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Development of a Teaching Module on the Deep Learning Approach to Ratios

Nur Azizah[1*], Illah Winiati Triyana[1]

[1]Department of Mathematics Education, Faculty of Teacher Training and Education, Universitas Qomaruddin

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ABSTRACT

Teaching ratios at the junior high school level often poses a challenge for students who need a deep conceptual understanding to distinguish between direct and inverse proportions through real world contexts. Therefore, this study aims to produce a valid, practical, and effective Deep Learning based instructional module on ratios. The research method employed a Research and Development (R&D) approach using the 4D development model, which includes the Define, Design, Develop, and Disseminate stages, involving 25 students from MTs Hasyimiyah Bungah Gresik. The instruments used included an expert validation sheet, a teacher response questionnaire, a student response questionnaire, and a summative assessment. Based on the research results, the developed teaching module meets the criteria for validity, practicality, and effectiveness. The validation test results met the validity criteria, with an average score of 3.94 from two validators, falling into the highly valid category. Furthermore, the practicality test results met the practicality criteria, with an average score of 3,92 from the teacher response questionnaire and an average score of 3,90 from the student response questionnaire thus, the combined average score of 3,91 from both questionnaires falls into the highly practical category. Meanwhile, regarding the effectiveness test results, the module met the effectiveness criteria with an average score of 83,2 on the summative assessment test, placing it in the highly effective category. Therefore, the teaching module using the Deep Learning approach can be implemented and is recommended to teachers to stimulate conceptual understanding and enhance student engagement through more meaningful learning in the instructional process. The novelty of this study lies in the development of a ratio module that integrates Deep Learning (Mindful, Meaningful, and Joyful) in accordance with the Merdeka Curriculum, which transforms procedural learning into a deep mastery of concepts. Additionally, previous research has not extensively explored the Deep Learning approach to ratio material.

Corresponding Author:

Nur Azizah,
Department of Mathematics Education,
Faculty of Teacher Training and Education,
Universitas Qomaruddin,
Jalan Raya Bungah 01 Bungah Gresik 61152, Indonesia,
✉ nur327526@gmail.com

Introduction

In the era of globalization, education plays a vital role in equipping individuals, as it is a lifelong process of acquiring knowledge; the world of education is essential for every individual, as it fosters a strong sense of curiosity and helps develop one's potential in relation to the surrounding environment (Rahma., 2024). Therefore, to achieve these goals, a curriculum is needed that can support and facilitate the educational process. The curriculum is one of the key elements in education because it serves as a guide for the teaching and learning activities required of students (Marjohan et al., 2022). The curriculum in Indonesia frequently undergoes changes and adjustments to meet local needs and keep pace with the times, particularly in the field of education (Fitriani et al., 2019). Currently, the curriculum in effect is the Merdeka Curriculum, which has been ratified as the basic framework and structure of the national curriculum through Regulation of the Minister of Education, Culture, Research, and Technology No. 12 of 2024, issued on March 25 (Permendikbudristek, 2024).

The Merdeka Curriculum is a project based curriculum that provides teachers and students with the freedom to learn according to their abilities and developmental stages, while emphasizing character building through the Pancasila Student Profile (Permendikbudristek, 2024). The main characteristic of this curriculum lies in the transformation of the education system toward one that is more flexible and student centered, with a special emphasis on the development of critical and creative thinking skills (BSKAP Kemendikbudristek, 2023). The Merdeka Curriculum provides ample room for exploration for teachers and students, creating a fundamental need for the development of innovative teaching materials capable of facilitating conceptual depth in the learning process. In some regions, educational facilities and resources remain unevenly distributed, preventing the full implementation of the Merdeka Curriculum (Nurhasanah, 2025).

Although the Merdeka Curriculum brings many positive changes, its implementation still faces several challenges on the ground. To address these obstacles, Indonesia's national education system must undergo a structured transformation. Currently, Indonesia's elementary and secondary education systems are striving to quickly and effectively accelerate positive impacts on education through various learning approaches; one such approach is the Deep Learning approach, also known as Pembelajaran Mendalam (PM), introduced by the Ministry of Elementary and Secondary Education (Kemendikdasmen, 2025). Based on this data, in November 2024, the Minister of Education, Culture, Research, and Technology Abdul Mu'ti presented a key concept regarding the need for a new approach to education: the Deep Learning approach. In his statement, he emphasized that Deep Learning is not a new curriculum, but rather a learning approach that can be applied within any education system to provide students with a more meaningful, enjoyable, and in depth learning experience (Putri et al, 2022).

Kemendikdasmen (2025) states that Deep Learning is an approach that prioritizes the creation of a learning environment and a learning process that are mindful, meaningful, and enjoyable, involving the comprehensive and interconnected development of the mind, heart, emotions, and body. Therefore, to create such an atmosphere, there is a framework within the Deep Learning approach. According to the Kemendikdasmen (2025) Deep Learning approach is based on three core principles Mindful, Meaningful, and Joyful and comprises four frameworks: graduate profile dimensions, learning principles, learning experiences, and the learning framework. According to Fatria et al. (2026) the implementation of the Deep Learning approach is rapidly evolving to foster an optimal, engaging, and meaningful learning process. This approach prioritizes Deep Learning, reflection, and contextual learning activities. Students do not merely memorize information, rather they develop critical thinking skills and Problem Solving abilities related to everyday life. Similarly, a study Berliana (2024) found that Deep

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Learning is not just about learning concepts but also about solving problems by applying them to everyday life.

Problem solving skills are very important, as all students need to possess these skills to help them solve a variety of problems, whether in mathematics or in everyday life (Nasution, 2016). Problem solving skills are essential in life, but they are often at odds with students' current abilities. Several previous studies have shown that students' problem solving skills particularly in mathematics remain relatively low (Berliana, 2024). The ability to solve contextual problems related to ratios is one of the key skills that students must master, especially at the junior high school level (Saryanto, 2019). The concept of ratios is widely used in everyday life, therefore it is important for students to master this material.

However, in practice, students still face various challenges in understanding the concept of ratios and applying it in everyday life. This is supported by research Berliana (2024) this indicates that students still face difficulties in solving problems involving ratios, primarily due to their lack of understanding of the difference between direct and inverse proportions. Toha et al. (2018) stated that there are still students who often struggle to distinguish between problems involving direct and inverse proportions, among other things, they face difficulties in formulating problems in mathematical terms, do not understand the meaning of the problems, and struggle to find solutions to solve them.

In line with Adawiyah et al. (2024), students experience difficulties in understanding ratio concepts related to direct and inverse proportions. This is caused by teachers who, during the learning process, fail to delve deeply into the material, teach in an unsystematic manner, and do not fully optimize the content of the material or the questions related to real life contexts. Consequently, when it comes to ratio concepts, many students experience boredom, confusion, a lack of enthusiasm, and a lack of motivation. Students difficulties in understanding and applying ratio concepts, as revealed by various studies, indicate a lack of teacher creativity in instructional activities even though the current curriculum requires teachers to be creative and actively engage students. To address these challenges, innovation in instructional materials is needed to provide meaningful learning experiences. One solution is to develop teaching modules in accordance with the current curriculum, which not only help students understand the concept of ratios structurally but also increase their motivation and interest in learning and actively engage them so that they are able to apply the concepts when solving problems.

According to Nengsih et al (2024), instructional modules are key tools in the learning process because they provide targeted guidance, supporting resources, and learning activities that are aligned with the course material. According to Johnson et al. (2021), instructional modules are designed to provide structured guidance, facilitate mastery of subject matter, and foster creativity among students. Thus, although various studies have developed instructional modules for the implementation of the Merdeka Curriculum, research specifically integrating a Deep Learning approach remains limited, particularly in the context of teaching the topic of ratios in junior high school mathematics. Given this gap, this study focuses on developing a mathematics teaching module using the Deep Learning approach for the topic of ratios in junior high school, with the hope that learning will become more structured and that students learning outcomes will be enhanced through a deeper understanding during the learning process.

Method

Types and Subjects

In this study, we used the 4D Research and Development (R&D) model to produce valid, practical, and effective instructional modules (Sugiyono, 2019). In this case, we followed the

4D model, which includes needs analysis (Define), designing tools to support the development of instructional modules (Design), testing for validity, practicality, and effectiveness (Develop), and dissemination (Disseminate) (Maydiantoro, 2021; Sugiyono, 2019). This phase is used to provide a systematic approach to designing and refining educational products thus, this study aims to produce a teaching module using a deep learning approach to the topic of ratios. We involved 25 seventh grade students from MTs Hasyimiyah Bungah Gresik for the 2025/2026 academic year. The selection of this subject was based on the implementation of the Merdeka Curriculum using a deep learning approach to the topic of ratios at that school. Meanwhile, the research object consists of teaching modules for seventh grade MTs students, developed to meet the learning needs for the topic of ratios.

Instruments

The instruments used in this study included an expert validation form, a teacher response questionnaire, a student response questionnaire, and a summative assessment test as tools for collecting data in accordance with the research objectives. The validation form was used to measure the validity of the teaching modules that had been developed based on evaluations by expert validators. The teacher and student response questionnaires were used to test the practicality of the teaching modules that had been developed. In addition, the summative assessment test consisted of three essay questions designed based on the identified test material, and this test was used to evaluate the effectiveness of the teaching modules that had been developed. The description of the summative assessment instruments is provided in Table 1 below:

Table 1. Summative Assessment Instruments

Identification of the Material to Be Tested	Question	Answer
Applying the concept of ratios	The ratio of Rani's pencils to Siti's is 12 : 18. Determine the simplest ratio!	Find the FPB of 12 and 18, which is 6, so $\frac{12:6}{18:6} = \frac{2}{3}$. So, the simplest ratio is $2:3$.
Determining the value of an equivalent ratio	At the school cafeteria, 3 rolls cost Rp 9.000. If a student buys 8 rolls, how much money must the student pay?	Example: $x = the\ price\ of\ 8\ loaves\ of\ bread$ Cross multiply $\frac{3}{9000} = \frac{8}{x}$ $3 \times x = 9.000 \times 8$ $3x = 72.000$ $x = 72.000 \div 3$ $x = 24.000$
Solving inverse proportion problems	A group of students is working on a science project. If 8 students can complete the project in 5 days, how many days will it take if only 5 students work on it?	Multiply according to the inverse proportion formula: $\frac{8}{5} = \frac{x}{5}$ $8 \times 5 = 5 \times x$ $40 = 5x$ $\frac{40}{5} = x$ $8 = x$ or $x = 8\ days$

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Procedures

The procedure used in this study followed the stages of the 4D model. *First*, the define stage, we analyzed issues related to classroom learning, student characteristics, learning materials, and learning objectives through interviews with mathematics teachers at the school. *Second*, the design stage, we designed a learning module by collecting reference materials in accordance with the Merdeka Curriculum using a deep learning approach, drafting the module text, selecting teaching materials based on discussions with teachers, and designing the module from the title page to other components related to the deep learning approach. *Third*, the development stage involves implementing the instructional module design into a ready-to-use module. This process begins with validation by two validators a university lecturer and a high school mathematics teacher followed by revisions to improve the initial product until a valid instructional module ready for pilot testing is obtained. Next, a practicality test was conducted by distributing a practicality questionnaire to teachers and students at MTs Hasyimiyah Bungah Gresik after the lesson, which was then analyzed according to the practicality categorization criteria. Finally, the effectiveness was tested through a summative assessment, which was analyzed according to the criteria for categorizing effectiveness. *Fourth*, the dissemination stage, the developed product was provided to mathematics teachers at MTs Hasyimiyah Bungah Gresik for use during the learning process.

Next, we conducted analyses of validity, practicality, and effectiveness. *First*, the validity analysis was based on the validators evaluations of the developed teaching modules. The validators suggestions and comments were analyzed qualitatively, while the assessment data measured using a Likert scale were analyzed quantitatively. The scoring criteria for the Likert scale were adapted from (Effendi et al, 2021), as shown in Table 2

Table 2. Likert Scale Scoring Criteria

Score	Description
4	Excellent
3	Good
2	Fair
1	Very Poor

This interval data can be analyzed by calculating the average response based on the average score for each response from the experts (Nisa' et al, 2025). The assessment is expressed by the following formula:

$$\overline{M_v} = \frac{\sum_{i=1}^{n} \bar{V}_t}{n}$$

Notes:
$\overline{M_v}$ = Average validation results
$\bar{V}_t$ = Average validity score of the *i*-th validator
n = Number of validators (Ferdianto & Setiyani, 2018)

The results of the calculations were analyzed based on the validity criteria listed in Table 3

Table 3. Criteria for Categorizing the Validity of Teaching Modules

Validity Score	Category
$\overline{M_v} \leq 1{,}79$	Invalid
$1{,}79 < \overline{M_v} \leq 2{,}60$	Partially Valid

$2{,}60 < \overline{M_v} \leq 3{,}40$	Valid
$\overline{M_v} \geq 3{,}41$	Highly Valid

(Adapted from Nasution, 2018)

Based on Table 3, a Deep Learning teaching module is classified as valid if its minimum validity level, as determined by the validation results, falls within the valid category.

Second, the analysis of practicality was derived from teacher and student response questionnaires. The teacher response questionnaire was administered to subject teachers, and the student response questionnaire was administered to students participating in the pilot study. This survey data was then analyzed both qualitatively and quantitatively. Data in the form of suggestions and comments was analyzed qualitatively, while assessment data measured using a Likert scale was analyzed quantitatively. The scoring criteria for the Likert scale are as shown in Table 2 above.

The data from this interval can be analyzed by calculating the average response based on the scores from the subject teachers and students responses. The average response for the teacher response questionnaire and the student response questionnaire is calculated using the following formula:

$$\overline{M_p} = \frac{\sum_{i=1}^{n} \bar{P}_t}{n}$$

Notes:
$\overline{M_P}$ = Average score from teacher and student questionnaire responses
$\bar{P}_t$ = Average practicality score for teachers and students
n = Number of subject teachers/students (Ferdianto & Setiyani, 2018)

The average results obtained were analyzed based on the criteria for categorizing the practicality of the teaching modules, as shown in Table 4

Table 4. Criteria for Categorizing the Practicality of Teaching Modules

Practicality Score	Category
$\overline{M_p} \geq 3{,}41$	Very Practical
$2{,}60 < \overline{M_p} \leq 3{,}40$	Practical
$1{,}79 < \overline{M_p} \leq 2{,}60$	Less Practical
$\overline{M_p} \leq 1{,}79$	Very Less Practical

(Adapted from Wibowo, 2017)

Based on Table 4, a Deep Learning teaching module is categorized as practical if at least the teacher and student questionnaire responses fall into the practical category.

Third, the analysis of effectiveness was obtained through summative assessment tests administered to students. The results of this summative assessment consist of quantitative data based on students average scores, which were measured according to the criteria for categorizing the effectiveness of the teaching module. The data from the students summative assessment can be calculated using the following formula for the average:

$$E_{\bar{x}} = \frac{\sum x}{n}$$

$E_{\bar{x}}$ = Average score on the summative assessment
x = Student score
n = Number of students

Next, the average calculation results were analyzed based on the effectiveness categorization criteria set forth in Table 5 below:

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Table 5. Criteria for Categorizing the Effectiveness of Instructional Modules

Score Interval	Effectiveness Level
$90 \leq E_{\bar{x}} \leq 100$	Very Effective
$75 \leq E_{\bar{x}} < 90$	Effective
$60 \leq E_{\bar{x}} < 75$	Fair
$40 \leq E_{\bar{x}} < 60$	Low

(Adapted fromWibowo, 2017)

Based on Table 5, the results of the summative assessment are categorized as effective, if at least the results of that assessment meet the effective.

Research Findings

Define

During the definition phase, the researcher conducted five needs analyses, including a preliminary analysis, a student analysis, a task analysis, a concept analysis, and a learning objective analysis. Following discussions with mathematics teachers, the preliminary analysis revealed a need for instructional materials using a Deep Learning approach so that students can develop their knowledge in a more conscious, meaningful, and enjoyable way when understanding mathematical concepts, particularly ratios. The discussion also revealed that students faced difficulties in understanding ratio material related to equivalent and inverse ratios. Their mathematical abilities were classified as moderate. Students were more motivated when learning by relating concepts to their daily lives and showed greater enthusiasm during group learning. The researcher's findings included an analysis of assignments, specifically on the subtopics within the ratios unit: equivalent and inverse ratios. Based on the results of the conceptual analysis, the material on ratios in this teaching module covers several key concepts, namely: the definition of a ratio, simplifying ratios, and determining the solutions to direct and inverse proportions. Furthermore, based on the analysis of learning objectives, the learning objectives derived from the sequence of learning objectives formulated from the learning outcomes specified by the Ministry of Education and Culture are as follows: students will be able to solve proportions, simplify ratios, and apply the concepts of direct and inverse proportions to solve contextual problems.

Design

During the design phase, the researcher carried out four steps in the development of the instructional modules, consisting of gathering reference materials, drafting the text, selecting instructional materials, and designing the instructional materials. The instructional module design phase began with gathering various relevant reference materials, such as teacher and student textbooks. Discussions with seventh grade teachers were also conducted to ensure the materials aligned with the students' needs. After the references were collected, the module text was drafted systematically; the researcher drafted the instructional module text, starting with the module's identification, core learning activities, and student worksheets (LKPD). The selection of instructional materials in this module was tailored to the seventh-grade ratio curriculum competencies, which include the concept of ratios, simplifying equivalent ratios, and inverse ratios. The material is organized in stages, progressing from basic concepts to contextual applications. The module is supported by YouTube videos shown on the school's digital TV to aid students understanding in a visual and engaging way. Next, the design of

instructional materials includes the creation of the module cover, module identity, identification of learners and content, graduate profile dimensions, learning outcomes, instructional design, assessment, and appendices. The instructional design is structured to include: interdisciplinary approaches, learning objectives, learning topics, pedagogical practices, learning partnerships, the learning environment, the use of digital resources, learning experiences, introductory activities, core activities (understanding, applying, reflecting), and concluding activities. The appendices include: reading materials for teachers and students, a glossary, a bibliography, and worksheets (LKPD) developed in accordance with the Deep Learning approach. Each stage in this teaching module aligns with the Deep Learning approach which emphasizes mindful, meaningful, and joyful learning and is applied to enhance students' understanding of ratios in a way that is more meaningful, mindful, and enjoyable. The following Table 6 provides a brief overview of the Deep Learning based teaching module design for the topic of ratios:

Table 6. Learning Module Design

Identification	
Students	Seventh grade MTs students have varying levels of prior knowledge, particularly in understanding the concept of ratios. Some still struggle to distinguish between different types of ratios and apply them in everyday contexts. Several students also face challenges in performing simple calculations involving ratios and have difficulty recalling the basic concepts of arithmetic operations they have previously learned. Students learning styles tend to be visual and kinesthetic: therefore, teaching ratios needs to be linked to real life situations around them and supported by the use of media and interactive activities. Students show a high level of interest in activities involving media and hands on practice, but they still need reinforcement in logical and systematic thinking skills to gain a deep understanding of the concept of ratios.
Lesson Content	The lesson on ratios for 7th grade MTs students covers conceptual and procedural knowledge, such as the definition of a ratio, how to simplify ratios, comparing two quantities, and applying ratios in direct and inverse proportions. This material is highly relevant to students daily lives, for example, when comparing the number of group members or the proportions of ingredients in a recipe. The structure of the material begins with the definition of a ratio, how to simplify ratios, direct and inverse proportions, the use of ratios to solve everyday problems, and their application in contexts related to students daily lives.

Develop

During the development phase, the storyboard that had been prepared earlier was implemented as a learning module using a deep learning approach. Figure 1 below shows a brief overview of that learning module:

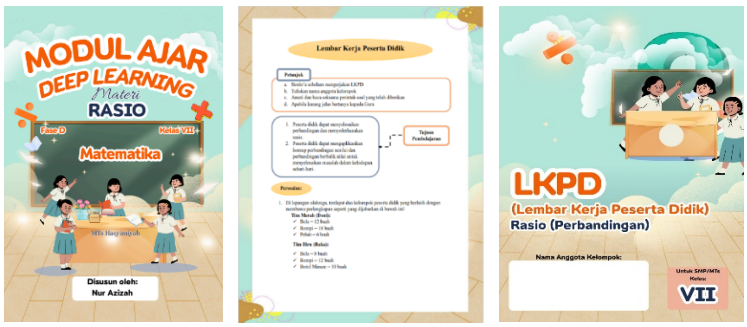

Figure 1. The resulting learning module

After the teaching module was developed, the next step was to pilot test it with 25 students at MTs Hasyimiyah Bungah Gresik. Following that, the teaching module was evaluated based

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on the criteria of validity, practicalty, and effectiveness. The teaching module validity assessment form was given to two validators: a university lecturer and a mathematics teacher. The results of the teaching module's validity assessment are shown in Table 7

Table 7. Results of the Expert Validation Sheet Analysis

Validator	Validity Score
Validator 1	3,92
Validator 2	3,96
Average	**3,94**

Based on Table 2 regarding the validity criteria for the teaching modules, the average score of 3, 94 falls within the range $\overline{M_v} \geq 3{,}41$. This indicates that the teaching modules developed fall into the highly valid category. The practicality of the teaching modules was assessed by distributing practicality questionnaires to teachers and students who participated in the pilot study after the lessons. The results of the teacher and student response questionnaires are shown in Table 8 and Table 9

Table 8. Teacher Response Results

Respondent	Practicality Score
Respondent 1	3,92
Respondent 2	3,92
Average	**3,92**

Table 9. Student Response Results

Total	Overall
Average Score	97,45
Respondent	25
Average	**3,90**

Based on Table 8 and Table 9 regarding the practicality criteria for the teaching modules, the assessment data from the teacher response questionnaire yielded an average score of 3,92, while the student response questionnaire yielded an average score of 3,90. Thus, the combined average score of 3,91 from the teacher and student response questionnaires indicates that the Deep Learning approach teaching modules fall into the very practical category. The effectiveness of the teaching module was then evaluated by administering a summative assessment test to 25 students. The results of the summative assessment test are shown in Table 10

Table 10. Summative Assessment Test Results

Total	Overall
Test score	2080
Students	25
Average	**83,2**

Based on Table 10 regarding the criteria for the effectiveness of teaching modules, the average score on the summative assessment test was 83,2, placing it in the highly effective category. Thus, the Deep Learning based teaching module on ratios can be deemed suitable for use in the learning process.

Disseminate

The researchers distributed these teaching modules only at MTs Hasyimiyah Bungah Gresik, the site of the study. Although distribution was limited, the researchers are confident that these teaching modules will still be beneficial to teachers and students.

Discussion

The implementation results show that the teaching module on ratios using the Deep Learning approach that was developed can be used to increase student engagement through deeper learning in the instructional process. This finding aligns with the view expressed by Akbar (2026), who states that the Deep Learning approach is capable of fostering higher cognitive engagement, enhancing teacher and student activity, and improving their learning outcomes in a profound way. From the practical perspective gleaned from teacher and student response surveys, the developed instructional module, when implemented, provides ease for both teachers and students due to the application of the Deep Learning principles of Meaningful, Mindful, and Joyful. Through the Meaningful principle which involves using real life contexts in ratio related material students are able to build meaningful conceptual understanding. Furthermore, through the Mindful principle, the module provides clear guidance for reflection, enabling students to become more independent and making it easier for teachers to guide them. Next, the Joyful principle, through the design of digital activities, creates a learning experience that is enjoyable, not boring, and increases students' enthusiasm for participating in each stage of learning. This aligns with the findings Solahudin (2025) which show that teaching modules using a Deep Learning approach are considered highly practical based on positive feedback from teachers and students. Research Putri (2022) also supports these findings, stating that the application of the Deep Learning approach makes it easier for students to understand the material and results in a learning experience that is more meaningful, enjoyable, and in depth for students.

Furthermore, the effectiveness of this teaching module, as evidenced by the results of the summative assessment, indicates that it has a positive impact on student learning outcomes due to the Meaningful principle of Deep Learning. In the assessment, the module uses questions related to real life contexts in the topic of ratios, thereby helping students build relevant and deep conceptual understanding rather than merely memorizing formulas. In addition, there are reflective activities that help students understand the concept of ratios more deeply through self evaluation of their thought processes. This meaningful learning process ensures that students are able to accurately distinguish between the concepts of direct and inverse proportions, which has a direct and significant impact on improving their learning outcomes. This is consistent with the findings Putra et al. (2024) and Agustin (2026) that Deep Learning approaches can improve the quality of learning in terms of students conceptual understanding, procedural skills, and critical thinking abilities.

In this study, the novelty lies in the development of a Deep Learning based instructional module on ratios presented in a contextual manner to support more meaningful learning for students. The novelty of this study lies in the integration of the Deep Learning approach into a mathematics teaching module on ratios, specifically designed in accordance with the Merdeka Curriculum. Unlike conventional teaching modules, which tend to be procedural, this module prioritizes the core principles of Deep Learning Meaningful, Mindful, and Joyful there by helping students achieve more Meaningful Learning. This provides a new contribution in the form of a learning tool that not only meets curriculum requirements but also addresses the limitations of previous research, which has not extensively explored the use of a deep learning approach to teaching ratio concepts at the junior high school level. In addition to testing the

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validity and practicality of the module, the researchers also measured its effectiveness in enhancing student engagement through meaningful conceptual understanding. The innovation in this module lies in the more contextual presentation of ratio material using real-life examples. This demonstrates that the active nature of the Deep Learning approach enables students to actively build deep understanding during the learning process (Hanifah et al., 2025). Thus, this Deep Learning based instructional module is suitable for use in teaching the topic of ratios in mathematics because it stimulates deep and structured conceptual understanding.

Conclusion

Based on the research findings, we developed a Deep Learning instructional module that meets the criteria of validity, practicality, and effectiveness. According to the validation test results, the instructional module met the validity criteria with an average score of 3.94 from two validators and was classified as highly valid. Furthermore, regarding the practicality test results, the teaching module met the practicality criteria, with an average score of 3,92 from the teacher response questionnaire and an average score of 3,90 from the student response questionnaire. Thus, the combined average score of 3,91 from both teacher and student response questionnaires falls into the highly practical category. As for the effectiveness test results, the teaching module met the effectiveness criteria, achieving an average score of 83,2 on the summative assessment test, thereby falling into the highly effective category.

Conflict of Interest

The authors declare that there are no conflicts of interest

Auhor Contributions

N.A. conceptualized the research idea presented, collected and organized the data, and prepared the initial draft of the manuscript. I.W.T. actively contributed to the development of the methodology, data analysis, and discussion of the findings. All authors confirm that they have read and approved the final version of this manuscript. The percentage contributions for the conceptualization, drafting, analysis, and revision of this paper are as follows: N.A.: 60%, and I.W.T.: 40%.

Data Availability Statement

The authors state that the data supporting the findings of this study will be made available by the corresponding author, [N.A.], upon reasonable request

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Authors Biography

Nur Azizah is a student and researcher at the department of mathematics education, faculty of teacher training and education, Qomaruddin University, Gresik, Indonesia. This journal is the first work published from the results of his research.
✉ nur327526@gmail.com

Illah Winiati Triyana, is a lecturer and researcher at the department of mathematics education, faculty of teacher training and education, Qomaruddin University, Gresik, Indonesia.
✉ illahwiniati@uqgresik.ac.id