

## **Analysis of Argumentation Contents in the High School Biology Textbook: A Discourse Analysis on the Topic of the Respiratory System**

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**Abstract: Analysis of Argumentation Contents in the High School Biology Textbook: A Discourse Analysis on the Topic of the Respiratory System. Objectives:** Study examines structure of learning discourse, explores aspects of discussion, examines presentation of learning motives in textbooks, analyzes a comparison of three biology textbooks on respiratory materials. **Methods:** A qualitative investigation of descriptive text, discourse structure analysis tasks, conversational type elements, learning motive explanations, Erlangga, Yrama Widya, Intan Pariwara as publishers of Biology textbook. **F:** Results revealed nature of conversation structure. Three scientific books observed that one side of the argument swamped any remaining sections of debate due to a rapid review of doubtful material. Examining three books analysed reveals a discussion of many quality, rating issues. In Good category, Book B got highest rating of 8.3. Book C received an 8.2 on the “upside” scale, whereas Book A received a 7 on the “appropriate” scale.

**Keywords:** Argumentation, tektbook, discourse analysis.

**Abstrak: Analisis Isi Argumentasi dalam Buku Teks Biologi SMA: Analisis Wacana pada Topik Sistem Pernapasan. Tujuan:** Penelitian ini mengkaji struktur wacana pembelajaran, memeriksa aspek argumentasi, meneliti penyajian motif pembelajaran buku teks, menganalisis perbandingan tiga buku biologi materi sistem pernapasan. **Metode:** Penelitian kualitatif jenis kalimat deskriptif, kegiatan analisis struktur wacana pembelajaran, aspek jenis argumentasi, presentasi motif pembelajaran, menggunakan buku teks biologi kelas XI semester 2 sebagai sample. Buku Biologi merupakan buku teks terbitan Erlangga, Yrama Widya, Intan Pariwara. **Temuan:** Hasil penelitian menunjukkan kualitas struktur hasil wacana dari persentase analisis argumentasi materi tiga buku biologi menyatakan aspek argumentasi lebih dominan dari semua aspek argumen lainnya. Perbandingan ketiga buku yang dianalisis memiliki wacana argumentasi kualitas dan skor berbeda. Skor buku B tertinggi dengan kategori “baik” dengan skor 8,3. Buku C Skor 8,2 dengan kategori “bagus” dan buku A skor 7 dengan kategori “cukup”.

**Kata kunci:** Argumentasi, buku teks, analisis wacana.

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## ■ INTRODUCTION

Argumentation is an inseparable part of science. In the practice of science learning, argumentation is the main thing that underlies students in learning how to think, act and communicate like a true scientist. The learning climate in the classroom contributes to the occurrence of communication in the form of arguments as one of the efforts to validate or refute statements scientifically. Statements in this case are not just giving opinions or ideas, but must give a strong reason to answer the problem. Sampson and Scheilgh (2013) state that the “Reason” should describe support in drawing conclusions that are primarily based on data obtained through research.

Scientific argumentation in science has distinctive characteristics, compared to argumentation in everyday contexts or in other fields of science, especially in the relationship between statements (claims), evidence (evidence) and justifications. A “statement” is a descriptive statement that answers a research problem. “Evidence” refers to measurements, observations, or other research results that have been collected, analyzed, and interpreted. The argument component is ultimately derived from statements explaining a phenomenon accompanied by relevant evidence and based on the concept or assumptions underlying it. Good scientific arguments must meet empirical, theoretical and analytical criteria (Siswanto, 2014)

The ability to argue becomes one of the main goals of science learning because students who study science must know scientific explanations of natural phenomena, use them to solve problems and be able to understand. In addition, it must understand the character of scientific knowledge that always develops over time. Students who understand science as a whole should be able to understand the language of science and actively participate

in scientific activities such as observation and argumentation. In reality there are still many students who have difficulty in this regard so that learning must begin to be directed to involve the students in scientific arguments as part of science. Science learning involving scientific argumentation does not occur naturally, But it must be planned carefully. Learning focuses and models must be adjusted and teachers must be able to direct students how to build and support knowledge through argumentation and judging and responding to statements or arguments submitted by others (Siswanto, 2014)

The meaning of learning discourse is “the ability to progress in discussion according to the proper order”. And the communication of the fruits of the mind, both oral and written, is official and orderly. Aspects of discourse analysis is a study that examines or analyzes the language used scientifically, both in oral and written form. Use of language, as in everyday communication. Discourse analysis emphasizes the study of use in social contexts, particularly in inter-speaker interactions. Discourse analysis is a study that discusses discourse while discourse is a language used to communicate (Siswanto, 2014).

Textbooks are textbooks in a particular field of study, which are standard books, compiled by experts in that field for instructional purposes and purposes, equipped with suitable teaching facilities and easily understood by users in schools and colleges so as to support a teaching program. The use of textbook learning purposes that refer to the curriculum. In addition to using textbooks, teachers can use facilities or techniques that are in accordance with the purposes that have been made before. The use that combines textbooks, techniques and other means is aimed at making it easier for textbook users, especially learners in understanding the material (Syaifudin, 2013).

A scientific approach is a way or mechanism of learning to facilitate students to gain knowledge

or skills with procedures based on a scientific method with basic concepts that accommodate, inspire, strengthen, and encourage thinking about how learning methods are applied based on certain theories. The learning process is one of the elements strengthened (Enhanced) in the 2013 curriculum. Reinforcement is done by demanding the teacher to manage the learning process. This scientific approach or scientific approach requires the basic steps of observing, mananya, reasoning, trying, and forming networks (Kemedikbud, 2013).

The scientific method refers to techniques of investigating one or more phenomena or symptoms, acquiring new knowledge, or correcting and blending prior knowledge. To be called scientific, the method of inquiry must be based on evidence of observable, empirical, and measurable objects with specific principles of reasoning. Therefore, the scientific method generally contains a series of data collection activities through observation, processing information or data, analyzing, then formulating, and testing hypotheses. (Herlanti, 2012).

The 2013 curriculum contains five essences, namely thematic learning, contextual learning, character education, scientific approach, and authentic assessment. Related to one of the essences of the 2013 curriculum, namely the scientific approach, there are scientific activities that need to be mastered by students, namely observing, menanya, reasoning, trying, and forming networks (Permendikbud, 2013). Referring to the 2013 curriculum, researchers are interested in conducting a study related to the analysis of teaching materials in the form of textbooks in which they contain teaching materials with the aim of increasing students' science activities based on scientific approaches so as to achieve the expected competencies.

Biology as one of the lessons that support learning in the 2013 curriculum, undergoes a good

renovation with the implementation of this curriculum. Biology textbooks, which are considered less interesting books, are now presented with an interesting arrangement of books using a scientific approach. Comparing the quality of biology textbook content from the three sources of the book is one of building in terms of student argumentation representation in the learning process, analyzing is done to find the right book to maximize students to argue in the learning process. Based on the background and aforementioned theoretical background, this research are conducted.

## ■ METHODS

This research uses a kualitatif approach, according to Meleong (2006) qualitative research is research that intends to understand the phenomenon of what is experienced by the subject. This type of research is reviewed from the way that is with descriptive sentences. Descriptive research intended to investigate the circumstances, conditions, how to group materials by dividing them into presentations of informing, eliciting, and directing motives. With the three existing books published by Erlangga, Intan Pariwara, Yrama Widya using these three types of textbooks. This type of research is reviewed from the way it is with descriptive sentences. Researchers use a table of motif presentation analysis, analysis of learning discourse, analysis of aspects of argumentation, and a percentage of comparison of the three books published A, B and C. There are 4 methods, namely: Participants; Research Design and Procedures; Instruments; Data Analysis.

### **Participants**

Various tools used in research, namely syllabuses and indicators based on the 2013 curriculum revisions from Erlangga, Yrama Widya, Intan Pariwara, concept maps and

concept analysis and relevance of the indicator is then made an analysis of the level of accuracy of the concept to the textbook that uses references from the biology dictionary book published by the library hall with relevant biology books.

### **Research Design and Procedures**

Carried out by observation directly analyzing the three biology textbooks of class XI high school according to the relevance of the contents to the indicators, the accuracy of the contents of the book with biological concepts, the analysis of learning discourse based on the structure of the subject matter and the presentation of learning motives. The steps that will be carried out in this study include: The implementation of research by analyzing three textbooks of Biology Science Class XI semester II high school level, namely books based on the 2013 curriculum revisions from Erlangga, Yrama Widya, Intan Pariwara and Discussion of research results in the form of exposure of research results (qualitative description). Research instruments used in research, namely syllabuses and indicators based on the curriculum 2013 curriculum 2013 revisions from Erlangga, Yrama Widya, Intan Pariwara, concept maps and concept analysis. Has 2 stages, namely: The seeding stage at this stage is carried out by analyzing the discourse in the biology textbook ipa SMA class XI which consists of three publications, namely the 2013 curriculum revision from Erlangga, Yrama Widya, Intan Pariwara. This step is done by reading, observing, and understanding the material contained in the three textbooks. Researchers look for the truth of the content with indicators and look for the accuracy of biological textbook concepts with references to relevant biology books. For the analysis of learning discourse is done by understanding carefully the description of the contents of the textbook based

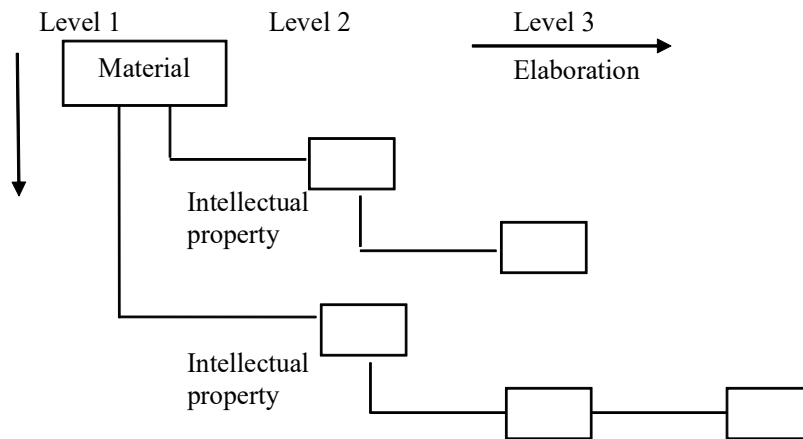
on macro and micro structures, and analysis of the presentation of the subject material is carried out by looking at the way the textbook is presented by dividing it into informing motives (informing) eliciting (digging) motives, directing (directing) motives. Recording stage This stage is in the form of recording the results of the analysis of the relevance of indicators into the table. The results of the analysis of the accuracy of the concept are also recorded in the table of the level of accuracy of the concept by assessing this conformity with the content of attributes in each book studied.

### **Instrument**

Research instruments are tools used to help collect data for analysis. Researchers use analysis tables of motives for presenting learning argumentation discourses to help collect this research data. Researchers write the content or content in the textbook and then write also sentences that occupy the function of the motive of presenting the learning argumentation discourse and how to convey it in argumentation (Parera, 1984). The data that has been obtained is then recorded in the table of instruments used as follows: The data that has been obtained is then recorded in the instrument table that is used as follows: Table of Instruments of The Structure of Discourse Macro and micro concepts. According to Van Dijk the text consists of various structures or levels, each of which supports each other. Van Dijk divides it into two levels: Macro structure is the global or general meaning of text that can be understood by looking at the topic of a text. The theme of discourse is not only the content of the book, but also the side of an event and microstructure is the meaning of discourse that can be observed by analyzing the words, sentences, propositions, sentence children, and images used. The results of this discourse analysis are then made a

representation of the text, namely the extension of the subject material in the form of outlets. That way it is known into a material described by the teaching book. The quality of the subject matter can also be known by reviewing from

the relationship of the subject matter, learning, indicators or patterns of argumentation discourse, the accuracy of the material concept, and the motive of the argumentation discourse.



**Figure 1** (Dahar and Siregar, 2000 in Redjeki 2006)

**Data analysis:** This research uses the technique of content analysis indicators usually research utilizes a set of procedures to draw conclusions that analyze an existing data, with a general regarding the quality of the profile of argumentative discourse part of the discussion of the respiratory system. Analysis of the conformity of textbook content with the 2013 curriculum includes: Analysis of the relevance of indicators is carried out by matching basic competencies and indicators to materials or tasks contained in the Biology Science textbook, Analysis of the accuracy of concepts is carried out by determining concepts based on basic competencies and indicators in the chapters studied, Analysis of the subject matter discourse is carried out by grouping the elaboration of materials based on macro and micro concepts. And the number of unit levels that are lowered is increasing and analysis based on the presentation of learning motives is done by grouping materials by dividing them into the presentation of informing, eliciting, and directing motives.

## ■ RESULT AND DISCUSSIONS

Three samples of biology textbooks used are the book Biology High School Class XI by “Erlangga” published A in 2013, the Biology Book for High School Class XI by “Yrama Widya” issued by B in 2013, and the Biology of Sma Class XI by “Intan Pariwara” issued by C in 2013. Based on three samples of the class XI high school biology book is a revision based on the 2013 curriculum. The books analyzed include textbooks for the 2013 curriculum class XI high school biology package revisions from Erlangga, Yrama Widya, Intan Pariwara. The author in analyzing this book, determines the concept of the subject matter and then elaborated and adjusted to the completeness of the book. Based on the analysis conducted by the structure of discourse based on the number of micro propositions and the depth of levels and motives of discourse based on the type of presentation motifs, namely Informing, Eliciting, and Directing. While the aspect of argumentation based on Walton based on aspects of sign, commitment, position to know,

expert opinion, evidence to hypothesis, correlation to cause, cause to effect, consequences, and analogy in biology textbooks.

The results of the recapitulation of the analysis of the structure of learning discourse in the sample book issued "A" are obtained when displayed in the form of.

### Analysis of the Structure of Learning Discourse Of Book Published "A"

**Table 2.** Analysis of the structure of learning discourse of book published "A"

| No         | Macro Concepts                                       | Amount of complexity     |                       |
|------------|--|--------------------------|-----------------------|
|            |  | Number of Micro Concepts | Number of Level Units |
| 1          | Breathing apparatus in humans has several functions. | 5                        | 2                     |
| 2          | Breathing Mechanisms                                 | 2                        | 3                     |
| 3          | Control and Speed of Breathing                       | 1                        | 4                     |
| 4          | Transport and Gas Exchange                           | 1                        | 5                     |
| 5          | Volume and Capacity of the Lungs                     | 1                        | 6                     |
| 6          | Respiratory System Disorders                         | 14                       | 7                     |
| 7          | Respiratory system technology                        | 1                        | 8                     |
| <b>Sum</b> |  | 25                       |                       |

Information:

Microstructure:

|   |                            |
|---|----------------------------|
| 1 | 1-9 Number of text units   |
| 2 | 10-18 Number of text units |
| 3 | 19-25 Number of text units |

Depth Level:

|   |           |
|---|-----------|
| 1 | < 2 level |
| 2 | 3-4 level |
| 3 | >5 level  |

Based on the results of table 1 states that the representation of macro structures in the book issued "A" there are 7 materials, namely respiratory devices in humans, respiratory mechanisms, respiratory control and speed, transport and gas exchange, lung volume and capacity, respiratory system disorders, and respiratory system technology. Each of the seven materials has its own microstructure. The first

material has 5 micro concepts and 2 level units. The second material has 2 micro concepts and 3 level units. The third material has 1 micro concept and 4 level units. The fourth material has 1 micro concept and 5 level units. The fifth material has 1 micro concept and 6 level units. The sixth material has 14 micro concepts and 7 level units. The seventh material has 1 micro concept and 8 level units. With a total of 25 micro concepts.

### Analysis of The Structure of Learning Discourse Of Book Published “B”

The results of the recapitulation of the analysis of the structure of learning discourse in the sample book issued “B” are obtained when displayed in the form of table 3.

Based on the results of table 2 states that the representation of macro structures in the book issue “B” there are 7 materials, namely respiratory devices and understanding of the respiratory system in humans, respiratory mechanisms in humans, air released in humans, respiratory

**Table 3.** Analysis of the structure of learning discourse of book published “B”

| No         | Macro Concepts  | Amount of complexity     |                       |
|------------|---|--------------------------|-----------------------|
|            |   | Number of Micro Concepts | Number of Level Units |
| 1          | Breathing apparatus and understanding of the respiratory system in humans | 5                        | 1                     |
| 2          | Respiratory mechanisms in humans  | 6                        | 3                     |
| 3          | Air that is released on humans  | 5                        | 4                     |
| 4          | Frequency of breathing in humans  | 5                        | 5                     |
| 5          | Exchange of oxygen and carbon dioxide in humans                           | 5                        | 6                     |
| 6          | Respiratory System in Animals   | 17                       | 7                     |
| 7          | Disorders and Diseases of the Respiratory System in Humans                | 1                        | 8                     |
| <b>Sum</b> |   | 44                       |                       |

Information:

Microstructure:

|   |                            |
|---|----------------------------|
| 1 | 1-9 Number of text units   |
| 2 | 10-18 Number of text units |
| 3 | 19-25 Number of text units |

Depth Level:

|   |           |
|---|-----------|
| 1 | < 2 level |
| 2 | 3-4 level |
| 3 | >5 level  |

frequency in humans, exchange of oxygen and carbon, dioxide in humans, respiratory systems in animals, and disorders and diseases in the respiratory system in humans. Each of the seven materials has its own microstructure. The first

material has 5 micro concepts and 1 level unit. The second material has 6 micro concepts and 3 level units. The third material has 5 micro concepts and 4 level units. The fourth material has 5 micro concepts and 5 level units. The fifth

material has 5 micro concepts and 6 level units. The sixth material has 17 micro concepts and 7 level units. The seventh material has 1 micro concept and 8 level units. With the total number of micro concepts 44 concepts.

### Analysis of The Structure of Learning Discourse Of Book Published “C”

The results of recapitulation of the analysis of the structure of learning discourse in the sample book issued “C” are obtained when displayed in the form of table 4.

Based on the results of table 3 states that the representation of macro structures in the book issue “C” there are 4 materials, namely the understanding and organs of respiration in humans, the mechanism of respiration in humans, the volume of air respiration in humans, and abnormalities in the human respiratory system. Each of the seven materials has its own microstructure. The first material has 7 micro concepts and 1 level unit. The second material has 6 micro concepts and 2 level units. The third material has 6 micro concepts and 3 level units.

**Table 4.** Analysis of the structure of learning discourse of book published “C”

| No         | Macro Concepts                                | Amount of complexity     |                       |
|------------|---|--------------------------|-----------------------|
|            |   | Number of Micro Concepts | Number of Level Units |
| 1          | Understanding and Organ respiration in Humans | 7                        | 1                     |
| 2          | Mechanisms of Respiration in Humans           | 6                        | 2                     |
| 3          | Volume of Respiratory Air in Humans           | 6                        | 3                     |
| 4          | Abnormalities in the human respiratory system | 12                       | 4                     |
| <b>Sum</b> |   | 31                       |                       |

Information:

Microstructure:

|   |                            |
|---|----------------------------|
| 1 | 1-9 Number of text units   |
| 2 | 10-18 Number of text units |
| 3 | 19-25 Number of text units |

Depth Level:

|   |           |
|---|-----------|
| 1 | < 2 level |
| 2 | 3-4 level |
| 3 | >5 level  |

The fourth material has 12 micro concepts and 4 level units. With a total of 31 micro concepts.

### Analysis of Aspects of Argumentation in Textbooks

The results of the data analysis of the argumentation aspects of the class XI high school

biology package book on the concept of the respiratory system for the three sample books. The results of the data analysis of the argumentation aspects of the class XI high school biology package book on the concept of the respiratory system for the three sample books. Based on the results of the analysis of aspects of

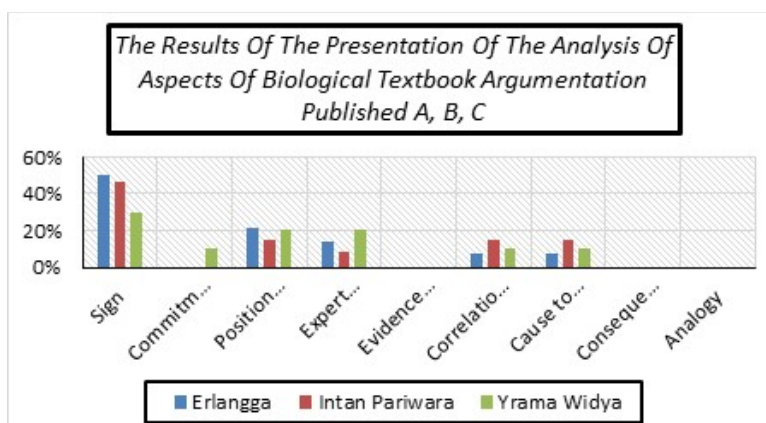


the argumentation scheme for reasoning (Walton 1996). In the biology package book can be known in book one issue A, B and C. Argumentation scheme according to Walton (1996): Sign is a reference for oral or written claims used to conclude the existence of characteristics or events of an event, Commitment is Related to actions that occur because of something (I must), Position to know is Requires more information, Expert opinion is a reference for external expert sources (people, texts, group consensus and others) for the information provided, Evidence to hypothesis is Making a hypothesis for a problem, Corelation to cause is concluding the causal relationship between two events, Cause to effect is First departing from an event that is considered a known cause, then moving forward towards a conclusion as the nearest effect or effect, Consequences is More to the action or action taken because of an event (may or may not occur), and Analogy is Used to argue one case that feels the same as another (Erduran, 2007).

The sign argumentation aspect is the highest aspect of the three books analyzed. Of the three types of books analyzed, the comparison of textbooks with the highest content of sign argumentation is the A-issue book with a percentage result of 50%, while the butu text issue B with a percentage result of 46.1% and butu text issued C with a percentage result of 30%.

The quality of the results of the analysis of aspects of argumentation in the material of the third respiratory system issued by A, B, and C. That aspect of Sign type argumentation is more dominant than the other 9 aspects of argumentation. Aspects of argumentation issued A, B, and C have different aspects of argumentation. In the biology book issued A quality “sufficient” with a score of 1.75. Book B has a quality of “enough” with a score of 1.71 and book issue C has a quality of “enough” with a score of 1.6.

Jimenez-Aleixandre & Erduran (2007) posits that argumentation is the solution to almost all problems in science education, on the one hand



**Figure 5.** Graph of analysis of aspects of argumentation in textbooks

helping students learn things that are difficult to learn for example in evaluating evidence, and on the other hand potentially helping teachers understand and support the learning process in science classes.

### Analysis of The Presentation of Motifs in Textbooks

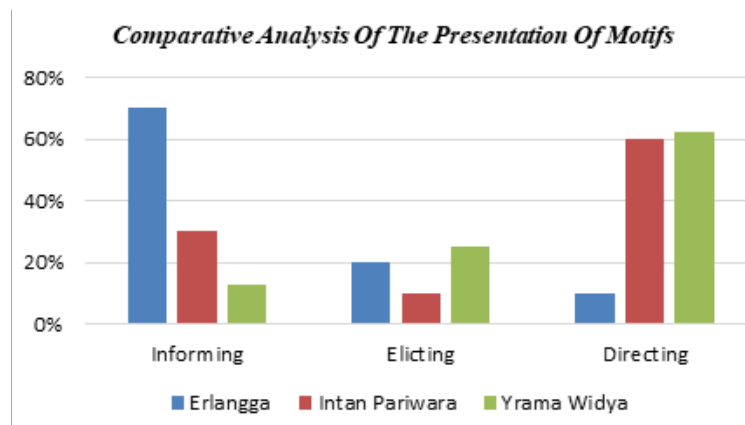
The quality analysis of the motive for presenting the 2013 curriculum-based Biology textbook learning for the selected class XI high

school is the concept of the respiratory system. The books analyzed included a 2013 revised high school biology package book from Erlangga, Yrama Widya, Intan Pariwara. The author in analyzing this book, determining the concept and then described and adjusted to the completeness of the book accompanied by several references.

Discourse analysis, thus, becomes facilitated by two forms of order that fill each other, namely, the order of macro-propositions resulting from the realization of motives and the regularity of matter controlled by the subject-matter (Siregar, 1998).

The presentation of the motif can take the form of: Informing (informing) is the presentation of subject matter to students only in the form of information, without students knowing how the

information is formulated. The motive of informing is also manifested in the form of speech that confirms the existence of a truth in the form of a proposition, for example describing an object or event, Eliciting (digging) is the realization in the form of speech that explains the logic of truth of the relationship between propositions. For example, comparing two truths and Directing is an activity of presenting subject matter that includes students as assessors and approvers and decisions based on materials that have been delivered previously accompanied by teacher guidance. This motive is manifested in transferring the proposition to the realization of an action. For example: instructions on how to compare truth data. (Siregar, 1998).



**Figure 6.** Motif Presentation Analysis Graph in Textbooks

The results of the presentation of the material motifs of the respiratory system of the three books published A, B, and C have different types of motif presentations. In biology books published A percentage that dominates is the motive of the Informing type, while the percentage of directing type motifs dominates in both biology books published B and C.

The presentation of the motifs of the three books published by A, B, and C has the quality of different types of motif presentations. In the biology book published A quality “enough” with

a score of 1.75. The book issued B has a “good” quality with a score of 2.42 and the book published by C has a “good” quality with a score of 2.4.

### **Comparison Table of Argumentation Discourse Textbooks**

Textbooks as a source of learning, used as a reference for both teachers and Students in the learning process. Textbooks should have quality. Good and can help students in overcoming difficulties understand the subject matter. Because

textbooks are an important element in building an understanding of student concepts and improving student competence in both cognitive, affective and psychomotor fields. So textbook analysis needs to be done to see the extent of the book. text plays an active role in achieving learning goals. One of the goals of science education is to provide students with ability to formulate

argument reasoning and criticize in context scientific. formulate a central and significant argument in developing and carrying out scientific activities. As a result, it is reasonable to assume that instilling the meaning of scientific content and the importance of developing concepts Scientific science will be a way to formulate arguments (Erduran, et al., 2004).

**Table 7.** Comparison of argumentation discourse textbooks

| Textbook         | Score | Category |
|------------------|-------|----------|
| Published Book A | 7     | Enough   |
| Published Book B | 8,3   | Good     |
| Published Book C | 8,2   | Good     |

he comparison of the three books analyzed has different quality argumentation discourses with different score results. Book B has the highest score included in the category of “good” with a score of 8.3. Book C has a score of 8.2 included in the category “good” and book A has a score of 7 included in the category “enough”.

## ■ CONCLUSIONS

The three books analyzed had different depth level complexity and different numbers of propositions. Of the three books, the A-published book has the highest depth level, reaching Level 7 with a total of 32 concepts. Book B has the highest depth level which reaches Level 7 with the number of 52 Concepts, and book C has the highest depth level which reaches 4 Levels with the number of 31 Concepts. Aspects of argumentation issued A, B, and C have different aspects of argumentation. In the biology book issued A quality “sufficient” with a score of 1.75. Book B has a quality of “enough” with a score of 1.71 and book issue C has a quality of “enough”

with a score of 1.6. The presentation of the third motif issued by A, B, and C has different types of motif presentations. In the biology book issued A quality “sufficient” with a score of 1.75. Book B has a “good” quality with a score of 2.42 and book issued C has a “good” quality with a score of 2.4. The comparison of the three books analyzed has different quality argumentation discourses with different score results. Book B has the highest score included in the category of “good” with a score of 8.3. Book C has a score of 8.2 included in the category “good” and book A has a score of 7 included in the category “enough”.

The publisher should first analyze the Biology Textbook he published. If the Biology Textbook is considered feasible then the Biology Textbook can be published and each teacher should first analyze the quality of the contents of the Biology Textbook from various publishers used in the teaching and learning process to see the difference in the quality of each biology textbook in circulation.

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