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Effectiveness of the Multi-Representation Discourse Learning Model on Mathematical Problem-Solving Ability and Self-Confidence

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ABSTRACT

This study investigated the effectiveness of the Multi-Representation Discourse (DMR) learning model in improving students' mathematical problem-solving skills and self-confidence. A quasi-experimental pretest–posttest control group design was applied to 55 students selected through cluster random sampling from a population of 194. Data were collected using observation sheets, problem-solving tests, and self-confidence questionnaires, and analyzed with descriptive and inferential statistics. The results revealed that the DMR model was effectively implemented and significantly enhanced both mathematical problem-solving abilities and self-confidence compared to conventional instruction. Beyond its practical effectiveness, this study contributes to the theoretical discourse by demonstrating the value of multi-representation integration in mathematics learning, and provides empirical evidence that discourse-oriented strategies can strengthen both cognitive and affective outcomes. These findings underscore the potential of the DMR model as a pedagogical innovation for advancing mathematics education..

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Introduction

Mathematics education plays a crucial role in developing students' higher-order thinking skills, problem-solving ability, and confidence in expressing ideas (Finesilver, 2022; Öçal et al., 2020; Ultan Segal, 2009; Verschaffel et al., 2020a). In Islamic perspectives, education is highly emphasized as a means of elevating human dignity, while in modern educational discourse mathematics is regarded as a structured way of thinking that enables students to connect abstract concepts with real-life problems (Muslimin et al., 2020). Despite its importance, students' mathematical problem-solving skills often remain low, and their self-confidence in learning mathematics is limited. These issues are partly rooted in conventional teaching practices that emphasize procedural fluency and formulas rather than creative reasoning, which makes mathematics appear difficult and uninteresting to many students. As a result, students tend to be passive, hesitant to ask questions, and reluctant to participate actively in the classroom.

One of the essential domains of mathematics is geometry, which requires students to apply reasoning and problem-solving systematically (Fiallo & Gutiérrez, 2017; Patahuddin et al., 2022; Ulusoy & Çakıroğlu, 2020). However, preliminary observations in junior high schools revealed that students often struggle with solving problems that require systematic steps and show a lack of confidence during the learning process, as indicated by their average achievement below the minimum mastery criteria. This situation calls for innovative and student-centered learning models that can simultaneously address cognitive and affective dimensions of learning.

The Multi-Representation Discourse (DMR) model provides such an alternative. It emphasizes the active engagement of students through discourse, idea sharing, and the use of multiple representations to deepen mathematical understanding (Charalambous et al., 2020; Ding & Li, 2014; Gulkilik et al., 2020). By encouraging collaborative learning, exchanging perspectives, and fostering participation, the DMR model has the potential to enhance students' problem-solving ability while also strengthening their self-confidence (Fredriksen, 2021; Hernandez-Martinez et al., 2024). Although discourse-based and multi-representational approaches have been discussed in the literature, empirical evidence on their combined impact on both problem-solving skills and self-confidence, especially at the junior high school level, remains limited.

Previous research has consistently shown that innovative and student-centered approaches are more effective than traditional lecture-based instruction in improving mathematical problem-solving skills. For instance, discourse-based learning has been found to promote critical thinking, deepen conceptual understanding, and increase students' willingness to participate actively in class discussions (Chronaki & Planas, 2018; Ivars et al., 2020; Kobiela & Lehrer, 2019). Similarly, studies on multiple representations suggest that when students are encouraged to connect symbolic, visual, verbal, and contextual forms of mathematical ideas, their ability to solve complex problems improves significantly (Çekmez, 2020; Swidan, 2020; Swidan & Fried, 2021). However, much of the existing literature tends to focus on either discourse or representation separately, with limited studies combining the two into an integrated framework such as the DMR model. This gap highlights the need for empirical evidence on the combined impact of discourse and multi-representational strategies in fostering both problem-solving and affective outcomes like self-confidence.

From a theoretical perspective, the DMR model is aligned with constructivist and socio-cultural views of learning, which emphasize that knowledge is actively constructed through interaction, representation, and negotiation of meaning (Ayalon & Wilkie, 2020; Paoletti et al., 2024). By engaging students in multi-directional discourse and encouraging them to explore concepts through multiple forms of representation, DMR provides opportunities for deeper cognitive processing as well as for building confidence in expressing mathematical ideas. In this way, the model not only addresses the cognitive dimension of learning but also the affective domain, which is often overlooked in mathematics education research. This dual focus makes the DMR model particularly relevant for addressing current challenges in mathematics classrooms, where students must be equipped with both problem-solving competence and the confidence to apply their knowledge in diverse contexts.

This study was therefore guided by several research questions: How is the DMR model implemented in mathematics classrooms? Does the model significantly improve students' mathematical problem-solving skills and self-confidence compared to conventional instruction? And to what extent is the model effective in fostering these two aspects simultaneously? Accordingly, the objectives of this study are to describe the implementation of the DMR model, compare students' problem-solving skills and self-confidence between experimental and control groups, and evaluate the overall effectiveness of the model. Theoretically, this study contributes to the literature by providing empirical evidence of the dual impact of discourse-oriented and multi-representational learning on both cognitive and affective outcomes. Practically, it offers mathematics teachers a viable and innovative approach to create more effective, student-centered classrooms that promote problem-solving ability while nurturing students' confidence in learning mathematics. Beyond the local context, this study is also timely in addressing global educational challenges, as international assessments such as PISA emphasize the importance of problem-solving, reasoning, and student self-confidence as key indicators of 21st-century competencies. The findings are therefore expected to provide insights not only for mathematics education in Indonesia but also for broader international contexts where the integration of cognitive and affective outcomes remains a central concern.

Method

Settings

This study adopted a quasi-experimental design with a pretest–posttest control group. Two intact classes were randomly selected using a cluster random sampling technique. One class was assigned as the experimental group, which received instruction using the Multi-Representation Discourse (DMR) learning model, while the other class served as the control group, taught with conventional methods (lecture and assignment). Both groups completed a pretest and posttest to measure mathematical problem-solving ability and self-confidence. This design was chosen to allow comparison of the effects of the DMR model with traditional instruction under real classroom conditions.

Participants

The participants were drawn from a population of 194 ninth-grade students enrolled in eight classes at SMP Negeri 1 Tomoni, East Luwu Regency, South Sulawesi, Indonesia. The school is a public junior high school located in a semi-urban area and follows the Indonesian national curriculum. Students in this school are generally between 14 and 15 years old, representing a typical age range for Grade IX in Indonesia. The population included 94 male students and 100 female students across all classes, providing a relatively balanced gender distribution. From this population, two classes were selected using cluster random sampling to minimize selection bias while maintaining the natural classroom setting. Class IX.1, consisting of 28 students (13 male, 15 female), was assigned as the experimental group, while Class IX.2, consisting of 27 students (12 male, 15 female), served as the control group. Thus, the final sample size comprised 55 students. The experimental group received instruction through the DMR model, while the control group was taught using conventional teaching methods.

This sampling strategy was considered appropriate because intact classroom groups were preserved, avoiding disruption to school schedules, while randomization ensured comparability between the groups. The two selected classes were also comparable in terms of prior mathematics achievement, as indicated by their average grades in the previous semester, which were within a similar range. Therefore, the sample can be regarded as representative of the larger student population at the school, while also providing a manageable cohort for detailed classroom-based intervention research.

Instruments

Three instruments were employed in this study, namely observation sheets, a mathematical problem-solving test, and a self-confidence questionnaire. The observation sheets were used to monitor both teacher and student activities during the implementation of the DMR model, covering five stages of learning: preparation, introduction, development, application, and closure. These instruments demonstrated strong content validity with Aiken's V values ranging from 0.86 to 0.89 and high reliability with Cronbach's α of 0.96. The mathematical problem-solving test consisted of five open-ended items designed to assess students' ability to understand problems, plan and execute solutions, and verify results in the context of congruence. Expert validation yielded an Aiken's V index of 0.90, and reliability analysis indicated a Cronbach's α of 0.72, categorized as high. A structured scoring rubric (0–3 scale per indicator) was applied to ensure consistency of assessment. The self-confidence questionnaire comprised 15 items distributed across four dimensions, belief in one's own ability, independence in decision-making, positive self-concept, and willingness to express opinions, using a four-point Likert scale with both positive and negative statements. The validity index reached 0.86 and the reliability coefficient was 0.67, indicating that the questionnaire was both valid and reliable for assessing students' self-confidence in mathematics learning.

Data Collection

Data collection was carried out over a six-week instructional period and followed three stages. In the pretest stage, both groups completed the problem-solving test and self-confidence questionnaire one week before the intervention, which served as baseline data. During the intervention stage, the experimental group received mathematics instruction using the DMR model, which emphasized discourse, collaborative discussion, and the use of multiple representations such as visual, symbolic, verbal, and contextual forms. Students worked in groups of five to six members, engaging in structured dialogue, presenting solutions, and responding to peer feedback, while the teacher functioned as a facilitator rather than a lecturer. In contrast, the control group received conventional teaching in which the teacher explained concepts, demonstrated procedures, and assigned individual exercises, with limited opportunities for dialogue or exploration. Throughout the intervention, trained observers monitored classroom activities to ensure fidelity of implementation and to record levels of student engagement. In the posttest stage, both groups completed the same test and questionnaire administered under standardized conditions to measure learning outcomes. All instruments were administered in paper-and-pencil format during regular school hours. The data collection was conducted by the researcher with the support of classroom teachers. Ethical considerations were carefully observed, including obtaining approval from the school administration and informed consent from parents or guardians, while maintaining students' anonymity and confidentiality.

Data Analysis

The data analysis procedure consisted of several steps. First, descriptive statistics, including means, standard deviations, and percentages, were computed to describe teacher and student activities, problem-solving performance, and self-confidence levels. Problem-solving

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test scores were categorized into five levels, ranging from very low to very high, while self-confidence scores were classified into five categories from very low to very high according to established score intervals. Prior to hypothesis testing, preliminary analyses were conducted to check assumptions. The normality of the data distribution was tested using the Kolmogorov–Smirnov test, and homogeneity of variances between groups was examined using Levene's test. After assumptions were confirmed, inferential statistics were applied using independent samples t-tests to compare the posttest mean scores of the experimental and control groups for both mathematical problem-solving and self-confidence. In addition to significance testing, effect sizes (Cohen's d) were calculated to assess the magnitude of the intervention's impact. All statistical analyses were conducted using IBM SPSS Statistics version 25, with the significance level set at α = 0.05. This analytic procedure allowed the study to not only determine whether the DMR model had a statistically significant effect but also to evaluate the practical significance of its impact on both cognitive and affective learning outcomes.

Results

Student Activity during DMR Lessons

Observation of student activities across three sessions showed that the implementation of the DMR model was consistently in the "very good" category. As presented in Table 1, the percentage of student engagement increased from 85.71% in the first session to 89.47% in the third, with an overall mean of 87.66%. The highest engagement was observed in routine activities such as prayer, attendance, and group formation (≥98%), while the lowest was in presenting or responding to group work (57.14%). These findings indicate that although students were highly engaged, opportunities for oral presentation and peer feedback still required reinforcement.

Table 1. Student Activity during DMR Lessons

Stage	Student Activity	Meeting 1	Meeting 2	Meeting 3	Mean (%)
Preparation	Students prepare learning resources	78.57	75.00	85.71	79.76
Development	Students engage in group discussion	78.57	71.43	71.43	73.81
Application	Students present or respond to group work	57.14	53.57	60.71	57.14
Closing	Students summarize/conclude	82.14	71.43	75.00	76.19
Overall Mean (%)	–	**85.71**	**87.78**	**89.47**	**87.66**

Teacher Activity during DMR Lessons

Teacher activities during the implementation of DMR also demonstrated very good performance across three sessions. As shown in Table 2, teacher activity scores increased from 84.78% in the first session to 89.13% in the third, with an average of 87.32%. High scores were consistently observed in lesson preparation and classroom management (≥95%), while slightly lower scores were recorded in motivating students and guiding discussions (≈80%).

Table 2. Teacher Activity during DMR Lessons

Stage	**Teacher Activity**	**Meeting 1**	**Meeting 2**	**Meeting 3**	**Mean (%)**
Preparation	Teacher prepares learning resources	100	100	75	91.67
Introduction	Teacher motivates students	75	75	50	66.67
Development	Teacher facilitates discussion	75	100	75	83.33
Application	Teacher guides problem solving	100	75	100	91.67
Closing	Teacher gives evaluation and feedback	75	75	100	83.33
Overall Mean (%)	–	**84.78**	**88.04**	**89.13**	**87.32**

Mathematical Problem-Solving Ability

Experimental Group (DMR)

The descriptive statistics for the experimental group (n = 28) are shown in Table 3. The pre-test mean score was 13.12 (SD = 4.23), categorized as “very low.” After the intervention, the post-test mean score increased substantially to 77.68 (SD = 4.85), categorized as “high.”

Table 3. Descriptive Statistics of Mathematical Problem-Solving (Experimental Group)

Test	**N**	**Min**	**Max**	**Mean**	**SD**	**Var**	**Category**
Pre-test	28	7.5	20	13.12	4.23	17.88	Very Low
Post-test	28	70	90	77.68	4.85	23.58	High

Control Group (Conventional)

The descriptive statistics for the control group (n = 27) are presented in Table 4. The pre-test mean score was 12.40 (SD = 3.27), categorized as “very low.” After conventional instruction, the post-test mean score only reached 45.93 (SD = 5.81), which falls into the “low” category.

Table 4. Descriptive Statistics of Mathematical Problem-Solving (Control Group)

Test	**N**	**Min**	**Max**	**Mean**	**SD**	**Var**	**Category**
Pre-test	27	7.5	17.5	12.40	3.27	10.67	Very Low
Post-test	27	37.5	55	45.93	5.81	33.72	Low

Comparison between Groups

A comparison of mean scores is summarized in Table 5. Both groups started from a very low baseline, but the experimental group demonstrated a dramatic improvement to the “high” category, whereas the control group only improved slightly to the “low” category.

Table 5. Comparison of Pre-test and Post-test Means in Problem-Solving

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Group	Pre-test Mean	Category	Post-test Mean	Category
Experimental (IX.1)	13.12	Very Low	77.68	High
Control (IX.2)	12.40	Very Low	45.93	Low

Self-Confidence

Experimental Group (DMR)

As shown in Table 6, the mean pre-test score of students' self-confidence was 58.14 (SD = 7.21), categorized as "moderate." After DMR instruction, the mean score increased significantly to 74.68 (SD = 14.92), categorized as "high."

Table 6. Descriptive Statistics of Self-Confidence (Experimental Group)

Test	N	Min	Max	Mean	SD	Var	Category
Pre-test	28	45	75	58.14	7.21	52.05	Moderate
Post-test	28	57	100	74.68	14.92	222.74	High

Control Group (Conventional)

In the control group (n = 27), the mean self-confidence score increased only slightly from 53.26 (SD = 6.35, "moderate") in the pre-test to 58.74 (SD = 10.65, "moderate") in the post-test, as summarized in Table 7.

Table 7. Descriptive Statistics of Self-Confidence (Control Group)

Test	N	Min	Max	Mean	SD	Var	Category
Pre-test	27	7.5	17.5	12.40	3.27	10.67	Very Low
Post-test	27	37.5	55	45.93	5.81	33.72	Low

Comparison between Groups

The comparison summarized in Table 8 indicates that self-confidence in the experimental group improved from "moderate" to "high," whereas the control group remained in the "moderate" category.

Table 8. Comparison of Pre-test and Post-test Means in Self-Confidence

Group	Pre-test Mean	Category	Post-test Mean	Category
Experimental (IX.1)	58.14	Moderate	74.68	High
Control (IX.2)	53.26	Moderate	58.74	Moderate

Inferential Statistics

Normality and Homogeneity Tests

Kolmogorov–Smirnov tests indicated that all data were normally distributed ($p > .05$), while Levene's tests confirmed homogeneity of variance across groups ($p > .05$). Thus, independent-samples t-tests could be validly applied.

Hypothesis Testing

Independent-samples t-tests revealed significant differences between groups. For problem-solving ability, the mean difference was statistically significant, $t(53) = 22.03$, $p < .001$, with a large effect size (Cohen's $d > 0.8$). For self-confidence, the mean difference was also statistically significant, $t(53) = 4.58$, $p < .001$, with a moderate effect size. These results indicate that the DMR learning model had a substantial positive effect on both students' mathematical problem-solving ability and self-confidence.

The findings of this study are presented in two main sections: descriptive and inferential analyses. The descriptive analysis includes observations of student and teacher activities during the implementation of the DMR learning model, as well as pre-test and post-test results of students' mathematical problem-solving skills and self-confidence. The inferential analysis involves normality and homogeneity testing, followed by hypothesis testing using independent samples t-tests to determine the effectiveness of the DMR model compared to conventional instruction. The results are reported systematically with supporting tables and figures to highlight both cognitive and affective outcomes.

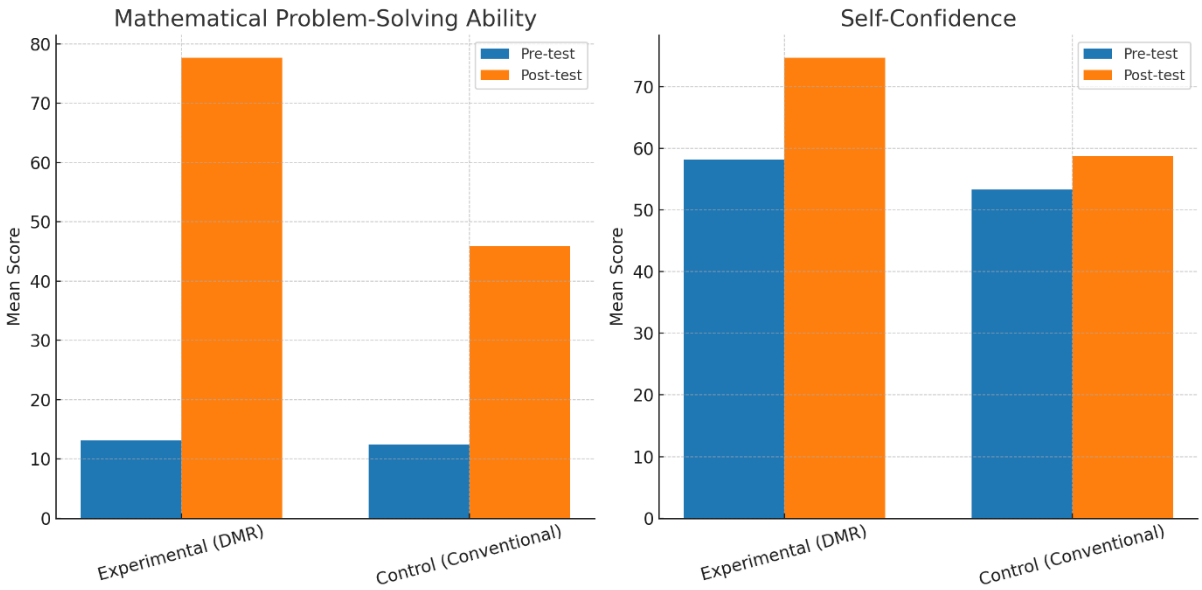

Figure 1. Comparison of pre-test and post-test mean scores between the experimental (DMR) and control groups: (a) mathematical problem-solving ability, and (b) self-confidence.

The graphical results clearly demonstrate that the Discourse Multi-Representation (DMR) learning model has a substantially greater impact compared to conventional instruction. In terms of mathematical problem-solving ability, the experimental group that received DMR-based instruction showed a remarkable improvement, with the mean score rising from 13.12 in the pre-test (very low category) to 77.68 in the post-test (high category). By contrast, the control group, taught through conventional methods, improved only slightly from 12.40 to 45.93, remaining in the low category. This indicates that active student engagement in discourse, the use of multiple representations, and collaborative problem-solving fostered through DMR can significantly enhance students' problem-solving competence, far beyond what lecture-based approaches can achieve.

A similar pattern was observed in students' self-confidence. The experimental group improved from an average score of 58.14 (moderate category) in the pre-test to 74.68 (high category) in the post-test. Meanwhile, the control group showed only a modest increase from

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53.26 to 58.74, both remaining within the moderate category. The significant improvement in the experimental group suggests that the DMR model is effective not only in addressing the cognitive domain but also in strengthening students' affective outcomes, particularly self-confidence. This can be attributed to the opportunities for interaction, group discussions, and idea sharing that allow students to believe more in their own abilities. Overall, the interpretation of the graphs underscores that the DMR learning model successfully promotes both mathematical problem-solving skills and self-confidence. These findings suggest that DMR is a powerful and innovative instructional approach that deserves strong consideration for mathematics teaching at the junior high school level.

Discussion

The findings of this study provide empirical evidence that the application of the Multi-Representation Discourse (DMR) model is effective in improving both students' mathematical problem-solving ability and their self-confidence. The experimental group, which was taught using the DMR model, showed a substantial increase in post-test scores compared to the control group taught with conventional lecture-based methods. This improvement was evident not only in the cognitive domain (for instance, problem-solving ability) but also in the affective domain (self-confidence). These results suggest that the DMR model has the potential to address two critical challenges in mathematics education: the development of higher-order thinking skills and the fostering of students' belief in their own capabilities.

In line with previous studies, the present research confirms that discourse-based approaches contribute positively to students' engagement and conceptual understanding (Csíkos & Szitányi, 2020). Similar to the findings of Ingram et al. (2019), who reported that discourse-oriented instruction enhances students' mathematical communication and confidence, this study extends the evidence by showing that when discourse is combined with multi-representational strategies, students are better equipped to approach mathematical problems systematically and to express their reasoning more confidently. Furthermore, the results resonate with Gulkilik et al. (2020), who demonstrated that cooperative multi-representational models significantly improve problem-solving performance. These findings also align with Montenegro et al. (2018), who argued that multiple representations provide complementary perspectives that foster deeper understanding. Unlike studies that focus solely on discourse (Herbel-Eisenmann & Otten, 2011) or representation (Moreno-Arotzena et al., 2021), this study highlights the added value of integrating the two within a single instructional framework.

From a theoretical standpoint, the effectiveness of the DMR model can be explained by constructivist and socio-cultural learning theories, which emphasize that knowledge is co-constructed through interaction and the use of multiple symbolic tools (Borji et al., 2020). By encouraging students to engage in dialogue, exchange perspectives, and utilize different forms of representation (verbal, visual, symbolic, and contextual), the model facilitates deeper cognitive processing while simultaneously enhancing students' confidence in communicating mathematical ideas. This dual impact on both cognitive and affective outcomes represents a noteworthy contribution to the field, as much of the existing research tends to emphasize either skill development or motivational aspects, rather than both (Lee et al., 2023).

The practical implications of this study are equally significant. For teachers, the DMR model offers a structured yet flexible approach to designing classroom activities that go beyond rote memorization and procedural fluency. It fosters a more interactive and student-centered learning environment where students are motivated to actively participate, articulate their thoughts, and collaborate with peers. This finding echoes research by Hitt et al. (2017), who argued that effective mathematics pedagogy should integrate discourse, representation, and student agency. For schools and curriculum developers, the findings underscore the importance of adopting innovative teaching models that not only enhance achievement scores but also strengthen essential non-cognitive skills such as confidence and self-efficacy (Verschaffel et al., 2020b). This aligns with the broader educational goal of preparing students not only as competent problem-solvers but also as confident lifelong learners.

Despite its promising results, this study has certain limitations. The research was conducted in a single junior high school with a relatively small sample size, which may limit the generalizability of the findings. Furthermore, the intervention was implemented within a relatively short duration, making it difficult to assess the long-term sustainability of the observed improvements. Future research should therefore involve larger and more diverse samples, longitudinal designs to track changes over time, and qualitative approaches to gain deeper insights into students' experiences and perceptions of the DMR model. Additionally, further studies could explore how digital tools and technologies might be integrated into DMR to enhance its effectiveness in contemporary learning contexts. In conclusion, this study provides strong evidence that the Multi-Representation Discourse model is effective in enhancing both problem-solving ability and self-confidence among junior high school students. By bridging cognitive and affective dimensions of mathematics learning, the DMR model offers a valuable pedagogical approach that contributes not only to theoretical discussions in mathematics education but also to practical improvements in classroom practice.

Conclusion

This study provides strong empirical evidence that the Multi-Representation Discourse (DMR) learning model is effective in enhancing both mathematical problem-solving ability and self-confidence among junior high school students. Students taught using the DMR model showed significant improvements in their ability to understand problems, devise and execute problem-solving strategies, and evaluate their solutions systematically. At the same time, they demonstrated higher self-confidence, particularly in terms of believing in their own abilities, making independent decisions, and expressing mathematical ideas. These findings highlight the dual impact of the DMR model on both cognitive and affective learning outcomes, thereby positioning it as a promising pedagogical approach for mathematics education. Several limitations of this study should be noted. First, the research was conducted in a single school with a relatively small sample size, which restricts the generalizability of the findings. Second, the intervention was implemented over a limited period, making it difficult to assess the long-term sustainability of the observed improvements. Third, the study relied primarily on quantitative measures of problem-solving and self-confidence, without incorporating qualitative insights that might provide a deeper understanding of students' experiences and perspectives. Finally, contextual factors such as teacher readiness, school resources, and student backgrounds were not fully explored, which may also influence the effectiveness of the DMR model.

Future studies should expand the scope by including larger and more diverse student populations across different educational levels and contexts to strengthen the generalizability of findings. Longitudinal research designs are recommended to examine the long-term effects of the DMR model on problem-solving ability and self-confidence. In addition, incorporating qualitative methods such as classroom observations, student reflections, and teacher interviews would provide richer insights into how students engage with the model and what challenges they face. Moreover, future research should explore the integration of technology into the DMR framework, such as digital representations, online collaboration tools, and adaptive learning

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systems, to maximize its effectiveness in contemporary learning environments. The findings of this study carry important theoretical and practical implications. Theoretically, the results contribute to the literature on discourse and multiple representations by providing empirical support for their combined use as an integrated framework. This reinforces constructivist and socio-cultural perspectives on learning, where knowledge is co-constructed through dialogue and symbolic mediation. Practically, the DMR model offers mathematics teachers a viable alternative to conventional lecture-based methods by creating an interactive, student-centered learning environment that promotes both problem-solving competence and self-confidence. For policymakers and curriculum developers, the results underscore the importance of adopting innovative pedagogical models that address both cognitive and affective dimensions of learning. Ultimately, the DMR model can serve as a catalyst for transforming mathematics classrooms into spaces where students are not only able to solve problems effectively but also develop the confidence to apply their knowledge in real-life situations.

Conflict of Interest

The authors declare that there is no conflict of interest.

Author Contributions

N.S. conceptualized the research idea presented and collected the data. The other fourth authors (S.R., D.R.A., M. and S.Z.T.) actively contributed to the development of the theory, methodology, data organization and analysis, discussion of results, and approval of the final version of the work. All authors confirm that they have read and approved the final version of this manuscript. The percentage contributions to the conceptualization, drafting, and revision of this paper are as follows: N.S.: 60%, S.R..: 10%, D.R.A..: 10%, M.: 10% and S.Z.T.: 10%.

Data Availability Statement

The authors state that the data supporting the findings of this study are available from the corresponding author, [N.S.], upon reasonable request.

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