

ABSTRAK

Wulandari, Siti. 2025. Pengembangan *Handout* Berbasis *Augmented Reality* (AR) Materi Sistem Ekskresi Manusia Untuk Kelas XI SMA. Skripsi, Program Studi Pendidikan Biologi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Jember. Pembimbing : (1) Ika Priantari, S.Si., M.Pd. (2) Aulya Nanda Prafitasari, M.Pd.

Kata Kunci : *Handout*, *Augmented Reality*, Sistem Ekskresi

Pendidikan memiliki peran penting dalam meningkatkan kualitas sumber daya manusia melalui pembelajaran yang berbasis teknologi. Namun, penerapan pembelajaran Biologi, khususnya pada materi sistem ekskresi yang bersifat abstrak dan sulit diamati secara langsung, masih belum banyak memanfaatkan teknologi interaktif. Hal ini dibuktikan dengan perolehan hasil *need assessment* yang menunjukkan bahwa seluruh guru mengalami kendala dalam penyampaian materi akibat terbatasnya media visual, dan sebanyak 66,66% guru belum pernah menggunakan animasi 3D. Selain itu 77,14% peserta didik menganggap materi sistem ekskresi sebagai materi yang sulit. Oleh karena itu, perlu dikembangkan media pembelajaran seperti *handout* berbasis *Augmented Reality* (AR) materi sistem ekskresi manusia untuk membantu peserta didik memahami materi dan mencapai dapat ketuntasan hasil belajar.

Jenis penelitian yang digunakan yaitu penelitian pengembangan. Penelitian ini dilakukan pada bulan April 2025 di SMA Muhammadiyah 3 Jember. Subjek pada penelitian ini yaitu 3 validator ahli dan peserta didik kelas XI SMA Muhammadiyah 3 Jember. Penelitian ini bertujuan untuk mengetahui tingkat validitas, hasil belajar peserta didik, dan kepraktisan dari *Handout* berbasis *Augmented Reality* (AR) yang dikembangkan pada materi sistem ekskresi manusia untuk kelas XI SMA. Penelitian yang dilakukan menggunakan lima tahap pengembangan model ADDIE (*Analyze, Design, Development, Implementation, dan Evaluation*). Instrumen yang digunakan angket *need assessment* guru & peserta didik, angket validasi ahli, tes dalam bentuk *post-test*, serta angket respon peserta didik. Data yang didapatkan akan dianalisis untuk mengetahui validitas produk, hasil belajar peserta didik, dan kepraktisan media setelah menggunakan *Handout* berbasis *Augmented Reality* (AR) materi sistem ekskresi manusia.

Hasil penelitian menunjukkan bahwa *Handout* berbasis *Augmented Reality* (AR) materi sistem ekskresi manusia yang dikembangkan memiliki tingkat validitas dengan presentase rata-rata ahli 85,44% dengan kategori sangat valid. Media ini juga terbukti dapat membantu ketuntasan hasil belajar peserta didik dengan persentase 82,75%, serta dinyatakan sangat praktis berdasarkan uji kepraktisan yang memperoleh nilai sebesar 91,45% dengan kategori sangat praktis. Peneliti selanjutnya disarankan menyempurnakan *handout* berbasis AR dengan menambahkan organ ekskresi lain seperti paru-paru, kulit, dan hati agar visualisasi lebih lengkap. Penggunaan AR sebaiknya menggunakan file yang ringan, tidak membebani memori perangkat, dan dapat diakses tanpa aplikasi tambahan. Objek organ juga perlu dibuat interaktif dengan fitur perputaran 360 derajat, serta dapat diamati dari berbagai sudut melalui tampilan di *smartphone*.

ABSTRACT

Wulandari, Siti. 2025. *Development of an Augmented Reality (AR) Based Handout on the Human Excretory System for Grade XI Senior High School Students*. Thesis, Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Jember. Advisors: (1) Ika Priantari, S.Si., M.Pd. (2) Aulya Nanda Prafitasari, M.Pd.
Keywords: Handout, Augmented Reality, Excretory System.

Education plays an important role in improving the quality of human resources through technology-based learning. However, the implementation of Biology learning, particularly in the excretory system material, which is abstract and difficult to observe directly, has not widely utilized interactive technology. This is evidenced by the results of the needs assessment, which showed that all teachers experienced difficulties in delivering the material due to the limited availability of visual media, and 66.66% of them had never used 3D animation. In addition, 77.14% of students considered the excretory system material difficult to understand. Therefore, it is necessary to develop learning media such as an Augmented Reality (AR)-based handout on the human excretory system to help students understand the material and achieve learning mastery.

This research is a development study conducted in April 2025 at SMA Muhammadiyah 3 Jember. The subjects of this research were three expert validators and eleventh-grade students of SMA Muhammadiyah 3 Jember. The aim of this study was to determine the validity level, student learning outcomes, and practicality of the Augmented Reality (AR)-based handout developed for the human excretory system material for Grade XI. The research followed the five stages of the ADDIE development model (Analyze, Design, Development, Implementation, and Evaluation). The instruments used included needs assessment questionnaires for teachers and students, expert validation questionnaires, post-tests, and student response questionnaires. The data obtained were analyzed to determine the product's validity, student learning outcomes, and the practicality of the media after using the AR-based handout.

The results showed that the AR-based handout for the human excretory system had an average expert validation score of 85.44%, categorized as very valid. This media also effectively supported student learning mastery, with 82.75% of students achieving the minimum competency standard, and was considered highly practical, scoring 91.45% in the practicality test. Future researchers are advised to improve the AR-based handout by adding other excretory organs such as the lungs, skin, and liver to enhance the completeness of the visual content. The AR application should use lightweight files that do not burden device memory and can be accessed without additional applications. The organ objects should also be made more interactive, with features such as zoom, 360-degree rotation, and the ability to be viewed from various angles through the smartphone interface.