

**Development of Augmented Reality-Based Learning Media for Solar System
Exploration in Grade V Science Course
(A Case Study at Hang Tuah 9 Elementary School Candi)**
Supervisor Lecturer: Dhony Manggala Putra, S.E., M.M.

Reza Andyah Wijaya
*Study Program of Informatic Engineering
Majoring of Information Technology*

ABSTRACT

Natural Science (IPA) learning on solar system topics in elementary school demands high spatial visualization capabilities due to the abstract nature of astronomical objects that cannot be directly observed. The limitations of traditional static two-dimensional media at SD Hang Tuah 9 Candi have led to low student motivation and susceptibility to misconceptions. This study aims to develop an interactive learning media based on Augmented Reality (AR) named "Solar System Edu" web application using the Multimedia Development Life Cycle (MDLC) framework. This web application was innovatively built leveraging a modern ecosystem including Vite.js, React.js, Three.js, React Three Fiber, and React Three XR by implementing Markerless Tracking technology. Through this method, 3D planet model projections based on NASA's scientific public library data can be rendered in real-time directly via smartphone browsers without requiring additional software installations or physical markers.

The evaluation of the technical functional aspects was conducted using Black Box Testing, resulting in 100% success in meeting system requirement specifications. Furthermore, the educational impact of this media was evaluated using the One Group Pre-test Post-test Design involving 30 fifth-grade students at SD Hang Tuah 9 Candi on March 12, 2026. The empirical results demonstrated a significant surge in cognitive understanding, where the students' mean score expanded sharply from 2.10 during the pre-test to 4.10 during the post-test. Quantitatively, the implementation of the Solar System Edu application proved effective in increasing students' cognitive understanding of the solar system

material by 95.24%. This Web-AR-assisted learning was successfully received by students and successfully transformed abstract astronomy concepts into a concrete, interactive, and engaging self-exploration experience.

Keywords: *Augmented Reality, Markerless Tracking, Elementary School Learning, Interactive Application, WebXR, Multimedia Development Life Cycle*