

ABSTRAK

PENGEMBANGAN ALAT PERAGA GAYA ANTARMOLEKUL “Inform” MENGUNAKAN TEKNOLOGI 3D *PRINTING*

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Konsep gaya antarmolekul merupakan materi kimia yang bersifat mikroskopik dan sulit divisualisasikan secara konkret, sehingga sering menimbulkan kesulitan pemahaman pada peserta didik SMA. Keterbatasan media pembelajaran yang masih didominasi oleh penjelasan verbal dan representasi dua dimensi menjadi salah satu penyebab utama kesulitan tersebut. Penelitian ini bertujuan untuk mengembangkan alat peraga antarmolekul bernama “Inform” (*Intermolecular force model*) menggunakan teknologi 3D *printing* serta mengetahui kelayakan ditinjau dari aspek validitas, efektivitas, dan kepraktisan. Penelitian ini merupakan penelitian pengembangan (*Research and Development*) yang menggunakan model ADDIE, meliputi tahap *analysis*, *design*, *development*, *implementation*, dan *evaluation*. Validitas produk dinilai oleh dosen dan praktisi menggunakan lembar validasi, efektivitas diukur melalui uji kompetensi peserta didik dengan menggunakan alat peraga, dan kepraktisan diukur melalui angket respons peserta didik terhadap penggunaan alat peraga. Uji coba produk dilakukan kepada 10 peserta didik Fase F IPA di SMA Pangudi Luhur St. Louis IX Sedayu. Hasil penelitian menunjukkan bahwa alat peraga memperoleh tingkat validitas sebesar 98,6% dengan kategori sangat valid, tingkat efektivitas sebesar 89% dengan kategori sangat efektif, dan tingkat kepraktisan sebesar 92,7% dengan kategori sangat praktis. Berdasarkan hasil tersebut, dapat disimpulkan bahwa alat peraga dengan menggunakan teknologi 3D *printing* layak digunakan sebagai media pembelajaran pada materi gaya antarmolekul.

Kata Kunci: 3D *printing*, ADDIE, alat peraga, gaya antarmolekul, kelayakan produk.

ABSTRACT

**DEVELOPMENT OF LEARNING MEDIA FOR INTERMOLECULAR FORCE
STYLE USING 3D PRINTING TECHNOLOGY**

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The concept of intermolecular forces is a microscopic aspect of chemistry that is difficult to visualize concretely, often leading to difficulties in understanding among high school students. The limitations of learning materials—which are still dominated by verbal explanations and two-dimensional representations—are one of the main causes of these difficulties. This study aims to develop an intermolecular force learning media called “Inform” (Intermolecular Force Model) using 3D printing technology and to assess its feasibility in terms of validity, effectiveness, and practicality. This is a research and development (R&D) study that employs the ADDIE model, encompassing the stages of analysis, design, development, implementation, and evaluation. Product validity was assessed by faculty members and practitioners using a validation sheet; effectiveness was measured through competency tests of students using the learning media; and practicality was measured through a questionnaire on student responses to the use of the learning media. The product was pilot-tested on 10 students in Phase F of the Science class at Pangudi Luhur St. Louis IX High School in Sedayu. The research results show that the learning media achieved a validity rate of 98.6%, classified as “highly valid”; the product achieved an effectiveness level of 89% which was categorized as “highly effective”; and a practicality rate of 92.7%, classified as “highly practical.” Based on these results, it can be concluded that the learning media, which utilizes 3D printing technology, is suitable for use as a learning medium for the topic of intermolecular forces.

Keywords: 3D printing, ADDIE, intermolecular forces, learning media, product feasibility.