



AUGMENTED REALITY DANCE LEARNING MEDIA: LABAN NOTATION MOVEMENT LITERACY FOR JUNIOR HIGH SCHOOL STUDENTS

Siti Fatmasari ¹⁾, Dinny Devi Triana ²⁾, Jeong OK Jeon ³⁾

^{1*} Magister Pendidikan Seni, Universitas Negeri Jakarta

E-mail: ¹⁾nongsari@gmail.com, ²⁾dinnydevi@unj.ac.id, ³⁾jeongokjeon@gmail.com

Abstract (TNR11)

This study aims to introduce dance learning media using Augmented Reality with Movement Literacy material based on Laban Notation symbols for junior high school students. The background of the study is based on the low interest of students in learning dance and difficulties in understanding the elements of space, time, and energy due to the limitations of conventional media that are not in accordance with the characteristics of the digital generation. The method used is research and development (R&D) with initial stages including needs analysis, product design, product development, implementation through limited trials, and product evaluation. The product developed is an Augmented Reality (AR) application that presents movement literacy based on Laban Notation in an interactive 3D form, so that students can learn movement visually, kinesthetically, and reflectively. Initial results based on needs analysis and the designed product show that the application is considered interesting, easy to use, and helps understand basic dance movements, and is in accordance with the characteristics of students in the digital era. Teachers gave positive responses to the potential of this media as a supporter of deep learning that is conscious, meaningful, and enjoyable. Thus, it is hoped that the AR-Motion Literacy application can be an innovative alternative in dance learning, especially in stimulating students in learning movement in the digital era for junior high school students.

Keywords: *media pembelajaran tari, augmented reality, literasi gerak, notasi laban, deep learning, siswa SMP*

1. INTRODUCTION

Dance learning at the junior high school (SMP) level faces challenges related to low student motivation/interest (Arsyad, 2019) and fundamental difficulties in understanding essential elements of movement such as space, time, and energy. Conceptual problems arise because conventional learning media (lecture-based or static 2D visuals) fail to bridge abstract movement concepts to concrete 3D visualizations (Hutchinson, 1970). These media limitations prevent movement concepts such as level and direction from being realized spatially, which is the root of students' difficulties in understanding. An initial needs analysis involving observations and interviews with dance teachers and students at SMP Negeri 2 Kota Serang reinforced these findings, indicating that teachers struggle to provide interactive media that meets the visual-kinesthetic demands of digital students. This condition has triggered the urgency to develop media innovations.

The design of relevant learning media must be based on cognitive principles, specifically the Dual Coding Theory (Mayer, n.d.). This theory explains that maximum understanding is achieved through dual stimulation (verbal and visual), which is very relevant for motion content. In addition, the media must also be able to trigger student engagement which includes behavioral, emotional, and cognitive dimensions (Fredricks et al., 2004). The limitations of conventional media are considered inappropriate for the learning characteristics of the digital generation (Prensky, 2001). Therefore, a method is needed to overcome low student motivation through joyful learning experiences (Triana, D. D., Yudha & Adhi, n.d.) as a foundation for emotional engagement. By processing information through visual (motion) and verbal (symbols/descriptions) simultaneously, a deep learning approach can be achieved.

The state of the art of this research is in line with the demands of dance learning media in the digital era based on the theoretical framework, requiring a platform that can integrate symbol codes (verbal) and movement (visual) in real-time. One of the most suitable platforms is Augmented

Reality (AR) (Purba et al., 2023; Wang & Burton, 2012). AR is defined as a technology that projects virtual objects (3D) into the user's real world, creating a composite display (Azuma et al., 2001). The use of AR technology in recognizing basic dance movements has been tested for its feasibility (Ismiati et al., 2021; Utami et al., n.d.) These findings provide a strong basis that AR implementation is appropriate to support emotional engagement (joyful learning) and cognitive (deep learning) of the digital generation through the principle of Dual Coding.

Achieving deep learning through AR requires structured motion content. This structure is based on mastery of the elements of space, time, and energy as the main foundation for developing Motion Literacy (Bucek, 1998). Motion Literacy is strengthened through the introduction of Laban Notation (Hutchinson, 1970). In an international context, Laban Movement Analysis (LMA) is recognized as a comprehensive framework for describing, visualizing, and interpreting human movement (Studd & Cox, 2013). Motion literacy is reading, writing or describing and translating from symbols into motion or vice versa from motion into symbols (Labanotation). This motion literacy is an adoption and adaptation of simplified Laban notation, where understanding motion literacy is not in learning Laban notation, but rather Laban notation as a stimulus in activating and balancing brain function (Triana, D. D., Yudha & Adhi, n.d.) This strengthens the position of Laban symbols as an internationally recognized tool for structuring motion in digital media.

Despite the strong foundation of Laban content, research shows significant difficulties for junior high school students in understanding symbols for motion, space, time, and energy (level and direction) (Dwiyana Habsary et al., 2024) due to their abstract and two-dimensional nature. This content issue presents a major gap that technology can address. Previously, e-learning-based Laban teaching materials have also been recognized as effective in improving students' perceptual abilities through observing motion symbols (Triana, D. D., Yudha & Adhi, n.d.). Although Laban has been integrated into digital media, there is a gap (GAP) where there is no AR specifically integrated using Laban Notation symbols as markers to trigger 3D motion visualizations of Level and Direction. Therefore, the novelty of this research is the development of an AR-Motion Literacy application that directly integrates Laban symbols with concrete visualizations through marker-based AR. Thus, it is hoped that this innovation will be a solution to overcome conceptual difficulties, improve perceptual abilities, and increase student learning motivation in the digital era through a joyful learning experience.

Based on this background and urgency, this research aims to introduce dance learning media using AR with Movement Literacy material based on Laban Notation symbols for junior high school students, as well as to validate the feasibility and test the practicality of the product.

2. IMPLEMENTATION METHOD

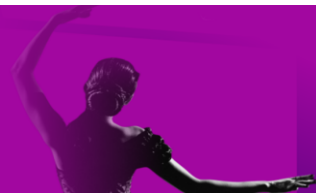
This study uses the Research and Development (R&D) method, adopting the ADDIE Model (Branch, 2009) This model was chosen because of its systematic procedures for producing valid and practical learning media products. This R&D method was chosen because it is relevant to producing new products and testing them empirically (Sugiyono, 2019). The focus of this study is on four main stages: Analysis, Design, Development, Implementation through limited trials, and Product Evaluation. All research, including initial observations, development, and limited trials, was conducted within the period of June to August 2025.

The subjects of this study were divided into three groups based on the testing objectives, namely validators (feasibility/validation test) consisting of two material experts (Dance Arts Education Lecturers) and Media Experts (Learning Technology Lecturers/Application Developers).

The Practicality Test respondents (Educators/Teachers) involved two junior high school dance teachers to assess ease of implementation and efficiency. The Practicality Test respondents (Students) involved 15 seventh-grade junior high school students with diverse backgrounds in dance learning.

The Development Procedure (ADDIE Model) is carried out through the following steps:

1. Analysis Phase



This phase includes an analysis of learning needs and materials. The needs analysis was conducted empirically in the field, involving observations and interviews with teachers and seventh-grade students at SMP Negeri 2 Kota Serang. This analysis aimed to identify key issues: low student motivation, students' fundamental difficulties in understanding spatial concepts (Levels and Directions) due to limited visualization, and teachers' need for innovative and easy-to-implement digital media.

2. Design Phase

This phase produces a product blueprint. The design includes determining the main material (Basic Laban Notation Movement Literacy 1-7: Levels and Directions), designing the application's storyboard, determining the 3D visual design of the dancer model, and designing the Laban symbol that will function as an AR marker.

3. Development Phase

This phase is the realization of the initial prototype. The steps include: Digital asset development (3D Laban motion modeling, rotation animation), AR application code development, and integration of interactive features (Mini Games and Synthesis Quizzes) into an Android-based mobile application. The product produced at this stage is an Initial Prototype.

4. Implementation Stage

The Implementation Stage was realized through a Limited Trial conducted at SMP Negeri 2 Serang City with two teachers and 15 seventh-grade students. At this stage, the AR application product was given to the subjects for use and observation. The main objective of this Implementation Stage was to collect empirical data regarding the media's practicality through a questionnaire.

5. Evaluation Stage (Evaluation/Formative Trial)

This stage was conducted to measure the theoretical feasibility and practicality of the product:

Expert Validation Test (Feasibility Validation): The initial prototype was tested with material and media experts using a Validation Questionnaire and Practicality Test: The revised product was tested with a limited number of subjects (two teachers and 15 students) using a practicality questionnaire.

C. Data Collection Instruments and Techniques

Data were collected through an expert validation questionnaire and a practicality test questionnaire (with teachers and students) using a 5-level Likert scale.

D. Data Analysis Techniques

Data were analyzed using descriptive percentage statistics. The scores from the validators and respondents were converted into percentages and then interpreted based on feasibility and practicality criteria.

Table 1. Percentage Conversion Criteria for Feasibility and Practicality

Percentage Score (%)	Category Feasibility/Practicality
81.01–100.00	Very Valid/Very Practical
61.01–81.00	Valid/Practical
41.01–61.00	Fairly Valid/Fairly Practical
21.01–41.00	Less Valid/Less Practical
0.00–21.00	Valid/Not Practical

The data from the expert validation and practicality tests were analyzed using descriptive statistics. The average scores from the validators and respondents were then converted into percentages to determine the product's feasibility and practicality. The criteria used to interpret these percentages determined that a score between 81.01% and 100.00% was categorized as Very Valid or Very Practical, indicating that the product was feasible and ready for use.

3. RESULTS AND DISCUSSION

AR Media Prototype Development Results - Motion Literacy, based on the Analysis and Design stages, a prototype of an Augmented Reality (AR) dance learning media application - Laban notation motion literacy has been developed. The main features include Laban symbol-based markers to trigger AR projections, 3D rotation visualizations that support dual coding theory, and Interactive Features (mini games and synthesis quizzes) to trigger joyful learning and HOTS.

The cover page (splash screen) of the AR-Literasi Gerak application is designed with attractive and cheerful visuals to stimulate students' interest and motivation from the start of use, in line with the concept of joyful learning. This page displays the application name and illustrations of 3D dancer avatars (female and male) to indicate that this application is suitable for use by both male and female students. Shown in Figure 1.

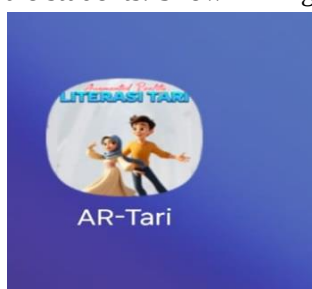


Figure 1. Cover Page

Source: Personal Document

After passing through the visually appealing cover page, users will be directed to the Main Interface (Main Menu). This interface is specifically designed based on high Usability principles, characterized by a minimalist, intuitive design, and easy to navigate by seventh grade junior high school students. The main visual components consist of: the application name (Augmented Reality Motion Literacy), illustrations of 3D dancer avatars (female and male) as content representations, and functional buttons. Available functional buttons include: an arrow symbol (start sign) to access the main learning material; a developer profile symbol for credit information; a musical note symbol that allows users to activate or deactivate musical accompaniment as they wish (supporting learning flexibility); and an 'off' button to exit the application. This concise and functional design ensures students can focus on the process of exploring and interacting with the material, supporting the achievement of joyful learning goals without technical barriers. can be seen in figure 2.



Figure 2. Main interface of the motion literacy application

Source: Personal Document

After passing the cover page, users will be directed to the Main Interface which offers four main menu options. These menus are designed sequentially to ensure a structured deep learning experience for students. This can be seen in Figure 3. The first menu, Material 1: Movement Literacy, serves as an introduction and contextualization of the basic concepts of Laban movement (Space, Time, Energy), building an initial theoretical foundation by scanning markers. Students



then proceed to Material 2: Explanation of Laban Notation, which provides a brief explanation of Laban notation. Materials 1 and 2 collectively serve as information providers on the verbal pathway (symbol codes and descriptions) in accordance with the principles of Dual Coding Theory. Once theoretical understanding is obtained, students enter the most crucial menu, namely Material 3: Movement Symbols (AR Scan). This menu activates the camera to scan Laban symbol markers, and projects 3D motion visualizations in the real world. This flow directly bridges abstract (verbal) Laban symbols with concrete (visual) 3D motion visualizations, which is crucial for achieving meaningful spatial understanding (space, time, energy). Finally, the application provides Material 4: Mini Games, Quizzes, and Evaluations, which are specifically designed to test students' synthesis abilities (HOTS) from symbols to motion, while maintaining joyful learning through interactive activities. The sequential design of this menu ensures that the learning process is not only emotionally engaging, but also structured from theory to cognitive practice to achieve the goal of deep motion learning. can be seen in figure 3.



Figure 3. Menu Options

Source: Personal Document



Figure 4. Marker Card

Source: Personal Document

Marker Cards to display 3D images for use in material 1 and material 3. Shown in figure 4.

3D display in lesson 1 on movement literacy. It displays 3D dance notation and dancers from basic 1 to basic 7. This display is important to provide a richer initial contextualization and visualization, bridging the limitations of conventional 2D media. In Lesson 1, the application displays 3D dancer models demonstrating basic dance notation (Basic 1 to Basic 7). Each basic movement is presented side by side with the corresponding Laban Notation. The function of the 3D display in Lesson 1 is to encourage students to carry out the movement literacy process: students are required to read the displayed Laban Notation and simultaneously observe and follow the 3D movements demonstrated by the virtual dancer. By focusing on Basic 1-7, this application ensures that students build initial visual-kinesthetic references to Laban terms and essential movement postures, thereby reducing cognitive barriers before they move on to more complex interactive challenges in Lesson 3. Can be seen in figure 5.

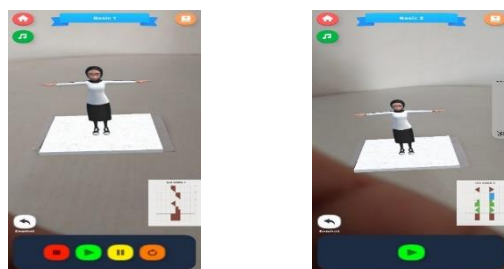


Figure 5. Basic examples of movement literacy 1 and 2

Source: Personal Document

Lesson 3: Movement Symbols (AR Scan) serves as the pinnacle of cognitive interaction and the core of this application. In this menu, a selection of basic hand and foot movement materials is presented based on the level and direction of movement. Users are required to carry out a complex movement literacy process: 3D dancer symbols and movements are presented one by one in real-time as the camera scans the Laban marker cards. Unlike Lesson 1, which is introductory in nature, the process in Lesson 3 encourages students to carry out a series of cognitive activities that support deep learning: (1) reading the Laban Notation symbols on the cards, (2) remembering the meaning of the symbols learned in Lesson 2, (3) analyzing the causal relationship between the 2D symbols and the 3D movements that appear, and (4) identifying or synthesizing these movements into a spatial understanding of the level and direction of movement. This activity of remembering, analyzing, and identifying directly triggers deep learning, ensuring that students do not simply imitate movements but truly understand and internalize the principles of Labanotation. The role of Lesson 3 is crucial in transforming abstract Laban symbols into concrete and meaningful kinesthetic knowledge.

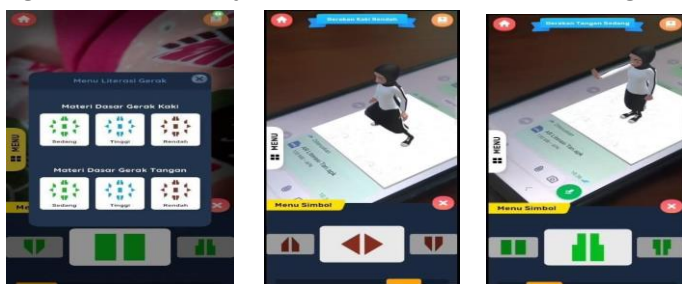


Figure 6. Movement symbol material

Source: Personal documentation

The front page of material 4 consists of mini-games, a symbol-guessing quiz, and an evaluation of uploading creative written and video works. This can be seen in Figure 7.



Figure 7. Display of Material 4

Source: Personal documentation

The first interactive feature in Lesson 4: Mini Games is the Memory Cards (matching pairs of cards). This game is designed to test and strengthen students' visual-symbolic memory, which is an essential part of the deep learning process. Students are challenged to match pairs of cards that have matching elements: a Laban Notation symbol and a 3D image of the movement it represents. This matching process requires students to remember the position of the cards that have been opened, encouraging the activity of remembering, analyzing, and identifying the relationship between the symbol and the movement. The Memory Cards game is presented in Levels 1 to 5, which progressively increase in difficulty. Once all cards are successfully matched, a score and a predicate are displayed (e.g., "Great!"), accompanied by a positive comment. Providing direct feedback and positive predicates is crucial to stimulate intrinsic motivation and ensure the evaluation experience remains enjoyable, in accordance with the principles of joyful learning. Shown in Figure 8.

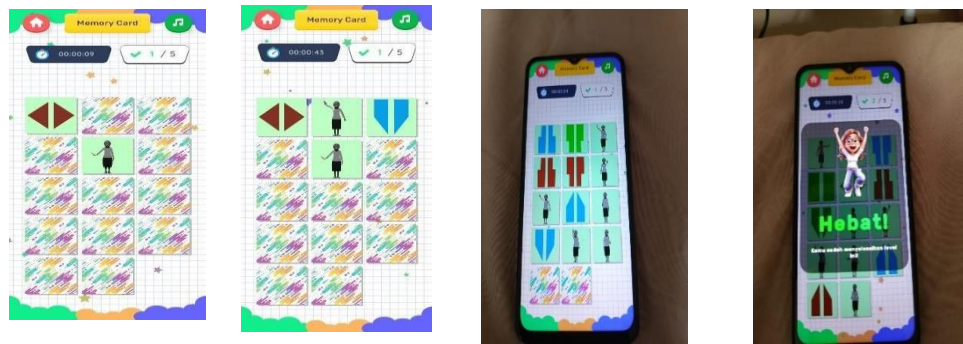


Figure 8. Memory card games
Source: Personal documentation

The second interactive assessment feature in Lesson 4 is the Symbol Guessing Quiz. This quiz serves as a formal cognitive assessment tool that measures students' ability to translate 3D visual movements back into the correct Laban symbols. Before starting, the app provides a prompt emphasizing student responsibility: "Make sure you have understood or studied the material on movement symbols." This aligns with the principle of structured learning that requires mastery of prerequisites. The quiz mechanism involves students being presented with a 3D image or model of a dancer's Level and Direction movements. To facilitate the analysis process and ensure accuracy, the 3D model has an object rotation feature. This rotation feature is crucial because understanding Level and Direction in Laban Notation is spatial and multidimensional, requiring students to analyze the movements from various angles (front, side, and above) before being able to determine the correct symbol based on the 3D image. This process directly tests students' Higher-Order Thinking Skills (HOTS). Upon completion of the quiz, the predicate and score are displayed, providing instant feedback and maintaining students' intrinsic motivation, completing a meaningful and joyful evaluation cycle. This can be seen in Figure 9.



Figure 9. Symbol guessing quiz
Source: Personal documentation

The final feature that complements Material 4 is the Written and Video Upload Evaluation. This feature is designed as the culmination of the summative assessment that tests students' abilities in creative synthesis, measuring the highest achievement of Higher-Order Thinking Skills (HOTS). Students are tasked with creating a simple work consisting of two components: first, a video of moving practice (kinesthetic) that applies the Levels and Directions they have learned; and second, a written work in the form of Dance Notation (symbolic) that represents the movements they make in the video. This dual task explicitly tests students' dual literacy, namely the ability to translate visual-kinesthetic understanding (movement) into symbolic-written understanding (notation). After the work is completed, students upload both components to the Google Form link provided in the application menu. This process confirms that the AR-Motion Literacy media focuses not only on receptive understanding (seeing and remembering), but also on students' productive and creative abilities in producing work based on the Labanotation principle. This can be seen in Figure 10.

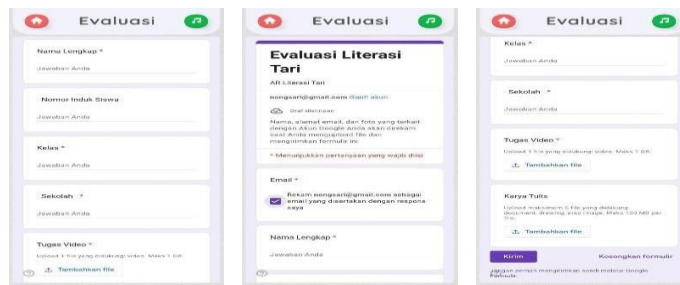


Figure 10. Material 4 evaluation of uploading written works and dance movement videos

The results of the feasibility test (expert validation) averaged 88.8% overall, falling into the "Very Valid" category. The details are as follows:

Tabel 2. Rekapitulasi Hasil Validasi Ahli Materi dan Media

Expert	Assessed Aspects	Percentage (%)	Category
Subject Matter Expert	Content, Pedagogy (Laban Movement Literacy)	90.0%	Very Valid
Media Expert	Technical, Usability, AR Interactivity	87.5%	Very Valid
Final Validation Average		88.8%	Very Valid

The results of the feasibility test of the AR-Motion Literacy media prototype by expert validators indicate that the product is theoretically feasible for use. The overall average validation score reached 88.8%, which is in the Very Valid category. In detail, the assessment from the Material Expert for the content and pedagogical aspects of Laban Movement Literacy obtained a score of 90.0% (Very Valid), confirming the material's suitability with educational principles and the junior high school curriculum. Meanwhile, the Media Expert assessed the technical aspects, usability, and interactivity of AR at 87.5% (Very Valid), which indicates that AR functionality has run optimally and supports the principles of usability.

The results of the practicality test (by teachers and students) produced an overall average of 93.1%, with the Very Practical category shown in Table 3.

Table 3. Results of the Practicality Test of AR Media by Teachers and Students

No.	Practicality Testing Aspect	Respondents	Percentage (%)
1.	Implementation and Efficiency Aspect	Teachers (N=2)	92.5%
2.	Usability and Interest Aspect (Joyful Learning)	Students (N=15)	95.0%
3.	Conceptual Understanding Aspect (Level/Direction)	Students (N=15)	90.9%
4.	Interactivity and Cognitive Engagement Aspect	Students (N=15)	93.4%
Average Final Practicality			93.1%

The practicality test was conducted on limited subjects (2 teachers and 15 students) and produced an overall average of 93.1%, which is in the Very Practical category. Details of practicality



data show that the highest score is in the usability and interest aspects (Joyful Learning) by students with 95.0%. These results confirm that AR media successfully stimulates students' emotional involvement. Meanwhile, the score for the implementation and efficiency aspects assessed by teachers reached 92.5%, confirming that this media is easy to integrate into the teaching and learning process. Two cognitive aspects, namely the concept understanding aspect (level/direction) and the interactivity and cognitive engagement aspect also obtained high scores, 90.9% and 93.4%, respectively, which indicates the effectiveness of the media in helping students achieve meaningful understanding (meaningful learning).

Thus, the results indicate that this media achieves meaningful learning (Concept Understanding score of 90.9%) through the support of dual coding theory (3D Laban visualization vs. Laban symbols), and achieves joyful learning (Interest score of 95.0%) which successfully overcomes the problem of low student motivation in the digital era. The practicality of implementation by teachers (92.5%) also strengthens that this media is an efficient solution.

4. CONCLUSION

Augmented Reality learning media for Laban Notation Motion Literacy has been proven to be Very Valid (88.8%) based on expert assessment and Very Practical (93.1%) based on trials on teachers and students. This product effectively overcomes the conceptual difficulties of space (level and direction) for junior high school students, and successfully increases learning motivation through meaningful and joyful learning experiences. However, there is one significant limitation of this study, the practicality trial was only conducted on 15 students (limited trial), so that the generalization of practicality in general still requires further testing. In addition, the performance of the AR application is highly dependent on the hardware specifications (smartphones) used by students.

The next step in this research is to conduct a large-scale experimental test with a single-group pre-test/post-test design. This test will involve a larger group (large-scale field test) to measure the significant impact of AR media on improving students' meaningful and enjoyable deep learning in understanding the elements of motion (space, time, and energy) across various classes or schools.

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