ICEE-4 *"The Direction of Elementary Education in the Future Challenge"*

Analysis of Elementary Mathematics Books Based on the Implementation of Guided Inquiry Model Process Skills

Miranda Abung ✉ **1, Tatang Herman2**

1,2, Program Studi Pendidikan Dasar, Sekolah Pascasarjana, Universitas Pendidikan, Indonesia

✉ mirandaabung57@gmail.com

Abstract. The inquiry learning model is one of the models set by the government as a learning model that uses a scientific approach. This study aims to analyze the book in terms of the working steps of the guided inquiry learning model. This research focused on the fourth-grade mathematics textbooks published by the Ministry of Education and Culture on fractions as the focus of the material. The data analysis technique was carried out in a qualitative descriptive manner with a documentation study by analyzing the material's content in the fourth-grade mathematics textbook. The analysis activities adapted to the activities of the guided inquiry learning model, which consists of orientation stages, conceptualization, investigations, conclusions, and discussions. The analysis results shown that the guided inquiry learning model activities that are mostly carried out in terms of application are conducting experiments to test hypotheses. These activities, if added up as much as 68 times throughout the six chapters of the book. The most minor activity carried out is the discussion activity. The activity was carried out 14 times throughout the six chapters provided by the book.

Keywords: Inquiry Process skills, Textbooks, Content Analysis.

INTRODUCTION ~ According to Law number 20 of 2003, the curriculum is a plan and arrangement that includes the objectives, content, and learning materials and the methods used as guidelines for implementing learning activities to achieve specific educational goals. Curriculum has a strategic position because in general, the curriculum describes the vision, mission, and educational goals of a nation. This also positions the curriculum as the central content of values that will be transformed to students (Bahri, 2017: 15). Furthermore, according to Lebeaume in Julaeha (2019: 163), the curriculum has six functions that must be considered, including the following: (1) increasing the efficiency of the use of curriculum resources; (2) increasing equity and opportunities for students to achieve maximum results; (3) increase the relevance and effectiveness of learning following the needs of students and the surrounding environment; (4) improve

the effectiveness of teacher performance and student activities in achieving learning objectives; (5) improve the efficiency and effectiveness of the teaching and learning process; and (6) increasing community participation to help develop the curriculum. This is a sign that the curriculum is an essential element in the development of education in Indonesia.

According to Anwar (2014: 98), in his journal, the Indonesian government has issued at least two curricula in less than 10 years. The curriculum includes the Competency-Based Curriculum (KBK) in 2004, the two Education Unit Level Curriculum (KTSP) in 2006. Then, in 2013, the government re-published a new curriculum, namely Curriculum 2013, which is valid until now. According to Novianto and Mustadi (2015: 2), the application of the curriculum aims to

equalise the general knowledge and skills that students must possess. This means that the development of the curriculum in Indonesia is intended by the government so that the general knowledge and skills possessed by students in Indonesia can develop better.

In its implementation, the government sets Graduate Competency Standards listed in Permendikbud number 20 of 2016. Graduate Competency Standards are criteria made related to graduate abilities, including attitudes, knowledge, and skills and are used as the main reference for developing content standards, process standards, and assessment standards education.

Determination of content standards, process standards, and assess-ment standards in the implementtation of the 2013 Curriculum to create effective and efficient learning to achieve optimal results. Optimal learning can help students develop their abilities both in terms of attitudes, knowledge, and skills. This can be achieved, one of which is supported by good learning resources. In line with this, according to Novianto and Mustadi (2015: 2), learning tools need to be considered for the successful implementation of the 2013 Curriculum. Furthermore, according to Mudhoffir in Nur (2012: 67), learning resources are essential components of an instructional system that includes messages, people, engineering tools and the environment, where this can affect student learning outcomes. So, learning resources can then be understood, that learning resources function as all kinds of learning resources that exist outside of students that can facilitate learning activities. Nur (2012: 68), explains that learning resources are a

component that is quite important not only for students but also important for a teacher. Learning resources, which in this case are books, include anything that can be used to assist a teacher in the teacher's learning activities and learning activities at school. According to Ramda (2017: 13), textbooks are one of the learning resources that can provide effective and efficient learning.

Books provided by the government in the Kurikulum 2013 as learning resources in schools include teacher books and student books. According to Trianto in Darmayanti et al. (2014: 93), the student book is a guidebook intended for students in the process of learning activities. Student books contain subject matter, research activities based on concepts, science activities, information, and examples of the application of science in contextual examples or based on students' daily lives. In his journal, Wijaya (2013) states that the student book describes the minimum effort that students need to make in their efforts to achieve the expected competencies. In its application, the Kurikulum 2013 uses a scientific approach. In this research, the scientific approach intended is an approach with the steps in the teacher's book covering five learning experiences, namely: (1) observing, (2) asking questions, (3) gathering information, (4) associating, and (5) communicate. According to Peramatasari (2014: 14), the scientific approach comes from the word saint, which means science. So the scientific approach is a scientific approach that is logical and systematic. In the implementation, starting from the activity of students asking questions, this activity is a response given by students because there are objects/problems that

are seen or heard. When the teacher responds to questions from students, the answers will be linked to the material to be taught. Then students are asked to solve the problems presented together by collaborating in a group. This learning activity must be evenly distributed and not in favour of one study group only so that the skills acquired by students will appear, such as respecting the opinions of others and also presenting competence. Based on this, student books are deemed necessary to be reviewed in terms of applying a scientific approach. This relates to the presentation that has facilitated students to carry out activities as expected in the scientific approach or not.

Changes to the curriculum change the approach to the learning process and changes to the methods and techniques of learning. The learning model will continue to be developed in line with the process of developing a learning approach. In K-13, there are learning models that adapt to a scientific approach, including problem-based learning models (PBL), project-based learning models (PjBL), and discovery/inquiry learning (Musfiqon and Nurdyansyah, 2015: 2).

According to Banawi (2019: 95), in the Regulation of the Minister of Education and Culture Number 22 of 2016 concerning Standards for the Primary and Secondary Education Process (Permendikbud No. 22/2016 concerning the standard of the primary and secondary education process), it is said that inquiry learning is called discovery. Discovery through a systematic thought process. Knowledge is not just a collection of facts resulting from remembering but the result of the process of finding or constructing. In other words, learning is a

process of facilitating discovery activities so that students gain knowledge and skills through their own discoveries.

The inquiry-based learning model or inquiry learning is one of the models set by the government as a learning model that uses a scientific approach. According to Helviyana et al. (2020: 2), inquiry learning emphasizes student activities during the investigation process. The inquiry learning model focuses students as learning subjects, and students can independently find facts, concepts, and principles in mathematics.

According to Sanjaya in Afandi (2013: 4), the application of learning with the inquiry model is expected to be able to encourage students to analyze and criticize a problem presented so that students will be able to solve various problems they face. Furthermore, Afandi (2013: 4), adds that inquiry learning is expected to encourage students to understand the problem, encourage students to give or make a temporary guess or hypothesis of a problem or situation. Then the activities of students in collecting data in their efforts to solve problems, conduct observations and investigations to provide answers to the hypotheses that have been formulated previously. The guided inquiry approach is basically the same as the inquiry approach in general. However, in the learning steps, in the guided inquiry approach there is teacher intervention in every step of the learning. The intervention in question is guidance and direction from the teacher. Because, in the guided inquiry model, the teacher acts as a facilitator.

In her journal, Dewi (2016: 120), describes three levels of the inquiry

learning model based on the level of complexity. The first model is discovery-based learning. Then there is guided inquiry learning, whereas the most complex level is an open inquiry learning model. The three levels of the inquiry model involve scientific process skills and basic skills in scientific work.

Banawi (2019: 96), then mentions the syntax of the inquiry learning model, which includes: (1) dealing with problems, (2) collecting data for verification, (3) collecting data in experiments, (4) organization, formulation, and explanation, and (5) analyzing the inquiry process. Furthermore, syntax is associated with elements in the scientific approach.

According to Fahmia et al. (2019: 239), the guided inquiry learning model is appropriate for elementary school-age children because, during the process of learning activities, elementary school students still need guidance so that learning activities are more focused. A guided inquiry model is learning with an inquiry approach. In the guided inquiry learning process, students do not just sit quietly and listen to the delivery of material from the teacher but make discoveries to answer the problems posed by the teacher, wherein the discovery process, students get intensive guidance. In line with this, Yuniastuti (2013: 82), in the guided inquiry learning model, students are presented with relevant tasks or problems to be solved, either in group discussions or individually so that students are able to solve problems and construct conclusions independently, but on the other hand Students still get guidance or direction given by the teacher.

This study will focus on the analysis of the book in terms of the work steps guided inquiry learning model(guided inquiries). This is based on the fact that this learning model provides opportunities for students to make observations, ask questions, formulate hypotheses, collect data, conduct experiments and make conclusions, but remain under the guidance and direction of the teacher. According to Hartono (2014: 72), the teacher acts as a facilitator, where students are tasked with finding and finding the subject matter themselves. The teacher has a role as a facilitator who provides direction and instructions for students in learning activities.

According to Helviyana et al. (2020: 2), the inquiry learning model is more focused on emphasizing student activities in seeking and finding concepts, principles, and theorems, both individually and in groups.

Furthermore, Worrell et al. (2020), revealed that inquiry-based learning has recently been used in mathematics learning wherein its application, this learning, relates to problem-solving and reasoning. Discovery-based learning involves students in experiments or scientific investigations that require making questions, preparing evidence, making explanations of the evidence made, connecting explanations with what has been investigated, and conveying conclusions that have been made.

According to Llewellyn in Retnosari et al. (2016: 1532), the syntax of the guided inquiry learning model is almost the same as open inquiry. The difference is in the activity of asking questions. In the open inquiry learning model, the activity of asking questions is carried out

independently by the students. In contrast, in the guided inquiry, the activity of asking questions is carried out by the teacher. The teacher provides several questions to design investigations, create experimental data, analyze the data to communicate the results in guided inquiry learning. This step is the same as problem-solving, where students are given a problem and answer to determine a solution.

In their journal, Pedaste et al. (2015: 51), explain the stages of inquiry learning, namely orientation, conceptualization (questioning, hypothesis generation), investigation (exploration, experimentation, data interpretation), conclusion, discussion.

In previous studies, there have been many researchers who have analyzed mathematics textbooks. However, it is still rare to analyze the suitability of the book's contents with students' skills in the inquiry learning model.

Given the importance of the role of books as one of the teaching materials for mathematics, and the guided inquiry learning model being one of the learning models that uses a scientific approach to the 2013 Curriculum, it is necessary to conduct further studies on student mathematics textbooks published by the Indonesian Ministry of Education and Culture. Therefore, the researcher raised the title, "Analysis of Elementary Mathematics Books Based on the Implementation of Guided Inquiry Model Process Skills."

METHOD

This study will use a qualitative descriptive method with content analysis techniques (content analysis). Shava et al. (2021), define that, content analysis is defined as, a research method to interpret subjectively the content of the data through a systematic classification process coding and identify a theme or pattern. This method is an empirical approach methodologically controlled analysis of the texts communication content, following the rules of content analytics and step-by-step procedures without quantification for generate theory. According to Bungin (2007: 68), research using qualitative descriptive aims to describe, summarize various conditions, situations, or various social reality phenomena that exist in the community that is the object of research, and seek to draw that reality to the surface as a feature, character. Characteristics, models, signs, or descriptions of certain conditions, situations, or phenomena. Meanwhile, according to Ahmad (2018: 3), based on the approach used, content analysis is divided into two approaches, namely quantitative content analysis, and qualitative content analysis. This study will use qualitative content analysis.

The data collection technique used is a documentation study, by analyzing the content of the material in the fourth-grade mathematics textbook. The analysis that will be carried out contains the suitability of the material with the implementation of the guided inquiry learning model. The analysis will be carried out on each page of the book. The books analyzed amounted to 6 chapters. The book was analyzed based on the stages of inquiry learning consisting of orientation stages (submission of topics

and observation of problems), conceptualization (formulating problems and formulating hypotheses), investigations (collecting data and conducting experiments to test hypotheses), conclusions, and discussions. The results obtained are then collected according to the stages in one chapter, then calculated and described descriptively.

The considerations in using this research method were adjusted based on the reasons for the researcher who wanted to analyze the suitability of the content of mathematics books based on the implementation of the guided inquiry learning process in the fourth-grade elementary school students' books.

RESULTS

The analysis was carried out on a fourth-grade elementary school mathematics textbook consisting of 6 (six) chapters. The textbooks analyzed were mathematics textbooks published by the Ministry of Education and Culture in 2018 with a revised version. The analysis is carried out on each page of each available chapter. The six discussion chapters consist of material; Fractions, LCM and GCF, Approximation, Flat Shapes, Statistics, and Angle Measurement. Each page is analyzed, considering each phase of the guided inquiry learning model starting from the orientation phase, conceptualization (questioning, hypothesis generation), investigation (exploration, experimentation, data interpretation), conclusion, discussion, then recorded, then calculated on each existing chapter. To then be presented in the form of a percentage. Next, a bar chart will be made to represent the data that has been collected and calculated in the analysis process. The data collected is contained in Table 1. Table 2 describes the data that has been collected in the form of a percentage, then represented in Diagram 1

Table 1. Analysis of Inquiry Process Skills in Mathematics Book

Inquiry Process Skill		Page					
		Chap 1	Chap 2	Chap 3	Chap 4	Chap 5	Chap 6
Orientation	Delivery Topics	5	2	2	2	2	2
	Observation	13	9	4	10	3	5
Conceptualization	Questioning	9	7	3	9	2	2
	hypothesis generation	5	6	3	6	3	3
Investigation	Collect Data	20	4	4	26	4	3
	verifying hypothesis/experiment	17	10	7	19	8	7
Conclusion		6	1	4	2	1	2
Discussion		2	4	2	2	2	2

The score obtained for each chapter is then converted in the form of a percentage, where each score obtained in each chapter is divided by the total score obtained by all chapters in each phase or by considering the following analysis:

$$score = \frac{score\ each\ chapter}{total\ score\ of\ each\ phase} \times 100\%$$

The percentage of scores obtained in each chapter is presented in Table 2.

Table 2. Percentage of Inquiry Process Skills in Books

Inquiry Process Skill		Page					
		Chap 1	Chap 2	Chap 3	Chap 4	Chap 5	Chap 6
Orientation	Delivery Topics	33%	13%	13%	13%	13%	13%
	Observation	30%	20%	9%	23%	7%	11%
Conceptualization	Questioning	28%	22%	9%	28%	6%	6%
	hypothesis generation	19%	23%	12%	23%	12%	12%
Investigation	Collect Data	33%	7%	7%	43%	7%	5%
	verifying hypothesis/experiment	25%	15%	10%	28%	12%	10%
Conclusion		38%	6%	25%	13%	6%	13%
Discussion		14%	29%	14%	14%	14%	14%

The following is a diagrammatic representation of Table 1, which contains the scores for the analysis carried out on the fourth-grade elementary mathematics textbooks published by the Ministry of Education and Culture. Then the scores obtained in Table 1, are represented in Diagram 1, to make it easier to read the resulting data.
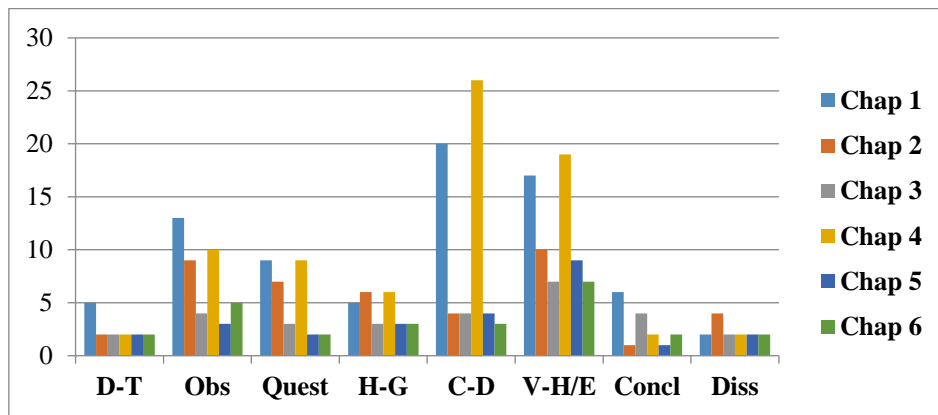

Figure 1. Analysis of Inquiry Process Skills in Mathematics Book

Description:
D-T   : Delivery Topics

Obs   : Observation

Quest : Questioning

H-G   : Hypothesis Generation

C-D   : Collect Data

V-H/E : Verifying Hypothesis/Experiment
Concl   : Conclusion
Diss   : Disscussion

DISCUSSION
Based on the diagram above, it can be seen that the highest score was obtained in the "Collecting Data" phase, with the highest percentage of 43% in Chapter 4.

Meanwhile, the lowest score was in the "Discussion" phase, with a percentage of 29% in Chapters 3 and 14 % for other Chapters. This means, in the book published by the Ministry of Education and Culture, the discussion activities provided are still relatively low, where on average per chapter only conducts 2 discussions with 4 discussion activities in Chapter 3. Meanwhile, the highest score was obtained in the "Collecting Data" activity, with the highest percentage score of 43% in Chapter 4, and 5% in Chapter 6. This means half of the activities are centered on the "Collecting Data" activity in Chapter 4.

RESULT
Results of Analysis in Chapter 1 - Chapter 6.
1. Orientasi (Delivery Topics Observation)

In the orientation phase, which consists of the "Topic Submission" activity, the highest score percentage is found in Chapter 1 at 33%, while for other chapters, it has the same result, which is 13%. In the " Observation" activity, the highest score percentage is still in Chapter 1 at 30%, and the lowest score is in Chapter 5 at 7%.

2. Conceptualization (Questioning and Hypothesis Generation)

The highest score percentage in activities in the conceptualization phase, namely, "Questioning" is in Chapter 1 and Chapter 4, which is 28%, while the lowest score percentage is in Chapter 5 and Chapter 6, amounting to 6%. In the "Formulating Hypothesis" activity, the highest score percentage is in Chapter 2 and Chapter 4, at 23%, while Chapter 1 has the lowest percentage, at 19%.

3. Investigation (Collecting Data and Verifying Hypothesis/Experiment)

The activity "Collecting Data" has the highest score percentage in Chapter 4, at 43%, and the lowest percentage in Chapter 6, at 5%. For the activity "Verifying Hypothesis/Experiment", Chapter 4 still has the highest score percentage, at 28%, and the lowest score is in Chapter 3 and Chapter 6, which is 10%.

4. Conclusion

For the "Conclusions" activity, the highest percentage is found in Chapter 1, at 28%, while the lowest score is found in Chapter 2 and Chapter 5, at 6%.

5. Discussion

The last activity in this learning model is discussion. This activity is the activity that has the least score among other activity scores. The highest score percentage in this chapter is found in Chapter 2, which is 29%, while for other chapters, it has the same percentage score, which is 14%.

CONCLUSION
Based on the results of the analysis of the fourth-grade Elementary School Mathematics Textbook published by the Ministry of Education and Culture, it can be concluded that in general, the activities in the guided inquiry learning model that are mostly carried out in terms of application are doing experiments to verifying the hypotheses. If added up as much as 68 times throughout the 6 chapters contained in the book, these activities. On the other hand, the activities that are least carried out in terms of applying the guided inquiry learning model are discussion activities. The activity was carried out 14 times

throughout the 6 chapters provided by the book.

When viewed from the number, "Delivering Topics" in the Orientation phase has an average percentage of 5%, while the "Observation" activity has 16%. The second phase, namely "Conceptualization" consists of "Questioning" and "Hypotheses Generation", respectively having an average percentage of 12% and 9%, while in the "Investigation" phase, which consists of "Collecting Data" and "Testing the Hypothesis", has an average percentage of 22% and 25%. For the "Formulating Conclusions" and "Discussion" activities, the average percentages are 6% and 5%.

REFERENCES

Afandi, A. (2013). Pendekatan open-ended dan inkuiri terbimbing ditinjau dari kemampuan pemecahan masalah dan representasi multipel matematis. PYTHAGORAS: Jurnal Pendidikan Matematika, 8(1), 1-11

Anwar, R. (2014). Hal-hal yang mendasari penerapan Kurikulum 2013. Humaniora, 5(1), 97-106

Bahri, S. (2017). Pengembangan kurikulum dasar dan tujuannya. Jurnal Ilmiah Islam Futura, 11(1), 15-34.

Bungin, B. (2007). Analisis data penelitian kualitatif

Darmayanti, V., Hariyadi, S., & Hariani, S. A. (2014). Pengembangan buku siswa berbasis inkuiri pada pokok bahasan pencemaran dan kerusakan lingkungan untuk meningkatkan hasil belajar siswa Kelas VII SMP Negeri 1 Maesan Bondowoso. Pancaran Pendidikan, 3(3), 93-102

Dewi, P. S. (2016). Perspektif Guru sebagai Implementasi Pembelajaran Inkuiri Terbuka dan Inkuiri Terbimbing terhadap Sikap Ilmiah dalam Pembelajaran Sains. Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah, 1(2), 179-186.Hartono, R. 2014. Ragam Model Mengajar yang Mudah di Terima Murid. Jogjakarta: Diva Press.

Helviyana, G., Susanti, E., Sari, N., & Simarmata, R. H. (2020, March). Students' mathematical reasoning in inquiry learning model. In Journal of Physics: Conference Series (Vol. 1480, No. 1, p. 012058). IOP Publishing

Julaeha, S. (2019). Problematika Kurikulum Dan Pembelajaran Pendidikan Karakter. Jurnal Penelitian Pendidikan Islam,[SL], 7(2), 157-182

Muhammad, M., & Nurdyansyah, N. (2015). Pendekatan pembelajaran saintifik

Novianto, A., & Mustadi, A. (2015). Analisis buku teks muatan tematik integratif, scientific approach, dan authentic assessment sekolah dasar. Jurnal Kependidikan: Penelitian Inovasi Pembelajaran, 45(1)

Nur, F. M. (2012). Pemanfaatan sumber belajar dalam pembelajaran sains kelas V SD pada pokok bahasan makhluk hidup dan proses kehidupan. Jurnal penelitian pendidikan, 13(1), 67-78

Pedaste, M., Mäeots, M., Siiman, L. A., De

Jong, T., Van Riesen, S. A., Kamp, E. T., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. Educational research review, 14, 47-61

Permatasari, E. A. (2014). Implementasi pendekatan saintifik dalam kurikulum 2013 pada pembelajaran sejarah. Indonesian Journal of History Education, 3(1).

Ramda, A. H. (2017). Analisis Kesesuaian Materi pada Buku Teks Matematika Kelas VII dengan Kurikulum 2012. PYTHAGORAS: Jurnal Pendidikan Matematika, 12(1). Wijaya, Adi. 2013. Pentingnya Analisis Buku Siswa dalam Implementasi Kurikulum 2013. Artikel Pusat Pengembangan dan Pemberdayaan Pendidik dan Tenaga Kependidikan (PPPPTK) Matematika

Retnosari, N., Susilo, H., & Suwono, H. (2016). Pengaruh model pembelajaran inkuiri terbimbing berbantuan multimedia interaktif terhadap berpikir kritis siswa kelas XI SMA Negeri di bojonegoro. Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan, 1(8), 1529-1535

Shava, George & Hleza, Siphumuzile & Tlou, Faith & Shonhiwa, S & Mathonsi, Ethel. (2021). Qualitative content analysis. 2454-6186.

Yuniastuti, E. (2013). Peningkatan keterampilan proses, motivasi, dan hasil belajar biologi dengan strategi pembelajaran inkuiri terbimbing pada siswa kelas VII SMP Kartika V-1 Balikpapan. Jurnal penelitian pendidikan, 13(1).