ABSTRAK

Sinar-X merupakan teknologi penting dalam bidang medis untuk pencitraan diagnostik. Namun, proses pembelajarannya di institusi pendidikan teknik elektromedik masih menghadapi kendala, seperti keterbatasan alat praktik, risiko paparan radiasi, serta minimnya media simulasi interaktif. Berdasarkan studi sebelumnya dan observasi lapangan, diketahui bahwa banyak mahasiswa kesulitan memahami hubungan antara parameter teknis sinar-X dan hasil citra akibat kurangnya alat bantu visual yang aman dan mudah diakses. Penelitian ini bertujuan untuk merancang dan mengembangkan *platform* simulasi pesawat *rontgen general purpose* berbasis *web* sebagai media pembelajaran interaktif tanpa risiko radiasi. Metode yang digunakan adalah *Research and Development (R&D)* dengan pendekatan *ADDIE* yang meliputi tahap *Analysis, Design, Development, Implementation*, dan *Evaluation*. *Platform* dikembangkan menggunakan *HTML5*, *CSS3*, *JavaScript*, dan pustaka *p5.js* untuk menciptakan visualisasi simulasi yang dinamis dan responsif. Fitur utama mencakup simulasi pembangkitan sinar-X, modul teori, serta soal latihan interaktif. Hasil evaluasi melalui kuesioner yang diberikan kepada 15 mahasiswa Menunjukkan bahwa *platform* ini efektif dalam meningkatkan pemahaman teknis: 75% mahasiswa menyatakan cukup paham hingga paham mengenai prinsip dasar tabung sinar-X, 75,1% memahami fungsi katoda, dan lebih dari 68% memahami pengaturan tegangan (*kV*) dan arus (*mA*). Dengan demikian, *platform* ini dinilaidan layak digunakan sebagai sarana pembelajaran inovatif di bidang elektromedik.

Kata Kunci: sinar-X, simulasi interaktif, pembelajaran berbasis web, p5.js, teknik elektromedik

ABSTRACK

X-rays are a vital technology in the medical field for diagnostic imaging. However, learning about X-ray systems in electromedical engineering education still faces several obstacles, such as limited access to practical equipment, radiation exposure risks, and a lack of interactive simulation media. Based on prior studies and field observations, many students struggle to understand the relationship between technical parameters and diagnostic image results due to the absence of safe and accessible visual learning tools. This study aims to design and develop a web-based general-purpose X-ray simulation platform as an interactive and radiation-free learning medium. The research employed the Research and Development (R&D) method using the ADDIE approach, which consists of Analysis, Design, Development, Implementation, and Evaluation stages. The platform was built using HTML5, CSS3, JavaScript, and the p5.js Library to deliver responsive and dynamic visual simulations. Key features include X-ray generation simulation, theoretical modules, and interactive practice questions. Evaluation results from a questionnaire completed by 15 students indicated that the platform effectively enhances technical understanding: 75% of respondents reported sufficient to good understanding of the basic principles of X-ray tubes, 75.1% understood the function of the cathode, and over 68% comprehended the adjustment of kV and mA parameters. Therefore, the platform is considered feasible and effective as an innovative and safe learning tool in the electromedical field.

Keywords: X-ray, interactive simulation, web-based platform, learning media, p5.js, electromedical education