



Expression of Architectural Form of Buoyant Montessori School Kupang

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ABSTRACT

This study aims to reveal the application of the relationship between architectural form and the expression of the Buoyant Montessori School (BMS) Kupang building. Developing a philosophy of architectural anatomy using the fundamentals of architectural design is the initial step in the study. The study's foundation is architectural anatomy and the design principles discovered in the observation unit of the two- and three-dimensional redesigned Buoyant Montessori School (BMS) Kupang building. After investigation, an interpretation of the Buoyant Montessori School (BMS) Kupang buildings was developed. This interpretation incorporated an ideology of universal educational value as well as a monumental, formal, local expression. For stakeholders, particularly the regional government and architectural practitioners, the study's findings can be used as a reference source and enhance the architectural concept of school buildings.

1.0 INTRODUCTION

Previous studies have uncovered that developments over time, engineering knowledge, and the development of ideological values from users greatly influence architecture (Clarissa, 2016; Salura & Clarissa, 2018). The development of school design, which is greatly impacted by students' educational experiences, influenced this phenomenon. Furthermore, it is impossible to isolate the globalization conditions from the contemporary development of school architecture. a phenomenon when new technology and norms are standardized to the point where it becomes impossible to resist a particular trend.

A distinct architectural character distinguishes the Buoyant Montessori international school buildings from the developing single-style school buildings that are beginning to appear in isolated parts of Eastern Indonesia. The Buoyant Montessori School (BMS) Kupang building in East Nusa Tenggara, namely Kupang City, is now under construction. It is based on SK-PBG-537104-10032023-001, dated 03-10-2023.

Buoyant Montessori School (BMS) Kupang is the only international school in Kupang City that adopts the North American Montessori Center (NAMC) and K-13 curriculum (KoranNTT, 2021). The design concept for Buoyant Montessori School (BMS) Kupang comes from the spirit of the Generasi Cahaya Bangsa Foundation, namely environmental order; teacher as facilitator and observer; as well as self-discipline, responsibility, and cooperation between children to create a conducive learning atmosphere (KoranNTT, 2021). As an educational building, it must have a formal, monumental representation, and have universal values and local characteristics. Therefore, in order to demonstrate the elaboration of architectural theories that are consistent with empirical evidence, efforts to interpret and articulate the concept of the form of the Buoyant Montessori School (BMS) Kupang building are imperative. The objective is to further the idea of architectural form expression in general and in educational architecture especially by utilizing the empirical notion of Buoyant Montessori School (BMS) Kupang.

2.0 DESIGN OBJECT

The rise of single forms of school architecture often involves the adoption of a universal design style, neglecting the unique needs and characteristics of each school's educational system (Lake, 2022). The attempts to lower construction costs and time, a disregard for the building site's local and cultural character, and the architects' lack of originality and inventiveness in their designs are the contributing reasons. Architects are thought to intentionally strive to create structures that can both convey their purpose as learning spaces and serve as representations of the local environment and culture (Clarissa, 2016). In contrast, the Buoyant Montessori International School stands out due to its distinctive architectural concept. This concept creates flexible and collaborative spaces, utilizes natural materials, makes effective use of natural lighting, includes ample open spaces, and presents designs that enhance user comfort (Tanzil & Indrani, 2013). The design of the Buoyant Montessori International School building was influenced by the school's history, educational goals, curriculum and school culture (Afifah &

Kuswanto, 2020).

In the 20th century, Maria Montessori established the first Montessori schools worldwide. Maria Montessori was a physician and teacher from Italy. In Rome, Italy, at the start of the 20th century, Maria Montessori created an educational approach that placed a strong emphasis on students' independence, freedom, and first-hand experience (Maemonah, 2020). The “children's home” or *Casa dei Bambini* in Rome was opened by Maria Montessori in 1907 as the beginning of the Montessori school (Fauziah, 2020). The teaching method is to give children the freedom to absorb knowledge from sensory materials and teaching aids. The aim is to help children develop their unique potential as a whole; motivating children to be independent, social and competent in exploring children's interests and talents (Hidayat, 2021). The Montessori method thereafter gained widespread acceptance around the globe as a result of its reputation for integrity in the classroom, which greatly aided in children's independence and personal growth. The Buoyant Montessori Kupang International School in NTT is one of the four Montessori schools in the world that still adheres to the same standards of consistency despite constant development and adaptation to the changing times. In Kupang City, Buoyant Montessori School (BMS) Kupang is a school that uses both the K–13 curriculums and the North American Montessori Center (NAMC) framework (KoranNTT, 2021).

The curriculum emphasizes enhancing sensory experiences and deepening ideas through natural materials and instructional tools, encouraging children to learn through authentic experiences both inside and outside the classroom. The Buoyant Montessori School (BMS) Kupang building, affiliated with the Generasi Cahaya Bangsa Foundation, reflects these educational principles through its design. This building was selected as a case study to explore and apply the concept of form expression in educational architecture (KoranNTT, 2021).

3.0 METHODS AND ANALYSIS STAGES

Developing a theoretical elaboration framework for analyzing the architectural form of the Buoyant Montessori School (BMS) Kupang building is the first stage in investigating and studying this design process. Salura and Fauzy's relationship between concepts, scope, and expression approach will serve as the foundation for this study and design technique (Salura & Fauzy, 2012). In line with the opinion of Channel and Fauzy (Salura & Fauzy, 2012), according to Clarissa (2016), architecture typically appears in an environment that can accommodate various activities, allowing it to exhibit specific expressions as well. The building envelope's external anticipate and features explore the design concept and reflect the architectural language in the issue. Previous studies have demonstrated that structural, semiotic, and phenomenological methods may be employed to read architectural expressions (Salura, 2001). According to Salura and Fauzy (2012), architecture typically appears in an environment that accommodates various activities, allowing it to exhibit specific expressions. This study employs structural, semiotic, and phenomenological methods to interpret architectural expressions. For example, the structural approach focuses on balance and hierarchical orientation (Salura, 2015) while the semiotic approach, based on Peirce's theory,

examines cause-effect relations, similarities, and communal recognition (Siregar & Wulandari, 2020; Zoest, 1993; Peirce, 1991). In line with expressing architectural expressions in a phenomenological context, Thiis-Evensen reads architectural expressions through descriptions of the building envelope, namely the influence of weight or mass, movement or trajectory and the surface of the object itself (Thiss-Evensen, 1987).

The design object administered as a study case is a type of educational building, located in the Municipality of Kupang. Government rule number 16 of 2021 concerning structures for social and cultural functions governs the design and construction of the Buoyant Montessori School (BMS) Kupang building. These regulations stipulate that in addition to building design and construction, buildings must also fulfill the following requirements: they must be established following their intended use, be safe, healthy, convenient, comfortable, and efficient with resources; the building's architectural form should reflect its intended use as an educational facility; they must be beautiful but not excessive; they must balance, harmonize, and integrate with the environment; when applying architectural and engineering concepts, they must consider local socio-cultural values; and they must consider the principles of preserving buildings, both historically significant and architecturally distinctive (Peraturan Pemerintah No 16 Tahun 2021 Tentang Peraturan Pelaksanaan Undang-Undang Nomor 28 Tahun 2002 Tentang Bangunan Gedung, 2021). Based on the objectives of this study, the following investigation only focuses on how the external appearance of the Buoyant Montessori School (BMS) Kupang building reflects its function as an educational building and is able to reflect its local identity.

There are four principles of expression of the architectural form of educational buildings which are ideally the same as the expression of the architectural form of government buildings (Ismail, n.d.; Kurir, 2018). First, a building's exterior and internal spaces convey an impression of solidity. This is recognized as a formal expression. A symmetrical shape composition is necessary for formal expression since it creates axe clarity and makes the shape appear sturdy. Balance is an essential element that forms the foundation of formal expression. Second, a monumental expression has an impressive and magnificent aspect that is primarily composed of vertical parts (Mako et al., n.d.). Aspects that need to be considered are position, distance and volume (Salura, 2010). Hierarchy is the fundamental idea. Third, the Buoyant Montessori School (BMS) structure is required to be able to convey the neighborhood's principles. The fundamental idea is that for the Buoyant Montessori School (BMS) building to become a symbol of the uniqueness of each region, it is crucial to preserve the contextuality of the building in its surroundings. If a building's general design or any of its constituent parts resemble local icons, they are considered to represent local expressions. The feature demands to be large enough to dominate the entire view and positioned in a way that allows viewers to see it from all angles and easily identify.

Educational structures, like the Buoyant Montessori School (BMS) Kupang building, serve to communicate the concept that their founders maintained in addition to reflect local values. The learning system that gave rise to Buoyant Montessori School

(BMS) was founded on freedom or universal ideals. Therefore, the Buoyant Montessori School (BMS) Kupang building needs to be able to convey messages about global principles in addition to monumental, formal, and local expressions (KoranNTT, 2021).

In line with research by Purbadi et al. (2020), Lake et al. (2020); Rayawulan et al. (2023), and Clarisa (2016), the similarities in the analysis steps used are: First, describe the form of a case study as a whole, namely two dimensions and three dimensions based on empirical data including information about the history of the school, educational goals, curriculum, and school culture before analysis. The building's form will be scrutinized within the framework of architectural anatomy, specifically the context of the surrounding area, the site, the enclosure, and the ornamentation embedded in the building's exterior (Salura, 2018). Thus, at a distance three times the building's height, visibility is crucial for observing a building's general shape and how it interacts with other buildings in the surrounding environment. It requires two times the building's height to observe the building's shape concerning the site. The ability to perceive the building's overall structure and the interaction between its mass and the surrounding environment is believed to be made possible by this viewing distance. Meanwhile, more detailed observations of ornamental aspects and unique features can be obtained by discovering them from a distance equal to the building's height (Neufert & Neufert, 2000).

Second, to describe the results of observations of building shapes based on visibility and architectural anatomy based on the principles of identification, balance and orientation-hierarchy (Salura, 2018). Third, the interpretation of the findings is predicated on the architectural expression of the school, namely on whether the building form is capable of expressing massive, formal, universal ideals while concentrating on the role of the built location's identity.

4.0 FINDING AND DISCUSSION

The Buoyant Montessori School (BMS) Kupang building's concept of expression is based on the design analysis approach and steps, particularly the aspect of visibility three times, twice, and once the building's height (see Figure 1).



Figure 1. The concept position of the observation point (16 m; 32 m; 48 m) towards the Buoyant Montessori School (BMS) Kupang building.

4.1. Surrounding environmental context

The Buoyant Montessori School (BMS) Kupang building's walls and roof can be viewed from a viewing distance three times the building's height, or 48 meters. The entry accent makes the mass of the podium particularly obvious, as can be seen in Figure 2. The building's overall shape is reminiscent of an ancient red brick school building in Midwest City, USA, with a touch of classical architecture to set it apart from the local landmark. The resultant design has the appearance of stability and firmness, akin to a fortified stronghold (refer to Figure 3). In terms of balance, it appears that each side of the wall of the Buoyant Montessori School (BMS) Kupang building is similar, thus creating a symmetrical composition. The tendency of the symmetrical concept to produce a vertical axis on each side of the building is visible, especially since all column and window elements are also composed symmetrically so that they rise vertically. Although the equal arrangement of the building walls on all side gives the impression that they are monotonous, it is easy to locate the entry (see Figure 4). The Buoyant Montessori School (BMS) Kupang building is constructed on a comparatively flat site, but it is taller than the Provincial BPK office building, as can be seen by further developing the concept using the orientation-hierarchy principle. On the side are NTT and the Telkom Kupang Grapari building. This allows the Buoyant Montessori School (BMS) Kupang building to occupy the majority of the observer's perspective and be seen in full (see Figure 5). With a site that extends towards Jalan W. J. Lalamentik, the face of the building faces towards the road node. The concept of orientation of the facade of the Buoyant Montessori School (BMS) Kupang building allows observers passing through Jalan W. J. Lalamentik to see it in its entirety from a distance.

The Buoyant Montessori School (BMS) Kupang building's composition and orientation, as well as its hierarchy within the surrounding environment, are described. These concepts inform the interpretation of the form expression that follows: (1) The Buoyant Montessori School (BMS) Kupang building has been able to exhibit a monumental expression as a result of the location of the building site, which allows the building's main mass to be seen in its entirety. The building's mass volume is larger and heavier than other buildings on the site. The windows' arrangement and the flow of the white lines in both vertical and horizontal directions reinforce the impression of monumentality. The formal expression was successfully displayed through the composition of the building's facade which is symmetrical with the other side of the wall, and the concept of an elongated rectangular shape tends to give the impression of stability. Even though the wall area is larger than the roof area, the dominant element of the Buoyant Montessori School (BMS) Kupang building when viewed as a whole is the head element, which houses the main mass. The head element is given a white accent along with a combination of curved lines that express the shape of a Timorese house roof (ume bubu) (refer to Figure 8), thereby supporting the creation of a local expression in the building.

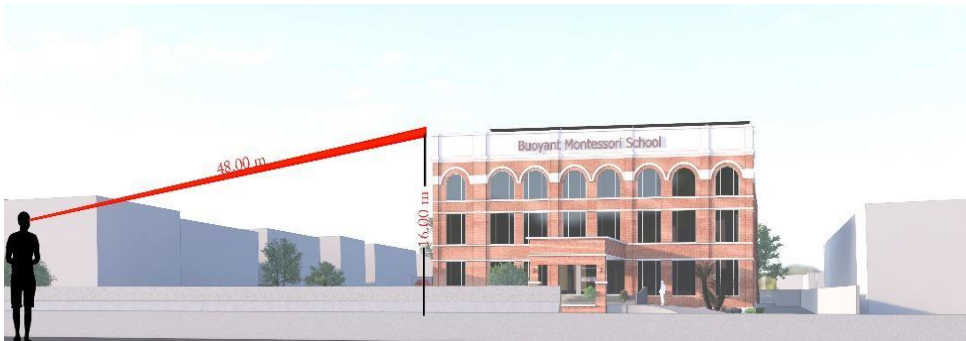


Figure 2. The entire shape of the Buoyant Montessori School (BMS) Kupang building can be observed from a distance three times the height of the building.



Figure 3. From three times the height of the Buoyant Montessori School (BMS) Kupang building, you can see the similarity of the building to an old red brick school in Midwest City, United States.



Figure 4. Vertical axis of the body mass (wall) and head of the Buoyant Montessori School (BMS) Kupang building.



Figure 5. Comparison of the height of the Kupang Buoyant Montessori School (BMS) building, the NTT Province BPK building, and the Telkomsel Grapari building.

4.2. Site context

Inside the site, visibility is 32 meters, which is twice the height of the structure. The concept of the Buoyant Montessori Kupang building's general design, which is made up of the mass of the head, body (the walls), and legs (the podium), is currently visible. The feature that most dominates the Buoyant Montessori Kupang building's overall appearance is the concept of the body element or wall. In comparison to the elements of the head (roof) and foot (podium), the proportion is highest. The receiving mass, which includes the entrance and drop-off masses, makes up the middle mass. The flat top of this massif assists in the formation of a vertical axis, and its forward protrusion strengthens the front access or entry zone (see Figure 6).

The interpretation of the expression of form in the context of the site is described as follows: the presence of space outside the site, which is quite wide because it follows the spatial planning directions of the City of Kupang as stated in SKRK PUPR number: PUPR.591/75/KOB/II/2018, giving the distance more than twice the height of the building means that the shape of the building within the site can be seen in its entirety. This idea provides the building with a massive appearance. Due to their vast proportions, the walls of the Buoyant Montessori Kupang building dominate the building's overall shape. The building's expression tends to be local because the idea of its red brick walls is an iconic one in the area.



Figure 6. Observation of the Buoyant Montessori School (BMS) Kupang building at a distance of twice the height of the building shows the mass of the podium (entrance) as the axis of the building.

4.3. The context of the scope element

The viewing distance of one building height, namely 16 meters, allows observation of the enclosure elements in the context of the overall shape so that the texture, pattern, color and material character of each building element are clearly visible.

At this point, it becomes easier to see the Buoyant Montessori Kupang building's entry area. The composition of the entrance mass, which consists of the main entrance area and the droop-off function, juts forward and has different proportions than the rest of the building mass. Transparent glass windows finished in the shape of a stone base give the walls in the entry area a hefty appearance. The building appears stable because of the base's broader shape at the bottom. Similarly, the drop-off area's roof is supported by columns. There is a sense of horizontality created by the large podium ceiling and the rows of columns. The wide podium roof and columns arranged in rows gives a horizontal impression. The composition of the opening elements and columns in the podium mass creates symmetry that supports the formation of a vertical axis. On this vertical axis, there is an entrance, which is the only entrance to the front of the building (see Figure 7).

The following is an explanation of how the concept of expression of the surrounding elements is interpreted: A strong vertical axis and a stable mass form effectively convey the formal impression. The idea of a monumental expression is created by the arrangement of the white lines, which create a horizontal impression, and the height of the stairs, which dominate the drop-off area's composition. On the front column of the entrance mass, a white line representing the *ume lopo* columns, and the use of red brick material conveying the idea of expressing the universal value of education are two examples of both local and universal expressions that can be displayed (see Figure 7). It is believed that the *ume lopo* building is a type of traditional house that is mandatory for every Timorese tribe in Indonesia. *Ume lopo* is a male symbol and means a group of people or tribe. In everyday life, *ume lopo* is used as a meeting place, for tribal ceremonies and for food storage.

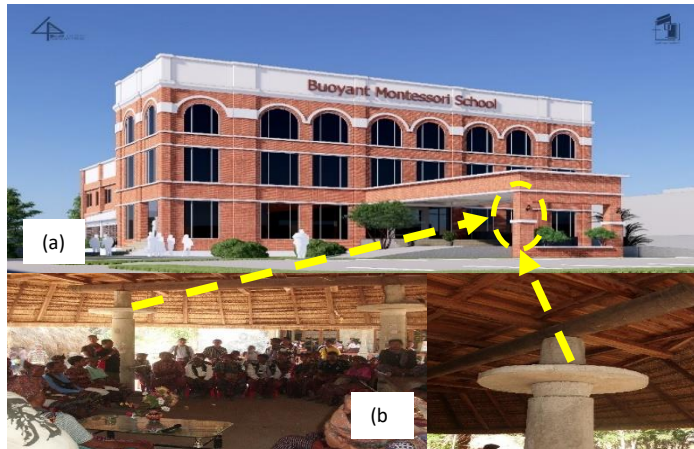


Figure 7. (a) Observation of the Buoyant Montessori School (BMS) Kupang building at a distance of one height of the building shows that the entrance area has different proportions from the rest of the mass, thereby strengthening the building's axis; (b): Ume lopo column model.

4.4. Context of ornamentation elements

Observing the context of the ornamentation elements requires a viewing distance equal to one time the building's height, or 16 meters, similar to observing the enclosure element concept. The ume lopo column's final line and the white line silhouette of a circular house, identified as the ume bubu, are the elements that are visible from this distance. The Timorese tribe was forced to construct ume bubu, the first traditional structure, in a traditional village. As a symbol of the utmost respect in traditional Timorese culture, ume bubu was constructed for mothers or women. Ume Bububu is a building that is both physical and has transcendent dimensions, or metaphysical-supernatural qualities. It is significant to the indigenous people of Timor because it houses artifacts that were once owned by their ancestors. The white line elements on the walls of the Buoyant Montessori Kupang building are interpreted concerning the meaning of ume bubu. These components can be discovered at the top of the two entrance column pillars and the wall elements, which are collectively referred to as the entablature. Its composition, which is above that of the building mass overall, makes it extremely dominant. In particular, the use of white contrasts sharply with the red brick color of the building wall elements (see Figure 8).

The interpretation of the dominant ornamentation elements, that is the white lines in the 2-dimensional shape of a round house (ume bubu) and the line ending the ume lopo column, is the result of agreement among the Timorese people. It is believed that this concept is a symbol of the locality of Timorese architecture which is based on the principles of the Montessori method, namely community cohesion as a fabric of community-based education. This ideology strengthens PP 16 of 2021 concerning local identity.

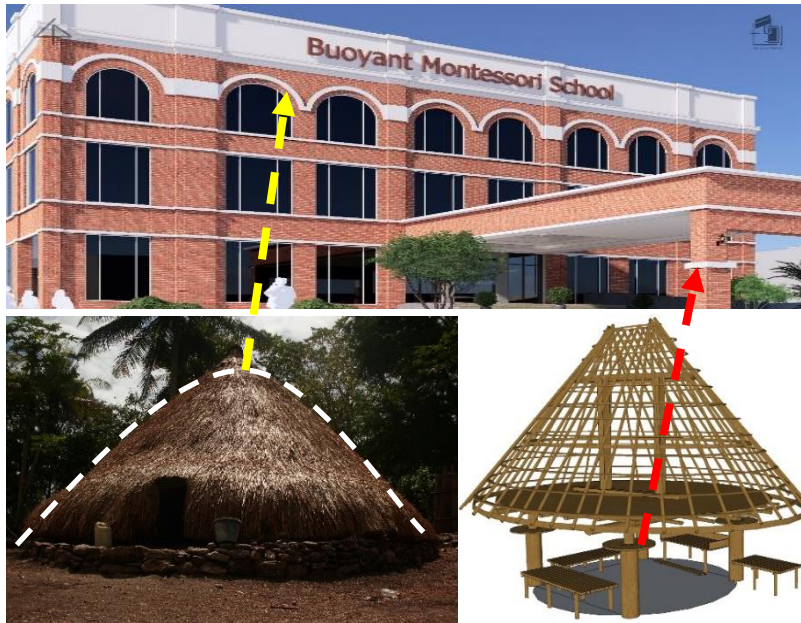


Figure 8. The signage and ornamentation on the Kupang Buoyant Montessori School (BMS) building are clearly visible from the two-dimensional white line composition that shows the basic shape of a round house (ume bubu) and the character of the columns of local Timorese architecture.

5.0 CONCLUSION

The analysis's conclusions are as follows: (1) This study generates a novel idea for expressing the shape of school buildings. The three aspects that are being proposed are: (1) the Buoyant Montessori Kupang building can produce monumental expressions by selecting the distance between the site and the building in accordance with the Kupang City PUPR SKRK number: PUPR.591/75/KOB/II/2018, which is based on the principle of orientation-hierarchy; and (2) consideration of visibility aspects, balance aspects, orientation-hierarchy, as well as architectural anatomical aspects (surrounding environmental context, site context, enclosure context, and ornamentation context). Apart from that, it is able to display formal expressions from the choice of the basic shape of the building which is based on the principle of balance; the local expression refers to the two-dimensional line signage of the round house figure (ume bubu) and ume lopo pillars originating from Timorese vernacular architecture; at the same time representing the ideology of universal educational values from the choice of building materials; (3) The findings of revealing the Buoyant Montessori Kupang building's expression may be utilized as a guide for the construction of comparable structures and help stakeholders, such as the Regional Government, remain devoted to architectural principles rather than becoming engulfed in the trap of copying foreign architectural forms.

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