ABSTRAK

Pemanfaatan *game* edukasi sebagai media pembelajaran interaktif menjadi salah satu solusi meningkatkan minat dan pemahaman belajar siswa sekolah dasar. Penelitian ini bertujuan untuk mengimplementasikan metode *fisher yates shuffle* (FYS) dan *finite state machine* (FSM) pada pengembangan *game* edukasi berbasis *unity* untuk mata pelajaran Ilmu Pengetahuan Alam (IPA) dan Ilmu Pengetahuan Sosial (IPS), serta menguji efektivitas penggunaannya terhadap peningkatan hasil belajar siswa. Metode pengembangan sistem yang digunakan adalah *Multimedia Development Life Cycle* (MDLC) yang meliputi tahap *concept, design, assembly, testing, dan distribution.* FYS diterapkan untuk mengacak soal dan jawaban pada kuis agar tidak monoton, sedangkan FSM digunakan untuk mengelola alur permainan dan perpindahan antar *scene* secara terstruktur. Pengujian dilakukan menggunakan *black-box testing* serta evaluasi pembelajaran melalui *pre-test* dan *post-test* pada siswa kelas III dan IV sekolah dasar. Hasil penelitian menunjukkan adanya peningkatan nilai rata-rata siswa setelah menggunakan *game* edukasi, dengan persentase peningkatan berkisar antara 22% hingga 25%. Selain itu, hasil kuesioner guru menunjukkan bahwa *game* edukasi dinilai layak, mudah digunakan, dan bermanfaat sebagai media pembelajaran pendukung. Dengan demikian, *game* edukasi berbasis *unity* yang dikembangkan terbukti efektif dalam meningkatkan pemahaman siswa terhadap materi IPA dan IPS.

Kata kunci: *Finite State Machine, Fisher-Yates Shuffle, Game* Edukasi, IPA dan IPS, *Unity*.

ABSTRACT

The use of educational games as interactive learning media is one solution to increase learning motivation and understanding among elementary school students. This study aims to implement the Fisher–Yates Shuffle (FYS) and Finite State Machine (FSM) methods in the development of a Unity-based educational game for Natural Sciences (IPA) and Social Sciences (IPS), and to evaluate its effectiveness in improving students' learning outcomes. The system was developed using the Multimedia Development Life Cycle (MDLC), which consists of concept, design, assembly, testing, and distribution stages. FYS was applied to randomize quiz questions and answer options, while FSM was used to manage game flow and scene transitions in a structured manner. System testing was conducted using black-box testing, and learning effectiveness was evaluated through pre-test and post-test involving grade III and IV elementary school students. The results indicate an increase in students' average scores after using the educational game, with improvement percentages ranging from 22% to 25%. In addition, teacher questionnaire results show that the game is feasible, easy to use, and beneficial as a supporting learning medium. Therefore, the developed Unity-based educational game is effective in enhancing students understanding of IPA and IPS subjects.

Keywords: *Educational Game, Elementary Education, Finite State Machine, Fisher–Yates Shuffle, Unity.*