PENGEMBANGAN BAHAN AJAR IPA TEMA SAMPAH BERMUATAN ESD MENGGUNAKAN METODE 4STMD UNTUK MEMBANGUN KEMAMPUAN BERPIKIR SISTEM PESERTA DIDIK

TESIS

Diajukan untuk Memenuhi Sebagian dari Syarat untuk Memperoleh
Gelar Magister Pendidikan Program Studi Pendidikan IPA

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PERNYATAAN

Dengan ini saya menyatakan bahwa tesis dengan judul **"Pengembangan Bahan Ajar IPA Tema Sampah Bermuatan ESD Menggunakan Metode 4STMD untuk Membangun Kemampuan Berpikir Sistem Peserta Didik "** ini beserta seluruh isinya adalah benar-benar karya saya sendiri dan saya tidak melakukan penjiplakan atau pengutipan dengan cara yang tidak sesuai dengan etika keilmuan yang berlaku sesuai dengan Peraturan Menteri Pendidikan Nasional Republik Indonesia No. 17 tahun 2020 tentang Pencegahan dan Penanggulangan Plagiat di Perguruan Tinggi. Apabila di kemudian hari, ada pelanggaran yang ditemukan pada tesis ini dan/atau pengaduan dari pihak lain terhadap keaslian karya ini, saya bersedia menanggung sanksi yang dijatuhkan kepada saya.

Demikianlah pernyataan ini dibuat dengan sungguh-sungguh tanpa pemaksaan dari pihak manapun.

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Pengembangan Bahan Ajar IPA Tema Sampah Bermuatan ESD Menggunakan Metode 4STMD untuk Membangun Kemampuan Berpikir Sistem Peserta Didik

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ABSTRAK

Bahan ajar memegang peranan penting dalam meningkatkan kualitas pembelajaran, khususnya dalam pembelajaran yang terkait dengan isu lingkungan seperti sampah. Di Indonesia, pembelajaran yang berfokus pada pengembangan keterampilan berpikir sistem masih kurang diperhatikan. Penelitian ini bertujuan untuk menghasilkan bahan ajar bermuatan ESD dengan tema sampah, menggunakan metode 4STMD untuk membangun keterampilan berpikir sistem peserta didik. Penelitian ini mengadopsi metode *Design and Developmental Research* (DDR) tipe 1 yang meliputi tiga fase utama: desain, pengembangan, dan evaluasi (formatif), dengan partisipan peserta didik kelas VII dari SMP Negeri di Kota Padang. Hasil dari tahap desain berupa rancangan bahan ajar yang yang mengintegrasikan berbagai komponen terkait sampah. Metode 4STMD diterapkan melalui empat tahapan: seleksi, strukturisasi, karakterisasi, dan reduksi didaktik. Tahap seleksi menghasilkan 8 indikator berpikir sistem, 22 tujuan pembelajaran dan 41 label konsep, yang kemudian dikembangkan menggunakan 16 buku teks internasional dan 1 buku IPA SMP. Upaya penanggulangan pencemaran sampah berkarakteristik ESD diambil sebagai konteks substansi, sementara keterampilan berpikir sistem menjadi konteks pedagogik. Tahap strukturisasi menghasilkan peta konsep, struktur makro, dan tiga level representasi, yang menyusun materi tentang sampah dari komponen dasar hingga upaya pengelolaan sampah. Dari tahap karakterisasi, diperoleh 4 teks utama yang didasarkan pada reduksi didaktik, dengan penyajian teks secara kualitatif dan penggunaan analogi serta gambar. Evaluasi menunjukkan bahwa bahan ajar ini sangat layak digunakan, dengan skor kelayakan 98% dan keterpahaman 98%, serta menunjukkan potensi dalam membangun keterampilan berpikir sistem peserta didik. Bahan ajar ini dapat diterapkan dalam pembelajaran untuk membangun kemampuan berpikir sistem peserta didik dalam konteks pengelolaan sampah.

***Kata Kunci**: Bahan Ajar, ESD, Sampah, Kemampuan Berpikir Sistem*

Development of Science Teaching Materials on Waste Theme Integrating ESD Using the 4STMD Method to Foster Students' Systems Thinking Skills

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ABSTRACT

Teaching materials play a critical role in improving the quality of learning, especially in topics related to environmental issues such as waste. In Indonesia, the focus on developing system thinking skills in education has been insufficient. This study aimed to develop ESD-based teaching materials on the theme of waste, utilizing 4STMD method to foster students' system thinking skills. The research used a Design and Developmental Research (DDR) type 1 methodology, which comprised three main phases: design, development, and formative evaluation. The participants were seventh-grade students from a public junior high school in Padang City, a draft of the teaching materials was created, integrating various components related to waste. The 4STMD method was implemented through four stages: selection, structuring, characterization, and didactic reduction. The selection phase resulted in the identification of eight system thinking indicators, 22 learning objectives, and 41 concept labels, which were developed using 16 international textbooks and one junior high school science textbook. Waste pollution was addressed within the context of ESD, while system thinking skills formed the pedagogical context. The structuring phase produced concept maps, macro structures, and three levels of representation, organizing the waste material from basic components to management strategies. The characterization phase led to the development of four main texts using didactic reduction, supported by analogies and illustrations. In the evaluation phase, the teaching materials received high ratings, with a feasibility score of 98% and an understandability score of 98%. These results indicate the potential of the materials to foster students' system thinking skills.

***Keywords**: Teaching Materials, ESD, Waste, System Thinking Skills*

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DAFTAR GAMBAR

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