Technical Performance Evaluation of Primary Education Buildings Based on Unesco Guidelines

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Abstract. Compulsory education is one of the Indonesian government's programs in an effort to advance the nation. The compulsory education program can run well if it is supported by right facilities and infrastructure, such as good quality educational buildings. The technical performance of educational buildings can be realized with good quality if the building is designed and built with due observance to the technical standards of a predetermined building. With the same quality of educational buildings in all regions of Indonesia, this study will evaluate the technical performance standards of basic education buildings. The aim of the study was to determine the feasibility level of the technical performance of basic education buildings in Indonesia based on the UNESCO guidelines for school building design in Asia. The study used a qualitative method with a comparative case study approach, namely six basic education buildings in the province of Bali. Those buildings are compared with UNESCO guidelines based on aspects of the environment, teaching spaces and service areas. The results of this comparison are expected to be able to consider more environmental aspects, teaching spaces and service areas in sustainable design, development and maintenance so that the policies applied are localities, such as the use of materials and building methods.

1. Introduction

Education is a very important thing in national life and is a strategic media in spurring the quality of human resources. This has made education the most important part for the sustainability, development and progress of a country. There are several important factors in improving the quality of a good education system, such as the quality of teaching staff, educational facilities and infrastructure, curriculum, and funding. Currently the Indonesian people are still facing challenges in terms of equity in the field of education as well as repair and improvement of educational infrastructure. By improving educational facilities and infrastructure, it can support the realization of the fourth sustainable development goal, namely realizing quality and sustainable education.

According to the Big Indonesian Dictionary (KBBI), evaluation refers to assessment. Evaluation according to Mulyono, (2009) is an effort to measure the results or impact of an activity, program or project by comparing it with the goals that have been set, and how they are achieved.

The definition of a building according to the Ministry of Settlements and Regional Infrastructure (2002) is: A building that functions as a place for humans to carry out their activities for residential or living activities, business activities, social activities, cultural activities and or special activities. According to the Minister of National Education Regulation no. 24 of 2007 concerning standard facilities and infrastructure for SD / Madrasah Ibtidaiyah, SMP / Madrasah Tsanawiyah and SMA / Madrasah Aliyah are: Buildings that are partly or wholly on land, which function as a place to conduct learning in formal education. So what is meant by the evaluation of the Technical Performance of Basic Education Buildings is a measure that is the basis for assessing the results achieved and the workability of a building where formal learning is based on skills, experience, seriousness and time which is done technically.

This study aims to determine the feasibility level of the technical performance standards of basic education buildings in Indonesia based on the guidelines for school building design in Southeast Asia required by UNESCO.
2. Technical Performance of Building
The basic education building is one of the physical buildings that has an important role in supporting teaching and learning activities. Over time, physically, the building performance will certainly decline.

Performance is often equated with performance which means work results or work performance. Whereas performance has a broader meaning, not only as a result of work, but also how the work process takes place. Performance is the result of work that has a strong relationship with the organization's strategic goals, customer satisfaction and makes an economic contribution (Wibowo, 2007). Building performance [2] is a criterion related to the engineering, process, or aesthetics of a building that usually reveals, in a measurable way, how well a building meets performance requirements. Technical performance in a building can be realized well, if the building is designed and built with due observance to the standards or technical requirements of a predetermined building. This paper discusses the existing education building standards in Indonesia compared to the standard requirements set by Unesco for educational buildings in Southeast Asia.

3. Indonesian Education Building Standards
The educational building is one of the educational facilities and infrastructure factors that have an important role in the learning process. In order to achieve the same learning objectives throughout Indonesia, educational buildings in Indonesia must follow the national education building standards that have been compiled by the Ministry of Education and Culture. Educational building technical standards are used as a reference in planning and procuring educational buildings in accordance with their function in supporting the learning process.

The technical standards for educational buildings used are those for junior high school education buildings, [1], consisting of:
- Type of school buildings for SMP are grouped into 3 types, type A, type B and type C

| TYPE | LAND AREA (M2) | LEVEL |
|------|----------------|-------|
| A    | 15000          | 1 floor |
|      | 12000          | 2 floor |
|      | 9000           | 3 floor |
| A1   | 15000          | 1 floor |
|      | 12000          | 2 floor |
|      | 9000           | 3 floor |
| A2   | 12000          | 1 floor |
|      | 9000           | 2 floor |
|      | 7000           | 3 floor |
| B    | 12000          | 1 floor |
|      | 9000           | 2 floor |
|      | 7000           | 3 floor |
| B1   | 9000           | 1 floor |
|      | 7000           | 2 floor |
| B2   | 9000           | 1 floor |
|      | 7000           | 2 floor |
| C    | 7000           | 1 floor |
| C1   | 6000           | 1 floor |
| C2   | 4000           | 1 floor |

- Study room dimensions are based on the results of the analysis of room capacity (classrooms, science laboratories, computer laboratories, language laboratories, skills rooms, art rooms.)
### Table 2 Space area analysis

| ROOM                        | ANALYSIS                             | DIMENSION |
|-----------------------------|--------------------------------------|-----------|
| 1 Classroom                 | Standard 1.6 m²/student               | 7 mx 9m   |
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 1.6 m² = 64 - 63 m² |           |
| 2 Science Laboratory        | Standard 2.4 m²/student               | 8 m x 15 m|
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 2.4 m² = 96 m²|
|                             | Teacher room, St 24 m²               |           |
|                             | Total 96+24=120 m²                   |           |
| 3 Computer Laboratory      | Standard 2.4 m²/student               | 8 mx 12 m |
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 2.4 m² = 96 m²|
| 4 Language Laboratory      | Standard 2.4 m²/student               | 8 mx 15 m |
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 2.4 m² = 96 m²|
|                             | Teacher room, St 24 m²               |           |
|                             | Total 96+24=120 m²                   |           |
| 5 Skills room               | Standard 2.4 m²/student               | 8 mx 15 m |
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 2.4 m² = 96 m²|
|                             | Teacher room, St 24 m²               |           |
|                             | Total 96+24=120 m²                   |           |
| 6 Art room                  | Standard 2.4 m²/student               | 8 mx 15 m |
|                             | Room Capacity 40 students            |           |
|                             | Space area 40 students x 2.4 m² = 96 m²|
|                             | Teacher room, St 24 m²               |           |
|                             | Total 96+24=120 m²                   |           |

- The arrangement of the school site discusses the minimum site area, site shape, open space, zoning, orientation to the sun and wind, the relationship and distance between buildings, ease of achievement and development plans.
- Arrangement of school buildings regarding technical requirements, requirements for spatial relations, requirements for lighting and ventilation, noise / acoustic control, building installations and utilities, security and safety, comfort, space requirements, and building structure and construction.
- Structuring the infrastructure, is the infrastructure for the school environment to complement the school building so that the school environment is safe, comfortable and healthy.

4. **UNESCO Guidelines**
United Nations Educational, Scientific, and Cultural Organization (UNESCO) is an international organization that deals with education, science, and culture under the United Nations (UN). UNESCO
has a guideline in planning the construction of secondary school buildings in Asia. Basic education building standards based on the UNESCO guidelines used in this paper include [13]: at Figure 1 illustrates, there are 7 contents of the UNESCO guidelines:

1. Educational Background
2. Educational plan
3. Education Brief
4. Environment
5. Teaching Spaces
6. Service area
7. Synthesis

![Figure 1 Contents of UNESCO Guidelines](image1)

Of the seven items, this paper will discuss the environment, teaching spaces, and service areas, because these three items relate to the physical building.

![Figure 2 Classification of Climates](image2)

Climate has an important role in building performance and energy consumption. The process to identify, understand, and regulate the influence of climate on a building is the most important aspect in designing a building [8]. A good building design must pay attention to the local climatic conditions where the building is located [17]. In Figure 2 Classification of climates [13], UNESCO shows that Indonesia is in an equatorial area with cooler uplands characteristics, the temperature depends on the altitude of the land, which has varying rainfall based on wind patterns and topography. So that in comparison in this study using the requirements for the climate of the equatorial area.
5. Technical Performance Evaluation of Primary Education Buildings Based on Unesco Guidelines

This study uses a comparative case study approach. A case study comparative research approach according to Neuman [12] is comparative research in which researchers compare one or two specific cultures in depth. By examining in-depth on several cases, or just one case. This study was chosen to evaluate the technical performance of junior high school educational buildings in Bali province with UNESCO guidelines. Because Bali is the main tourist destination in Indonesia, schools in Bali can represent the condition of schools in Indonesia. The criteria for selecting locations in Bali, because Bali is the main tourist destination in Indonesia, schools in Bali can represent the condition of schools in Indonesia.

The method of collecting data is by conducting visual observations directly to the school which is the research review by taking photos, interviews with the school, and collecting data which is recorded documentation from the related school. The secondary school building which is the case study is the building of the public junior high school (SMPN) in Bali province, which consists of:

- SMPN 4 Mendoyo, Jembrana, Bali
- SMPN 5 Melaya, Jembrana, Bali
- SMPN 5 Pupuan, Tabanan, Bali
- SMPN 5 Bangli, Bangli, Bali
- SMPN 5 Kubutambahan, Buleleng, Bali
- SMPN 5 Busungbiu, Buleleng, Bali.

5.1. Case study data

The data on educational buildings used as case studies are in table 3 and table 4. Table 3 contains the size of the school area, the number of students and teachers, the number and size of study rooms and the number of toilets in these schools.

| No | SCHOOL NAME | YEAR | LEVE | SITE AREA | STUDENT | TEACHERS | CLASSROOM TOTAL | ROOM DIMENSION | SCIENCE LAB TOTAL | ROOM DIMENSION | LIBRARY TOTAL | ROOM DIMENSION | TOILET |
|----|-------------|------|------|-----------|---------|-----------|-----------------|-----------------|-----------------|----------------|--------------|----------------|-------|
| 1  | SMPN 4 Mendoyo, Jembrana | 2002 | 1 | 3/805 | 330 | 33 | 15 | 7 m x 5 m | 1 | 6 x 15 | 1 | 8 | 12 |
| 2  | SMPN 5 Melaya, Jembrana | 2003 | 1 | 9500 | 130 | 13 | 11 | 7 m x 9 m | 1 | 5.75 x 12 | 1 | 8 | 10 |
| 3  | SMPN 5 Pupuan, Tabanan | 2007 | 1 | 2309 | 190 | 19 | 9 | 6 m x 9 m | 1 | 6 x 15 | 1 | 8 | 9 |
| 4  | SMPN 5 Bangli, Bangli | 2011 | 1 | 3800 | 280 | 28 | 13 | 6 m x 9 m | 1 | 8 x 15 | 1 | 7 | 11 |
| 5  | SMPN 5 Kubutambahan, Buleleng | 2007 | 1 | 6200 | 190 | 19 | 6 | 7 m x 9 m | 1 | 10 x 25 | 1 | 9 | 9 |
| 6  | SMPN 5 Busungbiu, Buleleng | 2007 | 1 | 2000 | 85 | 8 | 5 | 7 m x 9 m | 1 | 10 x 25 | 1 | 10 | 10 |

Meanwhile, table 4 contains the site plan images and photos of the buildings and school classrooms which are used as case studies.
Table 4 Image data of SMPN 4 Mendoyo, SMPN 5 Melaya, SMPN 5 Pupuan, SMPN 5 Bangli, SMPN 5 Kubutambahan and SMPN 5 Busungbiu in Bali province

| NO | SCHOOL NAME                                  | SITE PLAN | BLOCK PLAN | FOTO               |
|----|---------------------------------------------|-----------|------------|--------------------|
|    | SMPN 4 Mendoyo,                           |           |            |                    |
|    | SMPN 5 Melaya,                            |           |            |                    |
|    | SMPN 5 Pupuan,                            |           |            |                    |
|    | SMPN 5 Bangli,                            |           |            |                    |
|    | SMPN 5 Kubutambahan,                      |           |            |                    |
|    | SMPN 5 Busungbiu,                         |           |            |                    |

5.2. Environment
In the environment there are 5 discussions:
- **Thermal Comfort** which has a rating criteria of
  - Orientation; The orientation of buildings in Indonesia faces north and south. This is applied to avoid direct sunlight during the learning process. The method of calculating school is the total mass of buildings that have faces according to UNESCO standards divided by the total mass of buildings in the school which is then multiplied by 100%. After calculating all schools, the average orientation percentage of the 6 schools was calculated.
  - Rain; Calculated based on the use of a noise-free roof covering material, in almost the same way as calculating the orientation. The total mass of a building using a silent roof covering is divided by the total mass of the building, which is then multiplied by 100%. After obtaining calculations from all schools, the average percentage of silent roof coverings from the 6 schools was calculated.
  - Ventilation; Calculations based on the presence of cross ventilation in learning spaces. In this way, the total mass of the building that has cross ventilation is divided by the total mass of the building which is then multiplied by 100%. After calculating all schools, the average percentage of the building mass that has cross ventilation is calculated from the 6 schools.
- **Site planting**, the criteria for the site planting are a function of the plants in the school. Having a counting method by looking at table 2, the percentage of plants that have the same function (cooling / protective / visual function) of all plants on the school land. Which then calculates the average percentage based on each function.
- Cooling function; Less heat gain on building site and give more fresh air
- Protective function; Protective function from dust and noise reduction (external noise from outside building site)
- Visual function; visual function from sun too bright and glare reduction

**Table 5 Environment**

| Environment | Thermo Comfort | 70.44% |
|-------------|----------------|--------|
| A Orientation | NORTH/SOUTH | 67% | 50% | 0% | 40% | 0% | 0% |
| 1 Orientation | 6 from building + ok | 5 from building + ok | 2 from building + ok |
| B Rain | 85% | 100% | 100% | 100% | 11% | 100% |
| 2 Protective function | ok | ok | ok | ok | 1 from building + ok | ok |
| C Ventilation | 100% | 100% | 100% | 100% | 100% | 100% |
| 3 Visual function | ok | ok | ok | ok | ok | ok |

- **Acoustic**, this noise control is carried out so that oral communication in the room can take place naturally without other sound disturbances. Assessment on acoustics is a school effort to reduce noise that comes from outside and in the classroom.
- Outdoor; Avoid noise by placing the study room away from noise (100-300 meters from noise sources), for example 300 meters from the workshop. Placing supporting buildings (such as canteens, toilets, warehouses) and trees between the study room and noise sources. The method of calculation is the number of efforts already made to avoid noise divided by the number of noise sources and then multiplied by 100%. Then the mean was taken from 6 case studies of school buildings.

- Indoor; avoid the noise that occurs in the study room. The first is the walls between the classrooms to the ceiling, the walls that act as a barrier, a blackboard on the side of the first classroom, and the side of the wall in the other class where the students sit. The second way, the dividing wall between classrooms is 2 meters high, but behind the two sides of the wall is the teacher’s teaching area. Whereas the last one is the dividing wall between the two classes which has a height of 2.4 meters. The side of the wall of each class is a student sitting room that has a student seat 2 meters from the wall. The calculation method is, the number of efforts that have been made (according to the explanation above) divided by the number of noise sources which is then multiplied by the number 100%. Once obtained in each school, then the average is carried out.

- Opening, the criteria for calculating the opening based on the function of each of these openings.
  - Illumination function, the calculation method is the area of the opening of 1/8 of the floor area.
  - Ventilation function, has openings facing the northeast / southwest, so it has good air circulation.
  - Protective function, protects the inner space from solar radiation, rain and dust. The assessment criteria, opening using a window with a side hinged system, top hinged, sliding window, louvres / grilles. As well as using shading devices.

- Earthquakes, Indonesia is one of the countries where earthquakes occur frequently, so it is recommended that buildings be built that are not dangerous during an earthquake. Namely by building in small rectangular blocks (not L or U shaped), anchorage of panels of stone, brick or mud, light covering and well framed roofs. The calculation method is to add up the buildings built according to the criteria above, then divided by the total number of existing buildings then multiplied by 100%.

### Table 6 Teaching spaces

| No | Criteria          | SMPN 4 MENDOYO | SMPN 5 MELAYA | SMPN 5 PUPUAN | SMPN 5 BANGLU | SMPN 5 KUBUTAMBAHAN | SMPN 5 BUSUNGBIU | Conclusion |
|----|-------------------|----------------|---------------|---------------|---------------|----------------------|------------------|------------|
| 1  | Classroom         | Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | 100%       |
|    | Kapasitas 42 siswa| 2,4 m²/student | 3,15 m² | 1,97 m²/student | 2,96 m²/student | 2,96 m²/student | 2,5 m²/student |             |
| 2  | Science Laboratory| Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | 100%       |
|    | Dimension         | 2,4 m²/student | 1,83 m² | 1,83 m² | 1,83 m² | 1,83 m² | 1,83 m² |             |
| 3  | Libraries         | Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | Kemdikbud standard | Existing UNESCO | 85.33%     |
|    | Dimension         | 2,15 m²/student | 1,83 m² | 1,83 m² | 1,83 m² | 1,83 m² | 1,83 m² |             |
|    | TOTAL FOR TEACHING SPACE AREA | 120 m² | 88 m² | 372 m² | 1,065 m² | 818 m² | 877 m² |             |

5.3. Teaching spaces
Teaching spaces are spaces for the learning process with or without the teacher. Consists of:
- Classroom [1] is a place where teachers teach, train and foster students. The method of calculating the evaluation is based on space requirements per student, namely the area of the classroom divided by the number of students.
- Laboratory room [1] is a place of learning, demonstration and practice of science / natural knowledge. The method of calculating the evaluation is based on space requirements per student, namely the laboratory area divided by the number of students.
- The library room [1] is a place to assist students in obtaining knowledge through books and printed media as well as non-books, including audio-video. The method of calculating the evaluation is based on space requirements per student, namely the area of the library space divided by the number of students.

### Table 7 Service Area

| NO | CRITERIA | SMPN 4 MENDOYO | SMPN 5 SAMALA | SMPN 5 PLUPAN | SMPN 5 KUNUTAMBAN | SMPN 5 BUSANGSU | CONCLUSION |
|----|----------|----------------|---------------|---------------|-------------------|-----------------|------------|
| 1  | Office   | Existing Data  |
|    |          | Teaching Space Area | UNESCO | Guidelines | Existing Data  |
|    |          | Existing Data  |
|    |          | Teaching Space Area | UNESCO | Guidelines | Existing Data  |
|    |          | Teaching Space Area | UNESCO | Guidelines | Existing Data  |
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|    |          | Teaching Space Area | UNESCO | Guidelines | Existing Data  |
5.5.1. Environment

In figure 2, the level of environmental conformity in SMPN buildings in Bali with UNESCO standards is 68.19%. Environment has five aspects of discussion, namely thermal comfort, site planting, acoustic, opening and earthquakes-design factors.

- **Thermal comfort**, The definition of thermal comfort based on the British Standard BS EN ISO 7730 / ISO 7730 1994 in the book Architecture and thermal comfort [8] is a state of mind that expresses satisfaction with the thermal environment. Empirical studies show that thermal comfort, which is one of the main parameters of indoor environmental quality, affects student performance [15,20]. The state of mind means that comfort is a psychological phenomenon, which depends on the state of the surrounding environment. Unstable thermal conditions will interfere with student performance in the learning process [6]. UNESCO's thermal comfort criteria for equatorial areas are building orientation, rainfall, and ventilation. The orientation of the building has a very important role in daylighting design. The caused by the position of the light source (sun) which has an orbit. Indonesia is a country located in an equatorial area that receives relatively stable sunlight throughout the year [11]. Likewise, the orientation of the building affects the height and low temperature of the air in the room [9]. The criteria for rainfall is the use of roof covering material in school buildings, with the factor that the roof covering material is heavy and does not cause noise. The roof cover is the top waterproof layer on the roof construction [4]. The roof is the main as the first barrier to rain. In tropical countries / equatorial areas, the rainfall is high, it can reach 4000 mm / year [8]. Cross ventilation is much more significant in tropical climate than in temperate climates because it moves air into space through it. The movement of air produces a thermal effect, even without a change in air temperature. Air movement is the basic principle for heat transfer in buildings [8]. Ventilation is the third parameter in achieving thermal comfort. Thermal comfort has a UNESCO standard compliance rate of 70.44%, with criteria below 50% at 26% building orientation. This condition is due to land limitations, overcrowded building mass on school sites and oriented to the main road in front of the school.

- **Site Planting**; The second discussion of the environment is about site planting. Green/site planting is an area design component, which is not only formed as additional elements or residual elements after the architectural design process is completed, but is also created as an integral part of a wider environment [7]. Green area planning in the school environment cannot be separated from the vegetation elements used, by making green spaces can be used as a means of playing for students. Vegetation can reduce noise, dust, air pollution, and visual pollution [11]. Indonesia, which is a location in an equatorial area, has abundant sunlight, which sometimes disturbs the eye. The reason is vegetation functions as a reducer of solar lighting.
entering the building which is the third function. The criteria for the site planting in the UNESCO guideline are a function of the vegetation planted on the school grounds. The site planting in 6 school buildings in Bali has the lowest suitability level in the environment of UNESCO standards, namely 43.33%. Caused by the land is limited, the school site has more pavements, the building mass is too dense so there is no land to plant crops.

- **Acoustic;** Acoustics are one of the requirements that must be considered in the environment of a school. This is because, in order for oral communication between the teacher and the student in the room to take place reasonably without any other noise disturbances. The results showed that poor acoustic environments had a negative influence on teacher teaching, learning, and health. Under UNESCO guidelines the acoustics to be considered are acoustics outside and inside the school room. There are two alternatives in trying to reduce outdoor noise, namely by applying the distance of the building to the noise source /highway and buffering. Acoustics in 6 school buildings in Bali have a level of compliance with UNESCO standards, which is 77.5%. The second alternative is to reduce noise for indoors, walls between classes are made full to the ceiling as well as put a whiteboard in one class and in another class behind the wall of the board is the student bench, this criterion applied to 6 case study school buildings.

- **Openings;** Discussion of openings based on the function of these openings to buildings. The value of compliance with UNESCO standards is 77.99%. First, the illumination function is calculated based on the size of the opening in a room, according to UNESCO, it is 1/8 or 13% of the floor area of the room. The second opening has a function as natural ventilation. Natural Ventilation System [5] presents specificities that need to be considered in its design, which is influenced by building location, building type, and dominant wind. The window type and its position on the façade are key to the design. Classroom ventilation is defined as an important element of indoor air quality and thermal comfort [21]. Six SMPN schools in Bali province have openings between 15.2% -16.7%. The classrooms have adequate lighting, not excessive. The last function of this opening is as a protective function from rain, dust, and from heat, and sunlight. From 6 schools according to the opening requirements. Meanwhile, the shading devices used in school buildings are in the form of a canopy, while with the lattice model no one uses it.

- **Earthquakes-Design Factors;** Earthquakes are common in Indonesia, therefore one of the factors that should be considered in designing buildings. Earthquakes have a conformity rate of 72% of UNESCO standards. On the criteria of light roof cover has the smallest percentage value of 15%. This is because 5 schools use roof covering material from roof tiles, which is a local material that is widely found in Bali.

5.5.2. **Teaching spaces**
In teaching spaces, a discussion of the dimension requirements of learning spaces such as classrooms, laboratories and libraries is in table 4 of the teaching spaces comparison. In figure 2, it can be seen that the teaching spaces chart is the highest conformity graph compared to the environment and service area which is 94.44%. Classrooms and science labs have a larger area of space than UNESCO standards. Classroom has a function as a place of learning with or without teachers. While the function of science laboratory room as a place of science learning with practice activities and science demonstrations with special equipment[ 1].

The library room is a place to assist students in obtaining information, knowledge through books and print media as well as non-books, such as audio-video. For library space, there is only one school that does not comply with UNESCO standards. The size of the library like the classroom is due to the limited school land.

5.5.3. **Service Area**
The service area aspect in 6 junior high school buildings in Bali has the lowest level of conformity with UNESCO standards (in Figure 2), namely 54.17% consisting of office space and toilets. Office space
(Facilities for school management-Administrative Offices) in question is rooms for school management including rooms for school principals. The area suggested for management activity is approximately 5% of the teaching space [14]. Office space has a conformity level of 83.33%, it is one school that does not reach the standard. Meanwhile, toilets have the lowest level of compliance with UNESCO standards, namely 25%. This is because toilets are not the main means of an educational building, so they are neglected. Also, building a toilet requires a higher cost compared to other spaces.

6. Conclusion
The technical performance for teaching spaces in educational buildings in Bali has a good and decent performance, because it is in accordance with UNESCO standards, while the technical performance for the environment must be further improved in line with UNESCO standards, and especially technical performance for service areas.

6.1. Implications for planning and designing school buildings
- Land conditions do not provide an alternative in determining the building orientation, so the orientation of the openings to the entry of sunlight and air into the room is a consideration in designing.
- The size of the room is according to the standard, if the land is limited, the room can be built vertically, into two floors.
- The challenge in choosing a roof covering material that is lightweight but does not cause noise when it rains.
- The importance of fulfilment the number of toilets according to standards, so that school buildings are more comfortable for users.
- On limited land, an area for plants is still provided which functions as a protection for the school building from dust, reduce noise from outside the location and dampens sunlight entering the room, so that it is not too bright and does not interfere with the view because to glare.

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