obtained. This study uses language research methods related to data

collection and reduction. This research is qualitative descriptive with data obtained in accordance with the object to be studied. The research data produced is in the form of written data, namely paragraphs in student papers. The form of data for this research is in the form of fragments of student scientific paper texts in the form of final projects, papers, and essays that are suspected to contain grammatical cohesion. In the process of data collection, researchers use computer media as a tool to describe and store data, create sheet/table formats to identify and classify data. The table format is created to analyze the grammatical cohesion contained in students' scientific works.

This study uses a literature review and synthesis of the results of previous research that examines grammatical and lexical cohesion in student scientific papers. The main data were collected from the results of document analysis, qualitative and quantitative studies, and the analysis of linguistic discourse theory. Some studies also use a content analysis method for students' theses, papers, or essays by identifying and categorizing the use of cohesion devices based on the Halliday and Hasan framework.

Data collection techniques include observation techniques and recording techniques. The stages carried out for data collection are as follows: (1) Identifying the data contained in the paragraph; (2) Mark each data; (3) Calculating the amount of data found included in the research data; (4) Marking data that includes cohesive paragraphs; (5) Explaining the data that has been found; (6) Analyze the data that has been described. The instrument used in this study is the researcher with the help of an analysis table. Analysis tables are used by researchers to help collect and process data.

The analysis table will also facilitate cohesion and coherence analysis.

The data analysis technique used in this study is descriptive qualitative analysis. The researcher will analyze the data on each sample that has been collected. The stages of data analysis are as follows: (1) Mark each sentence using grammatical cohesion aspects; (2) identify the grammatical cohesion of each sample that has been collected; (3) Analyze the grammatical cohesion of each aspect; (4) Summarize the results that have been analyzed.

RESULTS

Grammatical Cohesion findings include; (1) Reference is the most frequently used device. In the analysis of student documents, references can account for 50%-70% of the overall grammatical cohesion device found. (2) Conjunctions are also widely used, but their use sometimes causes cohesion problems if they do not choose a conjunction correctly. (3) Substitutions and ellipsis are much less frequently found in student scientific papers than in the previous two devices. Meanwhile, the findings of lexical cohesion include; (1) Reiteration (especially word repetition) is predominantly used by students, with a percentage of up to 93% of the lexical cohesion device in some studies. (2) The use of synonyms, collocations, and superordinates is still very limited, showing low lexical variation and high repetition tendencies.

Analysis of causative factors; (1) Weak mastery of vocabulary and understanding of the function of cohesion devices causes students to tend to repeat words literally. (2) The lack of specialized training and guidance in the use of synonyms or complex sentence structures reinforces the tendency for repetition. (3) Indonesian learning that emphasizes formal grammar has not fully emphasized advanced cohesion strategies.

Table 1. Results of Grammatical and Lexical Cohesion Analysis Based on Student Scientific Work

Cohesion Type	Main Devices	Frequency of Student Use	Usage Examples	Research Findings Notes
Grammatical	References, Substitutions, Ellipsises, Conjunctions	High (50%-70% for reference)	"He", "they", "however", "therefore"	References and conjunctions are most commonly used. Substitutions and ellipsis are rare.
Lexical	Reiteration (repetition), Synonyms, Collocation	Very high (up to 93% reiteration)	Repetition of words, synonyms, "doctor - hospital"	Students are very dominant in using word repetition. Synonyms, collocations, and superordinates are rare.

Based on table 1, it is stated that students more often use grammatical cohesion devices in the form of references (pronouns), as well as conjunctions rather than substitutions and ellipses. The lexical apparatus is dominated by word repetition (reiteration), while variations through synonyms, collocation, and paraphrasing are still limited. The main difference lies in the variety and diversity of use: grammatical devices (especially references) are used to connect between parts of the text, while lexical tends to repeat on the same word, less semantically varied.

References as the most dominant grammatical cohesion tool are used by students in scientific writing, with a frequency of more than 80% of the total use of grammatical cohesion. This shows the student's preference for the use of pronouns to avoid repetition and maintain the fluency of the text. Conjunctions are also widely found, serving to regulate the flow of logic between sentences and between paragraphs. However, the selection of conjunctions is sometimes still incorrect, which has the potential to cause incohesion. Substitutions and ellipsis are rarely used in student scholarly works, which indicates the limitations of mastery of more complex grammatical cohesion devices. Research on essays and recount texts also confirms that students are more familiar and comfortable using references and conjunctions than other devices.

Word repetition (reiteration) as the most common type of lexical cohesion found in student writing, shows the dominance of literal repetition strategies in maintaining the continuity of the text. The rate of repetition use reached more than 90% in some studies. The use of synonyms, collocations, antonyms, and hyponyms is relatively low, indicating the limitations of vocabulary variation and deep lexical mastery. Some studies reveal students' difficulties in managing lexical cohesion in a variety of ways, which affects the clarity and integrity of their scientific texts. Quantitative studies show the dominance of repetition and the lack of use of paraphrasing techniques or other lexical variations, so the quality of lexical cohesion still needs to be improved in the context of academic learning.

DISCUSSION
The results of research on grammatical and lexical cohesion in students' scientific papers reveal a pattern of use that is quite distinctive and consistent in various studies. Students tend to rely on grammatical cohesion tools in the form of references (pronouns) and conjunctions as the main means to create cohesion between parts of the text. However, the use of substitutions and ellipsis is still very minimal, showing limitations in utilizing variations in grammatical structures that can enrich cohesion.

Meanwhile, in the aspect of lexical cohesion, the dominance of literal repetition of words (reiteration) is very obvious. The use of synonyms, collocations, antonyms, and hyponyms that are able to strengthen the continuity of meaning and lexical variation is still very limited. This condition indicates that students have a tendency to maintain the same words in order to maintain cohesion, but still do not master alternative lexical strategies that are more varied and effective.

This limitation affects the overall quality of scientific papers, especially in terms of fluency, clarity, and cohesion which are important requirements in academic writing. Therefore, intensive and structured learning about the cohesion apparatus, especially the development of lexical variation and mastery of substitutions and ellipses, is indispensable. Improving cohesion competence will not only improve the quality of written language, but also significantly increase students' scientific communication skills.

Overall, the results of this study confirm the need for attention and pedagogical interventions that emphasize the balanced integration of grammatical and lexical cohesion elements to support the achievement of coherent and high-quality scientific results.

CONCLUSION

Literature studies and document analysis results show that students tend to use references and word repetition as the main cohesion tools in writing scientific papers. The dominance of these two devices indicates the need to strengthen the learning of other grammatical and lexical cohesion competencies, especially in the use of synonyms, collocation, and paraphrasing techniques. A better understanding and mastery of cohesion tools can improve the effectiveness, clarity, and scientific quality of student writing.

The suggestion from this study is that increasing training and mentoring in academic writing, especially related to the variety of cohesion tools, needs to be a focus in the higher education curriculum. In addition, learning must prioritize strategies for the use of synonyms, collocation, and paraphrasing techniques to enrich lexical cohesion. Lecturers or supervisors are advised to provide structured feedback on the use of cohesion in each student's scientific writing assignment. Further research can be directed to learning interventions that specifically target strengthening the cohesion of student writing from various disciplines.

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