

ABSTRAK

MODEL PEMBELAJARAN BERBASIS REPRESENTASI MATEMATIS UNTUK MENINGKATKAN KEMAMPUAN MATEMATIS BERDASARKAN *NATIONAL COUNCIL OF TEACHERS MATHEMATICS* (NCTM)

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Pembelajaran matematika yang efektif memerlukan peningkatan kemampuan representasi matematis siswa, yang dapat membantu mereka dalam menghubungkan, memvisualisasikan, dan memahami konsep-konsep abstrak. Namun, banyak siswa yang kesulitan dalam mengembangkan kemampuan ini, yang berdampak pada rendahnya kemampuan pemecahan masalah dan penalaran matematis mereka. Penelitian ini bertujuan untuk mengembangkan model pembelajaran berbasis representasi matematis yang dapat meningkatkan kemampuan representasi, komunikasi, koneksi, penalaran, dan pemecahan masalah matematis siswa, sesuai dengan standar *National Council of Teachers of Mathematics* (NCTM) yang memenuhi kriteria valid, praktis, dan efektif. Model ini mengintegrasikan teori kognitivisme, konstruktivisme, pemrosesan informasi, *dual coding*, dan beban kognitif dalam merancang strategi pembelajaran yang mendalam dan efektif. Penelitian ini menggunakan metode penelitian dan pengembangan (R&D) dengan pendekatan Plomp, yang terdiri dari fase investigasi awal, pembuatan prototipe, dan evaluasi. Populasi penelitian terdiri dari 45 SMP Negeri di Bandar Lampung, dengan sampel terpilih melalui teknik *cluster random sampling*. Uji validitas model dilakukan oleh lima ahli, dan uji kepraktisan dilakukan menggunakan angket yang diisi oleh guru, siswa, dan observer. Hasil penelitian menunjukkan bahwa model pembelajaran yang dikembangkan memenuhi kriteria valid secara isi dan konstruk, praktis, dan mudah diimplementasikan. Uji efektivitas menggunakan *pretest-posttest*, MANOVA, dan *normalized gain* menunjukkan bahwa model ini lebih efektif dibandingkan pembelajaran konvensional dalam meningkatkan kemampuan matematis siswa. Model pembelajaran DECADE (*Direction, Exploration, Construction, Articulation, Deep Reflection, dan Extension*) yang dikembangkan dapat dijadikan alternatif model pembelajaran matematika yang efektif untuk meningkatkan kemampuan matematis siswa di sekolah, khususnya dalam pengembangan program doktoral di bidang pendidikan matematika.

Kata Kunci: DECADE; Efektivitas pembelajaran; Pembelajaran matematika; Penalaran matematis; dan Representasi matematis.

ABSTRACT

MATHEMATICAL REPRESENTATION-BASED LEARNING MODEL TO ENHANCE STUDENTS' MATHEMATICAL COMPETENCIES IN ALIGNMENT WITH THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM) PROCESS STANDARDS

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Effective mathematics learning requires the enhancement of students' mathematical representation abilities, which help them connect, visualize, and understand abstract concepts. However, many students face difficulties in developing these abilities, which impacts their problem-solving and mathematical reasoning skills. This study aims to develop a mathematical representation-based learning model that can improve students' abilities in representation, communication, connection, reasoning, and problem-solving, in accordance with the National Council of Teachers of Mathematics (NCTM) standards, ensuring it meets the criteria of validity, practicality, and effectiveness. The model integrates cognitive, constructivist, information processing, dual coding, and cognitive load theories to design an in-depth and effective learning strategy. This research employs a Research and Development (R&D) method with a Plomp-based approach, consisting of the phases of initial investigation, prototype development, and evaluation. The study population includes 45 junior high schools in Bandar Lampung, with a sample selected through cluster random sampling. The model's validity was evaluated by five experts, and its practicality was tested using questionnaires completed by teachers, students, and observers. The results show that the developed learning model meets the content and construct validity criteria, is practical, and easy to implement. Effectiveness testing using pretest-posttest, MANOVA, and normalized gain analyses indicates that this model is more effective than conventional learning in improving students' mathematical abilities. The DECADE learning model (Direction, Exploration, Construction, Articulation, Deep Reflection, and Extension) developed in this study can serve as an alternative effective mathematics learning model to enhance students' mathematical abilities in schools, particularly in the development of doctoral programs in mathematics education.

Keywords: *DECADE; Effectiveness of learning; Mathematics learning; Mathematical reasoning; and Mathematical representation*