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# Musical Drama as a Medium for Strengthening Computational Thinking of High School Students

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Abstract: This study explores the integration of musical drama as a medium to strengthen computational thinking (CT) among high school students in Jakarta. Computational thinking, a critical 21st-century skill, involves problem-solving through decomposition, pattern recognition, abstraction, and algorithmic thinking. Despite its importance, CT remains underutilized in art education. This research employs a Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) to design and implement a project-based learning (PjBL) framework centered on musical drama. The study involved 35 grade XI students who participated in an 8-week musical drama project, divided into creative teams to handle various production aspects. Observations, interviews, and documentation revealed that students effectively applied CT components: decomposing tasks, recognizing patterns in performance elements, simplifying complex narratives (abstraction), and organizing systematic workflows (algorithmic thinking). Results indicated significant improvements in students' logical thinking, creativity, collaboration, and confidence. The study highlights the effectiveness of musical drama as an interdisciplinary tool to enhance CT skills while fostering emotional engagement and character development. It also underscores the teacher's role as a facilitator in promoting reflective and participatory learning. The findings align with prior research on PjBL and CT, suggesting broader applicability in art education. Future research could extend this model to basic education or incorporate digital technologies.

Keywords: Art education, Computational thinking, Musical drama, Project-based learning,

#### 1. Introduction

Computational thinking is one of the important abilities of the 21st century that must be cultivated from an early age because it is oriented towards "problem solving", thus making one's thinking power develop (Suprayitno, T., 2019). The development of creativity through education is indispensable because it can develop the potential of children as a whole (J.P. Guilford, 1967). Le'bok, A.S, et al. (2022) stated that creativity is meaningful as personal selfdevelopment and also development in social life. Creativity is also needed in the field of art. The concept of *computational thinking* is new in art learning in schools, so that wider implementation efforts are needed to develop students' thinking power, provide variations of art learning in schools that are fun and current and become innovations in the field of art education (Givartini et al., 2023). However, the current learning conditions have not fully run optimally. Low student interest in learning causes the quality of education in Indonesia to be less developed (Warsito, 2019). Learning can take place optimally if the components that support learning are well fulfilled. Teachers have an important role in increasing students' interest and talent for learning, especially in art lessons. However, in its implementation, art learning often faces challenges, namely the low active participation of students in learning (Purwaji & Rahmawati, 2022).

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Computational thinking is a critical, creative, communicative and collaborative thinking skill to understand and solve complex problems, even this thinking concept can shape the character of confidence, open-mindedness, tolerance and sensitivity to the environment (Marifah et al., 2022). According to (Shabrina & Astuti, 2022) teachers must apply the 6C elements (Critical thinking, Creativity, Collaboration, Communication, Culture / Citizenship, and Character education / connectivity) which are the focus of expertise in the field of 21st century education in depth to students in all learning content, including art learning because art learning in schools aims to be one of the character builders of students who are virtuous, understand cultural roots and are able to solve problems contextually according to their level of development. Apart from the role of the teacher, the learning model applied must also use methods that can make the learning process more effective and efficient, and are expected to be able to pump the motivation of students to always improve the quality of their learning outcomes (Sukmana & Amalia, 2021). One of the many learning models that exist is Project Based Learning (PjBL) (Ilhaq M & Hasan, 2025). Amini (Sukmana & Amalia, 2021) stated that learning outcomes had a very high effect when applying Project Based Learning. According to Le'bok A, et al. (2022), drama art is one of the art fields that really requires creativity. Musical drama is a project-based learning model that refers to the creation of a work with the final result of performing a musical drama work on stage.

The concept of *computational thinking* is a new thing in art learning in schools that requires wider implementation efforts. Therefore, the researcher is interested in conducting a similar research but with a slightly different discussion, which refers more to the integration of *computational thinking* and musical drama in art learning in the classroom as a means to hone computational thinking skills. This effort not only responds to the times, but is also an effective way to emphasize the role of art education in shaping students who are creative, critical and responsive to change. This research is expected to contribute concretely to building an inclusive and collaborative art learning environment, as well as a foundation for developing innovations in art education more thoroughly. In this study, the researcher only focuses on the context of *computational thinking* and musical drama at the Senior High School level in Jakarta.

#### 2. Proposed Method

This research uses a Research and Development (R&D) approach to develop and implement a learning model based on *musical drama* as a medium for strengthening computational thinking. The development model used in this research is ADDIE (Analysis, Design, Development, Implementation, and Evaluation) because according to (Branch, 2010), this model has proven to be effective in developing art-based learning media.

- 2.1. Research Stages:
  - 1. Analysis (Needs Analysis):

Literature study and observation were conducted to find out the urgency of developing musical drama learning in the context of computational thinking. Observations also included mapping students' initial conditions, teachers' challenges in learning cultural arts, and students' motivation levels.

2. Design:

Researchers designed musical drama scenarios, CT (computational thinking) assessment instruments, and project-based art learning tools. The musical drama scenario was designed to include elements of decomposition, abstraction, algorithmic thinking, and pattern recognition.

3. Development:

Products were developed in the form of learning tools, teacher guides, and project activity modules. Expert validation was conducted by art lecturers and pedagogy experts to ensure content suitability and feasibility of implementation.

4. Implementation:

The product was applied to grade XI students in one of the high schools in Jakarta. Students were divided into creative teams (actors, musicians, dancers, technicians, etc) and worked on a musical drama project for 8 weeks. Teachers acted as facilitators of PjBL-based learning and CT reinforcement.

5. Evaluation:

Evaluation was conducted through data triangulation techniques: observation of students' activities, in-depth interviews with students and teachers, process

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documentation, and pre-post questionnaires on CT understanding and interest in art learning.

2.2. Research Subjects:

A total of 35 grade XI students from one of the public high schools in Jakarta, who were actively involved in the musical drama project. Cultural arts teachers were also involved as key informants in the learning evaluation process.

Data Collection Instruments and Techniques:

- Participatory observation
- Semi-structured interview
- Video, photo, and script documentation

Data were analyzed qualitatively through the stages of data reduction, data presentation, and conclusion drawing (Miles & Huberman, 1994) Evaluation of the impact of learning on students' computational thinking skills was carried out by looking at CT indicators in the context of art.

# 3. Results and Discussion

After the implementation of the musical drama for eight weeks, a number of key findings were obtained that showed the significant contribution of this project to the strengthening of students' computational thinking. The results were obtained through observations, interviews, and student documentation.

#### 3.1. Student Activities in the Musical Drama Project

Observations showed that students were able to organize the roles and responsibilities of each group member based on expertise and interest. In the process of making and performing, students applied the four main components of computational thinking:

# A. Decomposition

Students divide a large project into small parts that can be handled by small groups or individuals. For example:

- 1. Form a production team, determine the director, music director, coregrapher, artistic stylist, wardrobe, make up artist, sound and lighting stylist, property, stage crew, IT team, Public Relations, Treasurer and secretary.
- 2. The storyline is divided into short scenes, each written and revised by the scriptwriting team and communicated with the other teams.
- 3. Music is divided into teams with each preparing an opening, middle and closing song, with the direction of the Music Director.
- 4. Movement and choreography are assigned to groups of dancers and choreographers based on the needs of each scene.
- 5. Make Up and Wardrobe are determined according to the character of the role and the stage of the scene by the Team.
- 6. The IT and Public Relations teams divide roles in social media content creation, print and digital media design and promotion.
- 7. Stage techniques such as lighting, sound, and properties are organized by the technical production team. Based on the results of the script or storyline, the production team in which the lighting stylist divides and determines the choice of lighting techniques in each scene. Then the property-making team records what supporting scene needs and records the materials that will be made in supporting the show and forms a team for the division of job desks. The sound stylist team lists what will be used to adjust to the stage layout and school facilities. All artistic needs are planned and supervised by the production team leader.
- 8. The treasurer and secretary accompanied by the production team divide the tasks in taking care of licensing, production financing.
- 9. Role selection is done by the director

This division makes it easier for students to focus on certain parts in depth, but still integrated with each other.

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### B. Pattern Recognition

Students analyze various examples of musical drama performances that they watch together as references. From these references, they can:

- 1. Identify movement patterns within a particular musical genre, such as ensemble dance or dramatic gesture. Distinguish movement gestures that have meaning
- 2. Recognize dialogue structures and transitions between scenes so that their work feels flowing and logical.
- 3. Determining the make-up style that suits the character of the cast
- 4. Noting musical structures such as the use of repeating refrains, musical climaxes, and tempo to build emotion. Determining the main melody that can become the identity of the show.
- 5. Find a stage arrangement pattern for a smooth live performance in each act or scene.
- 6. Using these patterns to create a performance that is distinctive but still easily understood by the audience.

# C. Abstraction

In simplifying the complexity of the story, students do:

- 1. Conflict reduction by trimming the initially complex storyline into one main conflict to keep the performance focused.
- 2. Character simplification by reducing the number of characters that are not important and each character is made to have a symbolic role to be easily recognized by the audience.
- 3. Language adaptation by adjusting the dialog to be easily understood by audiences of their age or younger.
- 4. Trimming scenes that change the stage layout which is deemed inefficient.

Thus, students learn to ignore unimportant details and prioritize the most essential elements.

# D. Algorithmic Thinking

Students organize logical and systematic steps such as:

- 1. Rehearsal schedule planning The production team organizes weekly rehearsal sessions based on the availability of all members and locations.
- 2. Sequencing of scenes according to the order of display and flow of emotions and technical moves on stage.
- 3. Task distribution with a checklist system of daily and weekly task lists so that all parts are completed on time.
- 4. Stage simulation with rehearsals in order to ensure time efficiency and logistical arrangements during the performance.

Students also use a digital whiteboard or spreadsheet to visually organize this sequence, demonstrating an understanding of simple programming concepts.

#### 3.2. Increased Understanding and Interest

Based on post-performance observations and interviews, it is divided:

- 1. Students felt they better understood how to think logically and systematically in completing project tasks.
- 2. Most students stated the musical drama activity helped them learn art in a more enjoyable way.
- 3. Students claimed that this experience increased their confidence in performing and working together.

In-depth interviews also showed that students felt more "thoughtful" when developing stories, making artistic decisions, and managing conflicts between group members in a mature manner.

#### 3.3. Discussion

The results of this study corroborate Cocco's (2007) opinion that project-based learning encourages learners to learn in a real context and through collaborative work. Musical drama as an interdisciplinary art form not only creates space for creative exploration, but also becomes a means to apply the principles of computational thinking in art learning. This finding is also in line with the study of Giyartini et al. (2023), which states that the computational thinking approach has not been widely explored in the realm of art. By incorporating elements such as algorithm-based decision-making and narrative simplification (abstraction), art students are positioned not only as artists, but also as problem solvers.

In addition, the ADDIE model is also proven to provide a systematic workflow that can facilitate higher order thinking concepts in art-based learning. The design and development stages allow teachers and researchers to prepare adequate materials, while the Implementation and Evaluation stages ensure reflective and participatory learning for students.

This research also emphasizes the importance of the teacher's role as a facilitator. Teachers who are able to provide space for creativity and reflection encourage the growth of critical thinking, collaborative, and solution characters. This is in accordance with Kaufman & Sternberg (2010), who mention that creativity develops optimally when learners are given the opportunity to explore problems deeply and multidimensionally. A similar statement was given by the cultural arts teacher at the school, who stated that the integration of musical drama in learning was able to significantly increase student engagement compared to the lecture method or partial practice. The teacher also noted that students' ability to convey ideas and argue logically improved.

#### 4. Conclusions

This study explains that musical drama learning designed using the ADDA approach systematically can be an effective approach to strengthen students' ability to think computationally. The fusion of drama, music, dance and visual arts elements in a collaborative design format encourages students to think critically, solve problems creatively and work in teams productively. In addition, the project enhances the emotional involvement of all students in the learning process, builds self-confidence, and strengthens character through direct experience of the arts. Therefore, musical drama not only strengthens computational cognitive aspects, but also enriches high school cultural arts learning as a medium for 21st century character education. Further research recommendations can be directed at developing similar models for basic education levels or integrating with digital technology.

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