

**PENGEMBANGAN *E-BOOK* MANAJEMEN RISIKO  
UNTUK MENUNJANG KESELAMATAN DAN KESEHATAN KERJA DI  
LABORATORIUM KIMIA SMA**

**Oleh**

**Regina Saraswati, NIM 2213031002**

**Jurusan Kimia**

**ABSTRAK**

Aktivitas laboratorium kimia di tingkat SMA memiliki potensi risiko kecelakaan kerja, sehingga diperlukan sumber informasi terkait keselamatan dan kesehatan kerja (K3) serta manajemen risiko di laboratorium kimia. Namun demikian, sumber belajar yang mudah diakses dan terstruktur membahas manajemen risiko laboratorium dalam konteks sekolah masih terbatas. Penelitian ini bertujuan untuk mengembangkan *e-book* manajemen risiko di laboratorium kimia SMA yang valid, praktis, dan efektif dalam meningkatkan hasil belajar terkait K3 siswa SMA. Penelitian ini menggunakan metode *research and development* (R&D) dengan model 4D. Produk divalidasi oleh ahli materi, ahli bahasa, dan ahli media, serta diuji keterbacaan, kepraktisan, dan keefektifannya. Keefektifan *e-book* diuji menggunakan *nonequivalent control group design* untuk mengetahui pengaruh penggunaan *e-book* terhadap pengetahuan, sikap, dan perilaku K3 siswa. Data dikumpulkan melalui tes pengetahuan, angket sikap, dan angket perilaku, serta lembar observasi perilaku K3. Data dianalisis menggunakan uji MANCOVA dan Chi-Square. Hasil penelitian menunjukkan bahwa *e-book* yang dihasilkan mencapai validitas yang sangat tinggi dalam hal konten (CV = 1,0), bahasa (LV = 1,0), dan media (MV = 1,0). Tingkat keterbacaan sebesar 95,6% (sangat baik), penilaian tingkat kepraktisan oleh guru 82,5% (sangat tinggi) dan siswa 96,8% (sangat tinggi). Hasil analisis MANCOVA menunjukkan terdapat perbedaan yang signifikan pada aspek pengetahuan, sikap, dan perilaku K3 siswa antara kelas kontrol dan kelas eksperimen. Hasil analisis *Chi-Square* menunjukkan bahwa terdapat hubungan yang signifikan antara kelas dengan perilaku siswa di laboratorium kimia. Berdasarkan hasil tersebut, *e-book* yang dihasilkan dinyatakan valid, praktis, dan efektif sehingga layak digunakan sebagai sumber belajar digital untuk menumbuhkembangkan budaya K3 dan kesadaran risiko yang lebih kuat di laboratorium kimia SMA.

**Kata kunci:** *e-book*, manajemen risiko, kesehatan dan keselamatan kerja (K3), laboratorium kimia

# DEVELOPMENT OF AN *E-BOOK* ON RISK MANAGEMENT TO SUPPORT OCCUPATIONAL SAFETY AND HEALTH IN HIGH SCHOOL CHEMISTRY LABORATORIES

By

**Regina Saraswati, NIM 2213031002**

**Chemistry Department**

## ABSTRACT

Chemistry laboratory activities at the high school level carry a potential risk of accidents, making it necessary to understand occupational health and safety (OHS) and risk management in the chemistry laboratory. However, easily accessible and structured learning resources that address laboratory risk management in a school context remain limited. This study aims to develop an e-book on risk management in high school chemistry laboratories that is valid, practical, and effective in improving high school students' learning outcomes about OSH. The study employs a research and development (R&D) method using the 4D model. The product was validated by subject matter experts, language experts, and media experts, and tested for readability, practicality, and effectiveness. The effectiveness of the e-book was tested using a nonequivalent control group design to determine the effect of e-book use on students' OSH knowledge, attitudes, and behaviors. Data were collected through knowledge tests, attitude questionnaires, and behavior questionnaires, as well as observation sheets of students' OSH behaviors during laboratory practice. Data were analyzed using MANCOVA and Chi-Square tests. The results of the study indicate that the e-book produced achieved very high validity in terms of content (CV = 1.0), language (LV = 1.0), and media (MV = 1.0). The readability level was 95.6% (very good), with teachers rating the practicality at 82.5% (very high) and students at 96.8% (very high). The MANCOVA analysis results indicated significant differences in students' knowledge, attitudes, and OSH behavior between the control class and the experimental class. The results of the Chi-Square analysis showed that there was a significant relationship between class and student behavior in the chemistry laboratory. Based on the results, e-book was found to be valid, practical, and effective, making it suitable for use as a digital learning resource to foster a stronger OSH culture and risk awareness in high school chemistry laboratories.

**Keywords:** E-book, risk management, occupational health and safety (OHS), chemistry laboratory.