

**EKSPLORASI PROSES BERPIKIR SISWA SMP  
DALAM MEMECAHKAN MASALAH ALJABAR  
DITINJAU DARI ASPEK REPRESENTASI SEMIOTIK MATEMATIS**

**DISERTASI**

Diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar  
Doktor Pendidikan Matematika



Oleh

**WA ODE DAHIANA**  
NIM 1803375

**PROGRAM STUDI PENDIDIKAN MATEMATIKA  
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM  
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**Wa Ode Dahiana, 2024**

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Oleh  
Wa Ode Dahiana

S.Pd. Universitas Pattimura, 2004  
M.Pd. Universitas Pendidikan Indonesia 2010

Sebuah Disertasi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Doktor Pendidikan (Dr.) pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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Disetujui dan Disahkan oleh Tim Panitia Disertasi



Prof. Dr. H. Tatang Herman, M.Ed.  
Promotor Merangkap Ketua



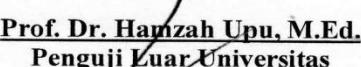
Dr. Elah Nisa Elalah, M.Si  
Ko-Promotor



Prof. Turmudi, M.Ed., M.Sc., Ph.D  
Anggota Pengaji

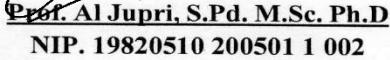


Dr. Jarnawi Afgani Dahlan, M.Kes.  
Anggota Pengaji



Prof. Dr. Hamzah Upu, M.Ed.  
Pengaji Luar Universitas

Mengetahui,  
Ketua Program Studi Pendidikan Matematika  
FPMIPA Universitas Pendidikan Indonesia



Prof. Al Jupri, S.Pd. M.Sc. Ph.D  
NIP. 19820510 200501 1 002

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## ABSTRAK

**Wa Ode Dahiana (2024)** Eksplorasi proses berpikir siswa SMP dalam memecahkan masalah aljabar ditinjau dari aspek representasi semiotik matematis

Pemecahan masalah merupakan suatu cara dan sarana pembelajaran matematika. Ini mencakup interpretasi, memodelkan, menghubungkan, mengkomunikasikan, dan memahami ide dan konsep matematika. Meskipun banyak cara untuk mendukung analisis pemecahan masalah matematis siswa telah diidentifikasi dalam literatur, hanya ada sedikit yang menggunakan representasi semiotik matematis dan proses berpikir (*Ways of Thinking*). Oleh karena itu, tujuan penelitian ini adalah untuk mendeskripsikan secara komprehensif dan memperoleh teori substantif (konjektur) tentang keterampilan representasi semiotik matematis dan *Ways of Thinking* (WoT) dalam pemecahan masalah aljabar berdasarkan level kemampuan matematis. Untuk mencapai tujuan ini, peneliti melakukan penelitian kualitatif dengan metode *grounded theory* melalui tiga langkah berikut. Pertama, setelah melakukan kajian literatur, peneliti mendesain soal-soal terapan aljabar untuk mengukur keterampilan representasi semiotik matematis siswa. Kedua, peneliti memberikan tes individu tertulis terhadap 31 siswa kelas XI (usia 16-17 tahun) dan melakukan wawancara mendalam dengan 13 partisipan yang dipilih berdasarkan level kemampuan matematis. Ketiga, hasil tes dan transkrip wawancara dianalisis menggunakan *software Nvivo 12 plus*. Hasil analisis menunjukkan bahwa siswa kelompok *high ability* mampu menunjukkan hampir semua aspek indikator keterampilan representasi semiotik matematis serta memiliki WoT invarian aljabar, penalaran proporsional dan deduktif; kelompok *middle ability* mampu menunjukkan masing-masing sebagian dari aspek indikator keterampilan representasi semiotik matematis serta cenderung memiliki WoT invarian aljabar, penalaran proporsional dan deduktif; kelompok *low ability* hanya menunjukkan satu aspek indikator keterampilan representasi semiotik matematis serta memiliki WoT simbolik *non-referensial*. Sementara, analisis *grounded theory* menghasilkan rumusan teoritik yakni semakin tinggi level kemampuan matematis siswa, semakin baik penguasaan mereka terhadap aspek keterampilan representasi semiotik yang dibutuhkan dalam pemecahan masalah aljabar serta semakin baik pula WoT yang dimilikinya. Temuan ini menyimpulkan bahwa keterampilan representasi semiotik matematis dan WoT menentukan kinerja siswa dalam memecahkan masalah aljabar.

**Kata kunci:** Keterampilan representasi semiotik, *ways of thinking*, pemecahan masalah aljabar, pendekatan *grounded theory*.

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## ABSTRACT

**Wa Ode Dahiana (2024)** Exploration of junior high school students' thought process in solving algebraic problems in terms of semiotic mathematical representations

Problem solving is a way and medium of learning mathematics. It includes interpreting, modeling, connecting, communicating, and understanding mathematical ideas and concepts. Although many ways to support students' mathematical problem-solving analysis have been identified in the literature, there are only a few that use mathematical semiotic representations and ways of thinking. Therefore, the purpose of this study is to comprehensively describe and derive substantive theories (conjectures) about mathematical semiotic representation skills and Ways of Thinking (WoT) in algebraic problem solving based on mathematical ability levels. To achieve this goal, the researcher conducted qualitative research with the grounded theory method through the following three steps. First, after conducting a literature review, the researcher designed applied algebra problems to measure students' mathematical semiotic representation skills. Second, the researcher administered individual written tests to 31 students in grade XI (aged 16-17 years) and conducted in-depth interviews with 13 participants selected based on mathematical ability level. Third, the test results and interview transcripts were analyzed using Nvivo 12 plus software. The results of the analysis showed that the high ability group students were able to show almost all aspects of the indicators of mathematical semiotic representation skills and had WoT of algebraic invariants, proportional and deductive reasoning; the middle ability group was able to show each part of the aspects of the indicators of mathematical semiotic representation skills and tended to have WoT of algebraic invariants, proportional and deductive reasoning; the low ability group only showed one aspect of the indicators of mathematical semiotic representation skills and had non-referential symbolic WoT. Meanwhile, the grounded theory analysis resulted in a theoretical formulation that the higher the level of students' mathematical ability, the better their mastery of the aspects of semiotic representation skills needed in solving algebra problems and the better their WoT. The findings conclude that mathematical semiotic representation skills and WoT determine students' performance in solving algebraic problems.

**Keywords:** Semiotic representation skills, ways of thinking, algebra problem solving, grounded theory approach.

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**EKSPLORASI PROSES BERPIKIR SISWA SMP DALAM MEMECAHKAN MASALAH ALJABAR DITINJAU DARI ASPEK REPRESENTASI SEMIOTIK MATEMATIS**

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