

**DIAGNOSIS OF MISCONCEPTIONS ABOUT WORK  
AND SIMPLE MACHINES WITH A FOUR-TIER DIAGNOSTIC TEST**

**RESEARCH PAPER**

Submitted as Requirement to Obtain Degree of *Sarjana Pendidikan* in  
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UNIVERSITAS PENDIDIKAN INDONESIA**

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# **DIAGNOSIS OF MISCONCEPTIONS ABOUT WORK AND SIMPLE MACHINES WITH A FOUR-TIER DIAGNOSTIC TEST**

Oleh

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Pendidikan pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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## DECLARATION

I do hereby declare that every aspect was written in this research paper entitled “**Diagnosis of Misconceptions about Work and Simple Machines with a Four-Tier Diagnostic Test**” is the original result of my idea, efforts, and works without copying or plagiarizing from other papers. The theories, opinions, and others that are contained in this paper have been quoted or referenced based on scientific code from UPI and under scientific ethics that applies in scholarly society. This declaration is created truthfully and mindfully. Unless it is eventually considered to be a violation of scientific ethics, or whether there is a statement by the other to the authenticity of this research paper, I can accept the authorization of scholars or copyright that are found. Hence, I am willing to take responsibility and accept academic sanctions corresponds to the rules.

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# DIAGNOSIS OF MISCONCEPTIONS ABOUT WORK AND SIMPLE MACHINES WITH A FOUR-TIER DIAGNOSTIC TEST

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## ABSTRACT

Student conceptions are the ways students understand phenomena in their surroundings. Diagnosing student conceptions is crucial for conducting more focused learning and preventing or reducing student misconceptions. The four-tier diagnostic test is considered more effective in diagnosing student conceptions but it is still in its early stages and requires improvement. One essential, yet challenging concept in physics for students to grasp is mechanics such as work and simple machines topic. The study of work and simple machines topics has previously been developed separately, but research that utilizes a four-tier multiple-choice test to diagnose misconceptions by integrating these topics is relatively limited. This study aims to analyze the level of student conceptions and common student misconceptions about work and simple machines. A survey research design was employed for this study, involving 110 students of 8<sup>th</sup> and 9<sup>th</sup> grade junior high school students. Data were collected through a four-tier multiple-choice test on the topic of work and simple machines. The results indicate that 39.5% of students are at the level of misconception, 25.8% possess scientific knowledge, 20.8% have a lack of knowledge, 9.3% represent false positives, and 4.6% represent false negatives. Students experienced significant misconceptions (> 10%) in all subtopics, particularly about types of simple machines. This suggests that classroom lessons need to be improved to assist students in constructing scientific knowledge and eliminating misconceptions. Therefore, teachers should address misconceptions and engage in active learning.

**Keyword:** Four-tier Test, Misconception, Simple Machine, Students' Conception, Work

# DIAGNOSIS MISKONSEPSI TENTANG USAHA DAN PESAWAT SEDERHANA DENGAN UJI DIAGNOSTIK EMPAT TINGKAT

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## ABSTRAK

Konsepsi siswa adalah cara siswa untuk memahami fenomena di sekitarnya. Mendiagnosa konsepsi siswa sangat penting untuk melakukan pembelajaran yang lebih fokus atau mencegah serta mengurangi miskonsepsi siswa. Tes pilihan ganda empat tingkat (four-tier test) lebih efektif dalam mendiagnosa konsepsi siswa tetapi masih terbatas dan memerlukan peningkatan. Salah satu konsep dalam fisika yang esensial tetapi siswa masih sulit untuk memahami adalah mekanik seperti topik usaha dan pesawat sederhana. Studi tentang topik usaha dan pesawat sederhana telah dikembangkan sebelumnya secara terpisah tetapi penelitian yang menggunakan tes pilihan ganda empat tingkat (four-tier test) untuk mendiagnosa miskonsepsi dengan menggabungkan topik ini relatif lebih sedikit. Penelitian ini dilakukan untuk menganalisis tingkat konsepsi siswa dan miskonsepsi siswa. Desain penelitian survei diterapkan dalam penelitian ini. Penelitian ini melibatkan 110 siswa SMP kelas 8 dan kelas 9. Data dikumpulkan dari tes pilihan ganda empat tingkat pada topik usaha dan pesawat sederhana. Hasil penelitian menunjukkan bahwa 39.5% siswa berada pada tingkat miskonsepsi (*misconception*), 25.8% pengetahuan ilmiah (*scientific knowledge*), 20.8% kurang pengetahuan (*lack of knowledge*), 9.3% salah positif (*false positive*), dan 4.6% salah negatif (*false negative*). Miskonsepsi yang dialami siswa signifikan ( $> 10\%$ ) pada semua subtopik, khususnya tentang jenis-jenis pesawat sederhana. Hal ini menyiratkan bahwa pelajaran di sekolah perlu ditingkatkan untuk membantu siswa membangun pengetahuan ilmiah dan menghilangkan miskonsepsi. Oleh karena itu, dalam pembelajaran guru harus membahas miskonsepsi dan melakukan pembelajaran aktif.

**Kata Kunci:** Diagnosis Tes Empat Tingkat, Konsepsi Siswa, Miskonsepsi, Pesawat Sederhana Usaha



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