Kontinu: Jurnal Penelitian Didaktik Matematika
E-ISSN: 2656-5544
P-ISSN: 2715-7326
Vol 6, No 1: Mei 2022
Hal. 64-82

Analysis of Proportional Reasoning Task in Task Series Book MANDIRI Grade VII

Ahmad Lutfi[1)], Mochamad Abdul Basir[2)], Imam Kusmaryono[3)], Dyana Wijayanti[4)]
Mathematics Education at Sultan Agung Islamic University[1), 2), 3), 4)]
*Corresponding email : amdlutfi25@std.unissula.ac.id

Abstract. This study aims to determine the distribution of the percentage of proportional reasoning tasks in the comparison chapter in task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics Grade VII Curriculum 2013, Revised Edition, 2016 Publisher Erlangga, written by Kurniawan. This research is a qualitative research using a descriptive approach. The task data from the book are documented and then analyzed based on indicators from each level of proportional reasoning. The tasks in the comparison chapter consist of two types of tasks, namely multiple choice tasks and essay tasks. There are 225 tasks in the comparison chapter. Based on the results of the study, it was found that the distribution of tasks based on the level of proportional reasoning found that tasks with level 1 (qualitative) were 31 (13.78%), tasks with level 2 (additive) were 22 items (9.78%), tasks with level 3 (pre-multiplicative) were 116 tasks (51.56%), tasks with level 4 (implicit multiplicative) were 24 items (10.67%) and tasks with level 5 (multiplicative) were32 items (14.22%).

Keywords: Task Analysis, Proportional Reasoning, Task Series Book

Abstract. *Penelitian ini bertujuan untuk mengetahui distribusi persentase soal penalaran proporsional bab perbandingan pada buku seri soal MANDIRI (Mengasah Kemampuan Diri) Matematika SMP/MTs Kelas VII Kurikulum 2013 Edisi Revisi 2016 Penerbit Erlangga karangan Kurniawan. Penelitian ini merupakan penelitian kualitatif dengan menggunakan pendekatan deskriptif. Data soal dari buku tersebut didokumentasikan kemudian dilakukan analisis berdasarkan indikator dari masing-masing level penalaran proporsional. Soal pada bab Perbandingan terdiri dari dua tipe soal, yaitu soal pilihan ganda dan soal esai. Soal pada bab perbandingan sebanyak 225 soal. Berdasarkan hasil penelitian diperoleh distribusi soal berdasarkan level penalaran proporsional didapatkan bahwa soal dengan level 1 (kualitatif) sebanyak 31 (13,78%), soal dengan level 2 (aditif) sebanyak 22 butir soal (9,78%), soal dengan level 3 (pra multiplikatif) sebanyak 116 soal (51,56%), soal dengan level 4 (multiplikatif implisit) sebanyak 24 butir soal (10,67%) dan soal dengan level 5 (multiplikatif) sebanyak 32 butir soal (14,22%).*

Keywords: *Analisis Soal, Penalaran Proporsional, Buku Seri Soal.*

INTRODUCTION

Mathematics is the science of well-defined objects and ideas that can be analyzed and modified in different ways using mathematical reasoning to arrive at certain and lasting conclusions that can achieve results that can be fully trusted as true in various real-life contexts (OECD, 2021). Students will be accustomed to finding an understanding from experience regarding the characteristics that are owned and not possessed by a collection of objects or what is commonly referred to as abstraction (Tutik, 2012). In learning mathematics, students are also prepared to have various mathematical abilities or competencies that are qualified, which consist of *soft skills* and *hard skills.* In connection with the achievement of good mathematical competence, professional and competent teachers are needed as well as various other supporting facilities and infrastructure, starting from textbooks, learning media and teaching aids.

Learning mathematics in class, reasoning ability is one of the focuses of developing students' abilities. The definition of reasoning was conveyed by (Basir, 2015), who defines reasoning as an activity that prioritizes the analysis process, with the framework of thinking used is the logic of that reasoning. On the other hand, (Agustyaningrum et al., 2019) describing reasoning is an activity of thinking in order to understand the final result or in making new ideas with truth values based on relevant theories. Reasoning in mathematics is commonly referred to as mathematical reasoning. Mathematical reasoning as one of the abilities/competencies that is quite important to be developed in learning mathematics. This is confirmed by the statement of *The Organization for Economic Co-operation and Development* (OECD) which states that reasoning plays an important role in understanding students' mathematical literacy, because one of the basic competencies of mathematical literacy is reasoning ability (Kusumawardani et al., 2018) In addition, mathematical literacy in the 21st century includes mathematical reasoning.

Regarding the mathematical reasoning ability of students in Indonesia, based on research by (Rizta et al., 2013) stating that there are only 28.15% of students with good mathematical reasoning abilities. In line with this, it Sukirwan et al.

(2018) states that students still experience task when facing mathematical task related to mathematical reasoning.

In mathematics there are several kinds of reasoning abilities. Proportional reasoning is an important mathematical reasoning ability and has a role as a basic reasoning needed in understanding and studying mathematical material (Lutfi et al., 2021). Based on Wijayanti & Winslow (2017) proportional reasoning is one of the most intensively studied topics in mathematics education research. Misnasanti et al. (2017) defines proportional reasoning as mathematical reasoning related to proportions and ratios. Prespective Lobato et al. (2012) defines proportional reasoning, that proportional reasoning focuses on understanding value, and understanding what happens when prices change; for example, continuous variation in value. Thus proportional reasoning in this study is reasoning that focuses on understanding value, and understanding what happens when prices change; for example, continuous variation in the value of . Proportional reasoning can be known through solving task or task related to proportions or ratios.

In proportional reasoning there are several levels of proportional reasoning skills. The higher the level/level of proportional reasoning, the more advanced the level of students' proportional reasoning ability. Irawati (2015) defines the level of proportional reasoning ability into: qualitativ, additive, pre-multiplicative, implicit multiplicative, and the highest level is multiplicative.

Regarding the importance of proportional reasoning skills so that this ability is developed through a variety of materials. Reasoning abilities are developed in various subjects including comparisons, statistics, probability, plane shapes and spatial shapes. At the junior high school level, grades VII and VIII, proportional reasoning tasks were found in three of the seventeen subjects, namely comparisons, triangles and quadrilaterals, and the Pythagorean theorem (Johar et al., 2018). Basically proportional reasoning is the ability to understand the ratios or preparation comparisons. The composition of proportional reasoning abilities will be found in many comparison subjects.

The course of the mathematics learning process is carried out by utilizing several supporting media, one of which is a textbook. One of the textbooks

circulating in the market is the task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School Grade VII based on the 2013 Revised Edition of the 2016 Curriculum, published by Erlangga in 2017, written by Kurniawan. Based on a statement from the publisher Erlangga, this book is ideal to be used as a companion and complement to the Mathematics textbooks for Junior High School Grade VII. The book series of tasks was made so that students can enrich their abilities in a more focused way. The tasks and task developed in the book are in the form of multiple choice tasks and essays which are grouped based on subject matter per chapter based on the 2013 revised 2016 edition of the curriculum.

Based on that, this book has been awarded the title of *Top Brand*. Based on Top Brand Award (2019) explaining that *Top Brand* is an appreciation given to a *brand* that is the best choice for customers. *Frontier Research* as an independent institution that has conducted assessments since 2000. This assessment has been trusted by brand holders and customers in Indonesia due to of their 21 years of experience.

Task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School Grade VII Curriculum 2013 Revised Edition 2016 published by Erlangga written by Kurniawan based on the results of field studies have been used in various schools. One of them is as a guide for mathematics teachers at Sultan Agung Islamic Junior High School 1 Semarang. Mathematics teachers use the book as additional teaching material when the teacher wants to provide additional evaluation tasks. Because basically this book contains a lot of varied tasks. This book is also used as an enrichment and complementary book for students to deepen the evaluation in the form of various tasks at SMP Negeri 1 Jepara. The tasks consist of multiple choice tasks and essay tasks.

In relation to the evaluation of learning, tasks are needed to measure students' abilities. To measure the ability of students required tasks that are in accordance with the circumstances of each student. For example, the teacher wants to know whether the student has reached level 3 (pre-multiplicative) proportional reasoning ability, then the teacher must use the appropriate tasks. Thus, it is necessary to

analyze tasks based on the level of proportional reasoning. In accordance with the opinion Fitrianawati (2017) explained that the analysis of the tasks will play a role as a determinant in the quality of the items to be used. The specific benefits of task analysis activities depend on the analytical technique used. Regarding this, the author will analyze tasks based on the level of proportional reasoning so that this can be used in relation to giving tasks to students.

RESEARCH METHODS

Research Types and Design

This research is a qualitative research. Sugiyono (2016) defines qualitative research as research based on postpositivism, used in research on natural objects, where the researcher will have a role as a key instrument. The approach used in this research is a descriptive approach. Descriptive method is defined as a research procedure by solving task investigated by describing the state of the subject or object in the study, which can be in the form of people, institutions, communities and others which at present are based on facts that appear and can be clearly observed.

Research focus

The focus of this research is the analysis of the comparison chapter in the task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School Grade VII Curriculum 2013 Revised Edition 2016 published by Erlangga written by Kurniawan based on the level of proportional reasoning.

Data source

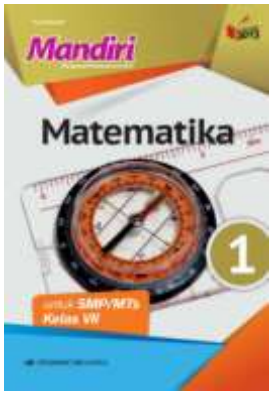

Figure 1. Independent Task Series Book for SMP/MTs Class VII

Sources of data were obtained from tasks contained in the task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School Grade VII Curriculum 2013 Revised Edition 2016. The book is a book published by Erlangga written by Kurniawan in 2017. The tasks analyzed are tasks that found in the comparison chapter. There are two types of tasks in this chapter, namely multiple choice tasks and description tasks. The number of tasks in the Comparison chapter is 225 tasks. Which consists of evaluation tasks, test tasks package 1 and test tasks package 2. The evaluation tasks consist of 175 multiple choice tasks and 25 essay tasks. As for the test tasks, each consists of 25 multiple choice tasks.

Method of collecting data

This study uses data collection methods with documentation techniques. Based on Herdiansyah (2011) the documentation method as a method of collecting qualitative data by viewing or analyzing documents made by the subject himself or by other people. Documentation is one way that qualitative researchers can use to get an overview from the subject 's point of view through a written medium and other documents that are written or made directly. Data in the form of proportional reasoning tasks in the Comparison chapter are documented for analysis. The tasks that have been documented are analyzed based on indicators of proportional reasoning. The instruments and research results have been validated by experts consisting of two lecturers from the Mathematics Education study program.

Research procedure

In this study, the first procedure carried out was an initial analysis in the selection of material in relation to the dominance of tasks that contained proportional reasoning abilities. This preliminary analysis results in the fact that the Comparison chapter contains more tasks related to proportional reasoning than the other chapters. Followed by preparing a task document to be analyzed. Then, analyze each task based on indicators from each level of proportional reasoning. The task indicators for each level of proportional reasoning are based on Irawati (2016) in her research developing proportional reasoning indicators from five levels of proportional reasoning, namely:

Level	Indicator
1. Qualitative	- Students make simple conection in comparison task by using multiple number operations (add or subtract) to the given task.
2. Additive	- Students make addition conection with integers.
3. Pre Multiplicative	- Students make addition, subtraction, multiplication or division conection in integers - Students make addition, subtraction, multiplication or division conection in fractional numbers
4. Implicit Multiplicative	- Students make some conection between addition, subtraction, multiplication or division in integers - Students make some conection between addition, subtraction, multiplication or division in fractional numbers
5. Multiplicative	- Students make connections between addition, subtraction, multiplication and division of whole numbers and fractions.

Table 1. Indicators of Proportional Reasoning According to Irawati (2016)

The following table describes the characteristics of proportional reasoning tasks at each level. These characteristics will be used in analyzing the tasks contained in the selected book.

Level	Task Characteristics	Reasoning Ability
Qualitative	Reasoning tasks with expressions through words such as increase, decrease, become	- Repeating and copying known knowledge - Task introduction - Re-registration task - Repeat information - Describe the task - Shows the conection of multiple operations (increase / decrease)
Additive	The use of additive conection (summation) in integers.	- Apply addition conection to comparison task involving integers
Pre Multiplicative	- Using multiplicative conection in integers - Using additive conection in fractions	- Applying addition, subtraction, multiplication or division operations to comparative task involving integers - Applying the conection of addition operations to comparative task with the involvement of fractions
Implicit Multiplicative	- Using multiplicative conection step by step on bil. round and number fraction	- Apply some relational operations to task involving integers - Apply the conection of several operations to task involving fractions
Multiplicative	- Using multiplicative conection on whole numbers and fractions	- Applying the operation conection of addition, subtraction, multiplication or division in comparison task involving integers and fractions

Table 2. Characteristics of Proportional Reasoning Tasks at Each Level

The next step is to draw conclusions about the percentage of tasks based on each level of proportional reasoning. Followed by presenting the results of the analysis of the tasks in the tabulation table.

Data analysis

The data obtained is used to describe the contents of the tasks contained in the book. The technique used in this research is *content analysis*.

Data analysis steps:

1. Preparation of research instruments to analyze each item based on each level of proportional reasoning.
2. Expert validation, to determine the feasibility of the instrument that has been prepared by the researcher.
3. Analysis of the tasks in the Comparison chapter based on indicators for each level of proportional reasoning.
4. Calculate the percentage of each level of proportional reasoning tasks in the comparison chapter using the following formula:

$$P_i = \frac{n_i}{N} \times 100\%$$

P_i= Percentage of Comparison chapter tasks at each level of proportional reasoning

n_i= Number of tasks at each level of proportional reasoning

N= Number of tasks in the Comparison chapter.

5. Validation of the results, to determine the validity of the research results.

RESULTS AND DISCUSSION

Research result

Before conducting the analysis on each item, the researcher arranged an instrument as a tool to carry out the analysis at the next stage. The instrument consists of indicators at each level of proportional reasoning. The instruments used have gone through a validation process by experts. With expert validation score 1 which is 100 and expert validation score 2 which is 95.83 so that the instrument can be used for research. Based on expert input and suggestions, the researcher made several revisions which included adding clearer indicators at the beginning of the instrument and compiling tables.

After the instrument obtained expert validation, the researcher analyzed each item based on the instrument that had been prepared. The results of the researcher's analysis were then validated by experts in order to determine the correctness of the task analysis that had been carried out by the researchers. Based on the results of the validation results, the results of the researcher's analysis have been suitable for

use in this study. In this section, it will be explained about the number of tasks, the percentage of each level and which number of tasks are included in that level. Based on the analysis carried out, the percentage distribution of proportional reasoning levels in the Comparison chapter tasks is as follows:

Proportional Reasoning Level	Number of Tasks	Percentage
Level 1: Qualitative	31	13.78%
Level 2: Additive	22	9.78%
Level 3: Pre Multiplicative	116	51.55%
Level 4: Implicit Multiplicative	24	10.67%
Level 5: Multiplicative	32	14.22%
Amount	225	100.00 %

Table 3. Percentage of Tasks Based on Proportional Reasoning Level

To facilitate the presentation of data in the form of the percentage distribution of each task based on the level of proportional reasoning, it is presented in the graph below:

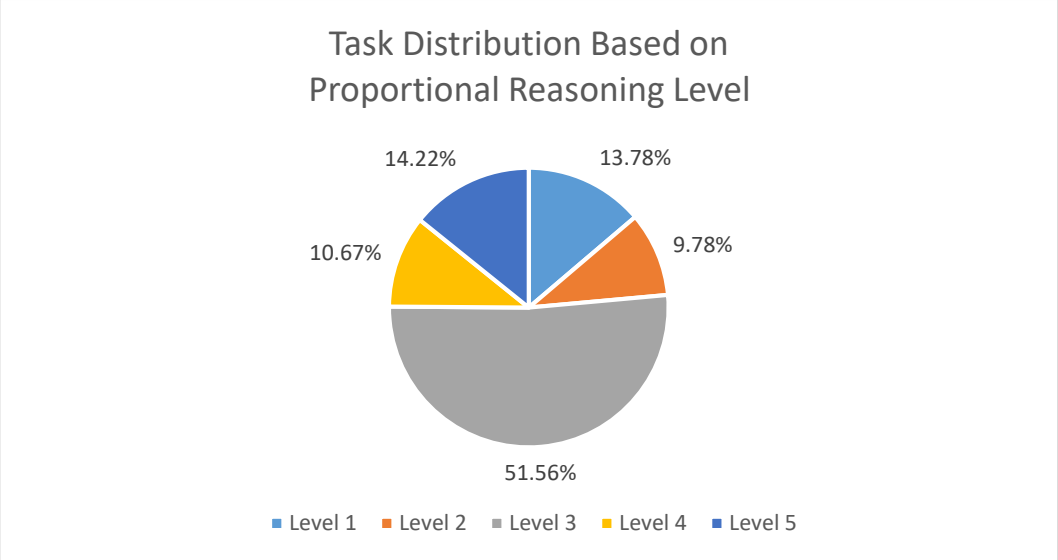

Figure 2. Graph of Task Distribution Based on Proportional Reasoning Level

a. Level 1: Qualitative

The first level of proportional reasoning is qualitative. At this level reasoning is based on qualitative conection, comparing things, answering tasks about fairness or tasks about more than or less than conection. At this

level, it can also be about qualitative conection regarding the most or least conection. The following is one of the tasks that match the criteria for level 1 proportional reasoning:

Soal Nomor 1 Pilihan Ganda (Soal Evaluasi)

(i) 1 jam : 72 menit

(ii) 2,5 kg : 30 ons

(iii) $2\frac{1}{2}$ lusin : $1\frac{2}{5}$ kodi

(iv) 10 hari : 2 minggu

Di antara perbandingan di atas, yang perbandingannya sama adalah …

A. (i) dan (ii)

B. (i) dan (iii)

C. (ii) dan (iii)

D. (ii) dan (iv)

This is a proportional reasoning task at level 1, which is qualitative because it is based on solving this task which will involve the first unit equating conection to choose an equal comparison by dividing fairly.

Based on the analysis conducted, there are 31 tasks of proportional reasoning level 1: qualitative. Thus, the percentage of tasks at this level is 13.78%. In the evaluation tasks, tasks with this level are found at numbers 1, 2, 3, 5, 6, 7, 10, 11, 15, 16, 18, 19, 20, 21, 26, 36, 37, 38, 39, 40, 41, 145 and 146 for multiple choice tasks and numbers 1 and 21 for essay tasks. In the daily test package 1 tasks with this level are in numbers 1, 2 and 5. While in the daily test package 2 tasks with this level are at numbers 1, 4 and 5.

b. Level 2: Additive

At the second level of proportional reasoning, namely additive, reasoning at this level is based on additive conection (summation). The subtraction conection is also part of this level. Which is the opposite of addition. The following is one of the tasks that match the criteria for level 3 proportional reasoning:

Task Number 4 Multiple Choice (Evaluation Task)

Umur Andi 6 tahun lebih muda dari umur kakaknya. Jika umur Agus 24 tahun, perbandingan umur Agus dan kakaknya adalah …

A. 2 : 3

B. 3 : 4

C. 4 : 5

D. 5 : 6

This is a level 2 proportional reasoning task, which is additive because in solving the task, to determine the age ratio of Agus and his brother, it is necessary to first find out the age of his brother by using the statement in the task, namely "Agus's age is 6 years younger than his brother's age". So to determine the age of his brother, you can add Agus' age by the number 6.

Based on the analysis conducted, there are 22 tasks of proportional reasoning level 2: additive. Thus, the percentage of tasks at this level is 9.78%. In the evaluation tasks with this level, there are numbers 4, 8, 13, 14, 24, 25 27, 28, 33, 43, 44, 96, 100 and 148 for multiple choice tasks and number 3 for essay tasks. In the daily test package 1 tasks with this level are at numbers 6, 9 and 10. While in the daily test package 2 tasks with this level are at numbers 3, 8, 11 and 21.

c. Level 3: Pre Multiplicative

At the third level of reasoning, namely multiplicative, reasoning at the level is based on multiplicative conection, but the multiplicative conection is limited to task involving integers. The comparative conection of this level is limited to conection involving two variables. The following is one of the tasks that match the criteria for level 2 proportional reasoning:

Task Number 15 Essay (Evaluation Task)

Diberikan data komparatif antara kecepatan sebuah kendaraan dan waktunya untuk menempuh sebuah jarak melalui jalur tol Jakarta-Cikampek.

Kecepatan (km/jam)	50	60	70	80	90
Waktu (menit)	72	60	48	45	40

Jika seseorang mengendarai kendaraannya dengan kecepatan 100 km/jam, hitunglah berapa menit yang diperlukan untuk menempuh jarak tersebut.

This is a level 3 proportional reasoning task, which is pre-multiplicative because solving the task involves a comparative conection involving multiplication and division of integers. The comparison conection in this task only involves two variables, namely speed and travel time. In solving this task, we use an inverse comparison of values.

Based on the analysis carried out, it was obtained that there were 116 multiplicative level 3 proportional reasoning tasks. Thus, the percentage of tasks at this level is 50.67%. In the evaluation tasks, tasks with this level are found at numbers 9, 12, 17, 22, 42, 45, 47, 48, 51, 52, 54, 55, 57, 58, 60, 62, 64, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 86, 87, 88, 89, 90, 91, 93, 94, 95, 97, 98, 101, 102, 103, 104, 107, 108, 109, 110, 113, 117, 120, 122, 123, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 147, 149 and 150 for multiple choice tasks and numbers 8, 13, 15, 16, 17, 18, 19, 22, 23, 24 and 25 for essay tasks. In the daily test package 1, tasks with this level are found in numbers 3, 4, 8, 11, 12, 14, 16, 18, 19, 20, 21, 22, 23, 24 and 25. While in the daily test package 2 Tasks with this level are at numbers 2, 12, 16, 17, 20, 22, 24 and 25.

d. Level 4: Implicit Multiplicative

At level four or implicit multiplicative reasoning is based on gradual multiplicative conection or *building up strategies* . The strategy can be in the form of a comparison conection which involves changing the units first to obtain an appropriate comparison conection to solve a given task. Multiplicative conection involving two variables and involving fractions as a multiplier are part of this level. The following is one of the tasks that match the criteria for level 4 proportional reasoning:

Task Number 6 Multiple Choice (UH Package 2)

Lima liter solar cukup untuk menempuh jarak $41\frac{2}{3}$ km. Jika tersedia 3 liter solar, maka jarak yang masih dapat ditempuh adalah …

A. 29 km

B. 25 km

C. $20\frac{3}{4}$ km

D. $20\frac{1}{3}$ km

It is a level 4 proportional reasoning task, which is implicit multiplicative because in solving the task it uses a multiplicative conection involving fractional numbers. This task can be solved by using an equivalent ratio.

Based on the analysis carried out, the level 4: implicit multiplicative reasoning tasks were obtained with 24 tasks. Thus, the percentage of tasks at this level is 10.67%. In the evaluation tasks with this level, there are numbers 23, 30, 31, 32, 34, 35, 46, 49, 50, 53, 56, 59, 66, 105 and 106 for multiple choice tasks and numbers 6, 7 and 14. for essay tasks. In the daily test package 1 tasks with this level are found at numbers 7 and 13. While in the daily test package 2 tasks with this level are at numbers 6, 7, 13, 14.

e. Level 5: Multiplicative

The highest level of proportional reasoning is multiplicative. At this level the ability to reason proportionally has reached the peak of directed maturity. So that at this level the task of comparative conection will involve more complex conection than at the previous levels. Comparative conection at this level can be in the form of task involving three arbitrary variables. So that students really understand the conection that remains even though the variables are changing. The following is one of the tasks that match the criteria for level 4 proportional reasoning:

Task Number 4 Essay (Evaluation Task)

Persediaan beras untuk 18 anak selama 25 hari adalah 20 kg. Hitunglah:

a. Kebutuhan beras untuk 10 anak selama 9 hari,

b. Berapa hari persediaan beras sebanyak 12 kg habis oleh 12 anak?

This is a level 5 proportional reasoning task, which is multiplicative because in solving the task it is necessary to have an understanding of the comparative conection involving three variable variables. This comparison uses a value comparison.

Based on the analysis carried out, it was obtained that there were 32 tasks of level 5: multiplicative reasoning. Thus, the percentage of tasks at this level is 14.22%. In the evaluation tasks with this level, there are numbers 29, 61, 63, 65, 85, 92, 99, 111, 112, 114, 115, 116, 118, 119, 121 and 124 for multiple choice tasks and numbers 2, 4 , 5, 9, 10, 11, 12 and 20 for essay tasks. In the daily test package 1 tasks with this level are at numbers 15 and 17. While in the daily test package 2 tasks with this level are at numbers 9, 10, 15, 18, 19 and 23.

Discussion

The analysis of the tasks carried out in the Comparison chapter based on the level of proportional reasoning generated in the previous section is based on indicators, characteristics or characteristics at each level. The following will identify how these groupings can be obtained so that the percentages in the sections described previously will be identified. From the identification results in the comparison chapter of the task series book MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School Grade VII Curriculum 2013 Revised Edition 2016 published by Erlangga by Kurniawan, the characteristics of each level were obtained.

The first level is the qualitative level. At this level there are several indicators, namely students can answer task involving fair distribution, comparing things. At this level it is still limited to the comparison of worth. Characteristics of the tasks in the Comparison chapter based on level 1 (qualitative) proportional reasoning, namely tasks in the form of determining the same ratio of two different units in the same magnitude, forming a simple comparison of two things that are already known, forming a comparison of the area of a shape if the size is known, forming a comparison of the travel time of a known speed, forming a thermometer scale comparison, determining the size if magnification is carried out, determining the

correct statement regarding the size of weight and volume, determining the correct statement regarding the comparison presented in the picture, stating the correct statement related to younger sentences, expressing the proportion of things that are already known. In answering tasks regarding the formation of simple comparative values, the principle of fair share can be used. The ability to compare something will be owned by every student with the existence of these tasks.

The second level is additive. Characteristics of tasks in the Comparison chapter based on level 2 (additive) proportional reasoning, namely tasks with the type of using integer additive conection that can be used in the completion process. Students can use addition and subtraction conection with integers to solve task of this type. Task with criteria for comparing things, but the value of each object is not known and the solution using addition or subtraction conection is also included in the additive level. There are tasks with commands stating comparisons and looking for a value.

The third level is pre-multiplicative. At this level, students are introduced to multiplicative conection. So that the multiplicative conection is still limited to a simple multiplicative conection that only involves two variables. The meaning of a simple multiplicative conection is a multiplicative conection that only involves integers, and can be obtained directly without any other process, both quantity changes and unit conversions. The characteristics of the tasks in the Comparison chapter are based on level 3 (pre-multiplicative) proportional reasoning, namely the use of multiplicative conection that can be obtained directly from the tasks without any modification or other processes, so that multiplicative conection can be obtained directly. The multiplicative conection at the level is also limited to involving integers only. Additive conection to fractions are also included in this level. Task with this level are found in task in finding a value or comparing ratios. There is a comparison of worth and reversal of value at this level.

The characteristics of the tasks in the Comparison chapter based on level 4 proportional reasoning (implicit multiplicative) are tasks that require that what is known in the task is changed first so that students cannot directly use simple multiplicative conection. As the name implies, that is implicit which means not

clearly (implied). This conection is a *building up strategy* to develop a more mature proportional reasoning ability. Multiplicative conection involving fractional numbers are included in the criteria for this level. Task with this level are found in task in finding a value or comparing ratios. There is a matter of comparison of worth and inverse value.

The highest level of proportional reasoning is multiplicative. With this level task, students' proportional reasoning ability can reach the peak of targeted maturity. The characteristics of the tasks in the Comparison chapter based on level 5 (multiplicative) proportional reasoning are the existence of a multiplicative conection that involves a change in the value in it, and can be in the form of three variables in a task. Task with this level are found in task in finding a value or comparing ratios, both in comparisons of value and in reverse values.

CONCLUSION

Based on the source of data obtained from the tasks contained in the task book series MANDIRI (Mengasah Kemampuan Diri) Mathematics for Junior High School VII Curriculum 2013 Revised Edition 2016. The book is a book published by Erlangga written by Kurniawan in 2017. Analysis of the tasks contained in the Comparison chapter. The tasks in this chapter consist of two types of tasks, namely multiple choice tasks and essay tasks. The number of tasks in the Comparison chapter is 225 tasks. Which consists of evaluation tasks, test tasks package 1 and test tasks package 2. The evaluation tasks consist of 175 multiple choice tasks and 25 essay tasks. As for the test tasks, each consists of 25 multiple choice tasks. Based on the results of the study, it was concluded that the distribution of tasks based on the level of proportional reasoning found that tasks with level 1 (qualitative) were 31 items or with a percentage of 13.78%, tasks with level 2 (additives) were 22 items or with a percentage of 9.78 %, tasks with level 3 (pre-multiplicative) are 116 tasks or with a percentage of 51.56%, tasks with level 4 (implicit multiplicative) are 24 items or with a percentage of 10.67% and tasks with level 5 (multiplicative) are 32 items or with a percentage of 14.22%. The level of tasks based on proportional reasoning is mostly found at the pre-multiplicative level.

REFERENCES

Agustyaningrum, N., Hanggara, Y., Husna, A., Abadi, A. M., & Mahmudii, A. (2019). An analysis of students' mathematical reasoning ability on abstract algebra course. *International Journal of Scientific and Technology Research*, *8*(12), 2800–2805.

Basir, M. A. (2015). Kemampuan Penalaran Siswa dalam Pemecahan Masalah Matematis Ditinjau dari Gaya Kognitif. *Jurnal Pendidikan Matematika FKIP Unissula*, *3*(1), 106–114.

Fitrianawati, M. (2017). Peran analisis butir soal guna meningkatkan kualitas butir soal, kompetensi guru dan hasil belajar peserta didik. *Seminar Nasional Pendidikan PGSD UMS & HDPGSDI Wilayah Jawa*, 282–295.

Herdiansyah, H. (2011). *Metode Penelitian Kualitatif untuk Ilmu-Ilmu Sosioal*. Salemba Humanika.

Irawati, T. N. (2015). Mengembangkan Kemampuan Guru Matematika DalamMembuat Soal Penalaran ProporsionalSiswa SMP. *Seminar Nasional Matematika Dan Pendidikan Matematika UNY 2015*, 1011–1106.

Irawati, T. N. (2016). *Pengembangan Paket Tes Kemampuan Penalaran Proposional Siswa SMP*. Universitas Jember.

Johar, R., Yusniarti, S., & Saminan. (2018). The analysis of proportional reasoning task in the Indonesian mathematics textbook for the junior high school. *Journal on Mathematics Education*, *9*(1), 55–68. https://doi.org/10.22342/jme.9.1.4145.55-68

Kusumawardani, D. R., Wardono, & Kartono. (2018). Pentingnya Penalaran Matematika dalam Meningkatkan Kemampuan Literasi Matematika. *Prosiding Seminar Nasional Matematika (PRISMA)*, 588–595. https://journal.unnes.ac.id/sju/index.php/prisma/

Lobato, J., Hohensee, C., Rhodehamel, B., & Diamond, J. (2012). Using Student Reasoning to Inform the Development of Conceptual Learning Goals: The Case of Quadratic Functions. *Mathematical Thinking and Learning*, *14*(2), 85–119. https://doi.org/10.1080/10986065.2012.656362

Lutfi, A., Basir, M. A., & Kusmaryonno, I. (2021). Pengembangan instrumen tes penalaran proporsional materi perbandingan berdasarkan taksonomi anderson. *Prosiding Seminar Nasional Pendidikan Sultan Agung 2 (Sendiksa 2)*, *2*(1), 169–176.

Misnasanti, Utami, R. W., & Suwanto, F. R. (2017). Task based learning to improve proportional reasoning of students in mathematics learning. *AIP Conference Proceedings*, *1868*(August). https://doi.org/10.1063/1.4995129

OECD. (2021). *PISA 2021 Mathematics Framework*. https://pisa2021-maths.oecd.org/#Mathematical-Reasoning

Rizta, A., Zulkardi, Z., & Hartono, Y. (2013). Pengembangan Soal Penalaran Model Timss Matematika Smp. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *17*(2), 230–240. https://doi.org/10.21831/pep.v17i2.1697

Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Penerbit ALfabeta.

Sukirwan, Darhim, D., & Herman, T. (2018). Analysis of students' mathematical reasoning. *Journal of Physics: Conference Series*, *948*(1). https://doi.org/10.1088/1742-6596/948/1/012036

Top Brand Award. (2019). *Bagaimana Penilaian Bagi Merek Dalam Survei Top Brand?* https://www.topbrand-award.com/tentang-top-brand-award/

Tutik, S. (2012). *Pengembangan Modul pada Materi Segi Empat untuk Siswa Kelas VII SMP Berdasarkan Pendekatan Kontekstual untuk Meningkatkan Hasil Belajar Siswa*. Universitas Negeri Yogyakarta.

Wijayanti, D., & Winslow, C. (2017). Mathematical practice in textbooks analysis: Praxeological reference models, the case of proportion. *Journal of Research in Mathematics Education*, *6*(3), 307. https://doi.org/10.17583/redimat.2017.2078