

# Development of Interactive Learning Media Based on Deep Learning of Solar System Materials

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**Abstract.** Development of Interactive Learning Media ‘METTA’ Based on Deep Learning Approach on Solar System Material. This study aims to develop interactive learning media ‘METTA’ (Getting to Know the Solar System) based on Articulate Storyline with a Deep Learning approach on Solar System material for Grade VI at SD Negeri 2 Suruh. The research used the Research and Development (R&D) method with the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The validation results showed that the media was very feasible, with a material expert score of 95.45%, media expert score of 97.2%, and language expert score of 91.7%. The practicality of the media was very high based on the responses of 98.33% of teachers and 83.9% of students. The effectiveness test results showed a significant increase in learning outcomes, with an N-Gain of 0.75 (high category). The METTA media was declared highly valid, practical, and effective.

**Keywords:** Learning Media, Articulate Storyline, Deep Learning, Solar System, Learning Outcomes

## 1 Introduction

Developments in education in the digital age demand innovation in learning methods and media. In the case of abstract material such as the solar system, which requires accurate visualisation, digital media-based learning greatly assists students in developing a more meaningful conceptual understanding. Based on preliminary observations in class VI of SD Negeri 2 Suruh, it was found that 58% of students (14 out of 24 students) were unable to explain the order of the planets correctly and had difficulty analysing the differences between the concepts of rotation and revolution. The use of conventional media was deemed incapable of stimulating deep conceptual understanding in primary school students.

The deep learning approach emphasises that students should not only memorise information, but also relate concepts to real experiences and process information deeply. Therefore, this study developed an interactive learning medium called ‘METTA’ (Media Edukatif Tata Surya or Solar System Educational Media) based on the deep learning approach, which was developed through the ADDIE model. METTA is designed as an interactive digital medium that dynamically visualises the concept of the Solar System and provides exploration activities to improve student learning outcomes.

## 2 Method

This study utilised a research and development (R&D) method with an ADDIE development model approach. This model consists of five stages:

- a. Analysis, which involves identifying problems and the needs of students and teachers.
- b. Design, which involves designing the material structure and visual media design.
- c. Development, which involves creating products using Articulate Storyline software and conducting validation by experts.
- d. Implementation, which is carried out through individual trials, small group trials, and field group trials with students.
- e. Evaluation, which includes analysis of the feasibility, practicality, and effectiveness of the media.

The research subjects involved subject matter experts, media experts, language experts, classroom teachers, and 24 sixth-grade students from SD Negeri 2 Suruh. The data collection procedure used instruments in the form of validation sheets, practicality response questionnaires, and learning outcome tests (pre-test and post-test). Data analysis techniques were carried out descriptively using percentages to measure the level of validity and

practicality, as well as N-Gain analysis calculations to measure the effectiveness of improvements in student learning outcomes

### 3 Results And Discussion

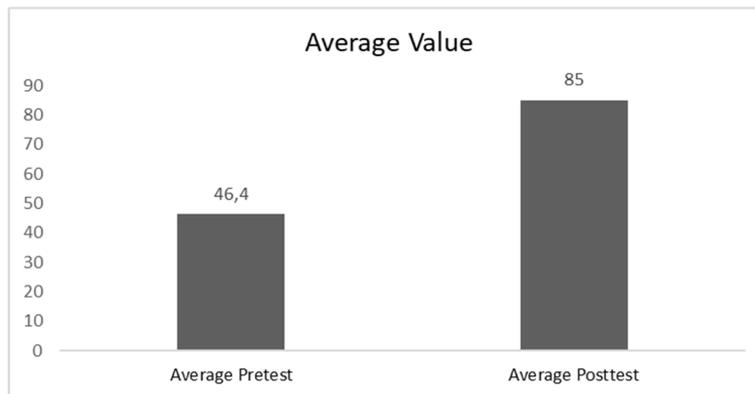
#### 3.1 Research Results

The results of this study include data on the validation, practicality, and effectiveness of the interactive learning media 'METTA'. This product has undergone validation by subject matter experts, media experts, and language experts, as well as empirical testing. The overall validation results show that the media is in the 'Highly Suitable' category. In addition, the level of practicality of the media, as measured by teacher and student response questionnaires, meets the criteria for 'Highly Practical'. A summary of the suitability and practicality assessments can be seen in Table 1.

**Table 1.** Validation and Practicality Results of METTA Media

Assessment Group	Percentage	Category
Subject Matter Experts	95,45%	Highly Recommended
Media Experts	97,20%	Highly Recommended
Language Experts	91,70%	Highly Recommended
Teacher Responses	98,33%	Highly Practical
Student Responses	83,90%	Highly Practical

To measure the effectiveness of the media, a comparison was made between the pretest scores before using the media and the posttest scores after learning using METTA media in sixth grade students. The evaluation results showed a surge in student learning outcomes. A comparison of the average pretest and posttest scores is presented visually in Figure 1 below:



**Figure 1.** Comparison Chart of Average Pre-test and Post-test Scores

The improvement in learning outcomes shown in Figure 1 was further analysed using the N-Gain test to determine the effectiveness of the developed media. The N-Gain calculation results can be seen in Table 2 below:

**Table 2.** N-Gain Calculation Results (Effectiveness)

Assessment Indicators	Average Score
Pre-test Average	46,4
Post-test Average	85,0
N-Gain Score	0,75
N-Gain Category	High

Based on Table 2, the average N-Gain score of 0.75 falls into the 'High' category. This proves that the use of METTA interactive media is very effective in improving IPAS learning outcomes on Solar System material for sixth grade students.

### 3.2 Discussion

The development of METTA interactive learning media based on a deep learning approach has proven to be highly feasible, practical, and effective for use in teaching Natural and Social Sciences (IPAS) material on the Solar System in primary schools. The optimal improvement in learning outcomes with an average N-Gain of 0.75 proves that the visualisations presented by METTA are effective in overcoming students' difficulties with abstract concepts, such as the rotational and revolutionary motions of planets. The branching scenario feature, interactive pop-up planets, and drag-and-drop-based games in this application allow students to explore concepts independently.

These findings are in line with the research by Afifah et al. (2023), which states that ADDIE-based media is very effective in improving IPAS learning outcomes. In addition, the results of this study reinforce Roziq's (2021) conclusion that interactive Solar System animations can significantly improve conceptual understanding compared to conventional media. The deep learning approach in METTA facilitates students so that they are not only stuck in superficial learning, but are able to analyse directly from interactive feedback.

The limitations of this study include the test subjects being limited to only one sixth grade class at SD Negeri 2 Suruh. In addition, the minimum infrastructure, such as the resolution of the LCD projector at the school, slightly reduced the sharpness of the animation for large-scale group viewing.

### 4 Conclusion

Based on the research results, it can be concluded that the interactive learning media 'METTA' based on the deep learning approach with the ADDIE model on the Solar System material for Grade VI elementary school is proven to be very valid with an average expert feasibility of 94.8%. This media is also very practical to use with a practicality level of 98.33% for teachers and 83.9% for students. The use of this media is effective and significantly improves student learning outcomes with an N-Gain score of 0.75, which is in the high category.

As a recommendation, teachers are advised to implement this media regularly in learning and utilise computer laboratories to train students' independent exploration and digital literacy. Future researchers are advised to expand the scope of material to other IPAS Phase B/C subjects, develop trials on a larger scale, and integrate the latest technologies such as Augmented Reality (AR) or Virtual Reality (VR).

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