Establishing sustainable habits of students in Green School Bali through green interior design

N N Alimin¹, E G Pertiwi ² and L Purwaningrum¹

¹Interior Design, Faculty of Arts and Design, Sebelas Maret University, Jl. Ir sutami No. 36 A (57126), Surakarta, Indonesia.
²Visual Communication Design, Faculty of Industrial Technology and Informatics, Telkom Purwokerto Institute of Technology, Jl. D.I. Panjaitan No. 128, Purwokerto, Indonesia.

Corresponding author: nurhayatunufut@staff.uns.ac.id

Abstract. Adopting the green concept for building as a place for human activities will be proved a sustainable environment. However, caring about the environment through habit in the early stage of human life is valuable. This study aims to find how green building school encourages students to be aware of their environment; and know the application of the green concept in their school. This research uses the green design and the habitus theory to explore how habits can be formed deliberately and how the actors in the school can create communities that are aware of the environment. It showed that the sustainable architecture and eco-environment encourage the user to be familiar with the environmental concept. Those were applying sustainable materials like bamboo to construct the building; utilization of solar energy and biogas as electricity; recycling animal waste into fertilizer; windmills through underground tunnels as air conditioners; and organic gardening. The green concept in the school creates a green environment and encourages students to establish green concepts in their minds.

1. Introduction

Based on U.S. Energy Information Administration, Total energy production in Indonesia reached ninth place in the World with 16.062 quadrillion Btu in 2018, under eight other countries, most of which developed countries such as the U.S and China [1]. Indonesian people need to find a solution to reduce the use of energy. Therefore, they need to educate people to understand the situation and start applying the sustainable environment in every aspect.

Indonesian need a tangible form of implementing the mandate of the United Nations Framework Convention on Climate Change (UNFCCC), especially in Article 6 relating to the importance of the role of each component of society to participate in providing education and spreading awareness to the public about climate change (UNFCCC, 1992), this is necessary disseminated to the younger generation [2]. Therefore, awareness of the environment needs to introduce early in the school environment.

Public green building education is essential for some reasons. First, people are life-long building consumers, and occupants within buildings can be crucial agents of change for resource conservation measures such as energy efficiency and material recycling [3]. In Indonesia, people need to realize that...
they need to start implementing a healthy life and concern for the environment. Green school is one of the best solutions to educate people through education. A famous school in Bali, Indonesia, is very concerned with this issue called Green School Bali. Therefore Indonesia's people need to learn from this school about sustainable habits through its building design and curriculum.

Green school is located in Badung city, Bali, Indonesia. This school is under the Kul-Kul foundation, which concentrates on using sustainable energy. The primary aim is to create awareness in students and the community's concern for the environment through this school. It is concentrated with the ecological principle ideals to focus on human behavior. It applies the green concept whose vision is to create a generation conscious of the environment and sustainable futures. It has specific curricula that focus on the green concept, so all aspects of the school are based on the green concept and sustainability, including the architecture, interior, and all product design in this school. This research discusses how design provides an ideal picture of thought. The buildings on this school use an environment-friendly green concept consisting of local ingredients and an open form design, and a few insulations.

Through this research, design becomes a place to educate users, in this case, students at green schools in Bali, on green design missions. Indeed, lately, designers are intensively popularizing the issue of environmental impact in their work. Twenty years ago, Victor Papanek argued convincingly that designers, in a position of power, could help create a better world or contribute further to the destruction of planet Earth. The idea is that designers must reject designs that are considered obsolete; that only consumer needs, and their wants, should be addressed; and that designers should try to find ways to use their abilities to be socially helpful [4].

Because the design profession is directly related to society and everyday life, the design products are indirectly used to influence people's lives and shape their behavior. In practice, they are expected to demonstrate proper ethics. The design must respond to the environment; it is necessary to consider the natural resources that affect human beings in the future. One of the most critical aspects of this approach is the idea of sustainability, which according to the World Commission on Environment and Development is "must take into account the needs of the present without compromising the ability of future generations to meet their own needs [4]. It is a new dimension in the ethics of the interior design profession that is developing.

Residential interior architecture involves creating a relationship between the "insides" and "outsides" together with the "human being." The different lifestyles of occupants have a direct impact on the environment. Thus, creating sustainable residential spaces requires serious design thinking. Aiming to collaborate with the natural physical conditions and wisely chosen materials to create self-sufficient residential spaces [5]. Recently, the designing house also considers the environment; it is called "Residential design" according to Nazmy Residential design aspects is aesthetic, functional, and sustainable—sustainability including social, environmental, and economical [6].

Architecture and interior architecture designers should maintain the identity of peoples and communities and respect their daily routine of life. The appropriate implementation of design aims to achieve the present needs of users and make it suitable for future generations." People feel comfortable in places that are concurrent with their place identities. Moreover, by reflecting true cultural identities, the designer can participate in the sustainability of cultural values [7]. This research will describe green interior design and curricula in Green School Bali becomes the solution to introduce awareness of the environment.

2. Methods
This research uses a qualitative method where the data collection method is obtained through field observations, interviews using recordings, and documenting anything encountered in the field through cameras. Meanwhile, this research's data analysis uses the green design analysis of the Papanek concept and the habitus of Bourdie humans involved in it.

Previously, there had been researched discussing green building design at green schools in Bali; the six Green Building criteria applied to the Green School Bali buildings had met Land Use, Energy
Conservation, Water Conservation, Use of environmentally friendly materials, Air quality, open building design, and Building environment management [8]. Meanwhile, in this study, we will discuss several other aspects of ecology design that have not been discussed previously related to interior design problems and products used in schools as a whole. Papanek explained, in ecology design, it is necessary to prioritize good planning comprehensively by considering several energy-efficient aspects, such as lighting systems, ventilation systems, selection of safe materials, environmentally friendly production processes, product packaging processes, product finishing, production transportation, and waste industry [4].

In this study, first, we will discuss architectural and interior designs that affect the attitudes and behavior of school residents in several school rooms according to Papanek's theory. Then the second one will discuss the learning programs implanted in this green school, including the subjects, regulations, and policies that are implanted in the school. Through the sociology theory by Pierre Bourdieu on habitus, that is how habits can be formed deliberately and how the actors in the school can create communities that are aware of the environment.

3. Results

3.1. Design in Green School Bali
The interior design consists of two parts: aesthetics related to beauty and systems related to the fulfillment of the functions of the space in it, including its relation to lighting, ventilation, and others. The main goal is to provide solutions to the occupants of the space in it so that they can get the desired atmosphere, but lately, the issue of global warming has also touched on the designer profession, a designer is responsible for the products created related to material selection, use, and waste generated. So that one more important aspect that needs to be considered in interior design is the sustainability aspect.

A building design must prioritize good planning comprehensively, which does not damage nature but can blend with nature itself. In Papanek, it was stated that natural resource conservation planning must be considered in a good design, including the use of lighting efficiently with the maximum use of natural lighting in the room [4]. The use of natural light can be done directly or reflected into the room. It can be done by maximizing the opening, using clear glass so that sunlight can get in maximally, skylights, and reducing the sun's glare by using lattices and various forms of shading. Maximizing this natural light can form an effort to save energy with a proper analysis of the area of the room, the function of the room, and the use of space.

Apart from lighting, the ventilation system is also part of the effort to conserve natural resources. Natural ventilation can also be used optimally in space design in order to save energy. An efficient artificial ventilation technique to create thermal comfort in the room is a cross-ventilation system [4]. This system is considered adequate to create comfortable ventilation in buildings located in tropical areas such as Indonesia.

Several examples of designs think about environmental ethics in both the process and the design results. As we can see, Green School - Kul-Kul Campus Bali, located in Sibang Kaja village, is the only school in the world whose buildings are made of environmentally friendly bamboo. This school has been open since 2008. The air conditioning no longer uses air conditioning but a windmill through an underground tunnel. The electric power uses bio-gas made from animal waste to light the stove.

Green School Bali has a unique interior architectural concept; it only uses bamboo to make buildings (Figure 1). Some of the buildings using thatched roofs almost have no bulkheads, separating the outer and inner spaces because they do not have entire closed but open walls, so they look very integrated with nature.

The building is applied with an open building design. There are windmills in underground tunnels, water infiltration in green open spaces, and environmentally friendly toilets. The green school also uses environmentally friendly materials such as petung bamboo, volcanic stone, and clay. This open
design of the building causes good air circulation. Starting from the prohibition of vehicles in the building area and providing open space for various outdoor learning activities [8].

The architectural and interior design uses bamboo as a whole. It always reminds people who see it to be at one with nature. Looking at Bali’s green school building design, it has implemented an excellent lighting and ventilation system. It can be seen from the design of the building, which does not use walls fully but is an open space that blends with nature; the building only consists of pillars, floors, and roofs. So that light and air can enter freely into the room in the building. The school also uses solar panels as the first source of energy.

![Green School Bali classroom](image)

**Figure 1.** Green School Bali classroom

In addition to the overall interior design planning mentioned above, Papanek adds that the production process of environmentally ethical design products is also essential. It is the manufacturer's responsibility to the interior product designer as the design and material planner. Product planning is related to selecting safe materials, environmentally friendly production processes, product packaging processes, product finishing, production transportation, and industrial waste [4]. People can also see the design products at Green School Bali; they use bamboo for their furniture, including tables, chairs, and props.

Green School Bali has implemented all of its products and is even very integrated with nature and environmentally friendly; they are accustomed to recycling, using existing materials, and converting them into other products. Examples of interior design elements that are pretty interesting are ropes and fabrics that are used as elements to decorate the room, which are very interesting accentuations in the middle of the room. In addition, there is also a collection of plastic that is converted into other decorative products in the form of attractive installations.

![Exhibition hall in Green School Bali](image)

**Figure 2.** Exhibition hall in Green School Bali

As Papanek has pointed out, interior materials are also essential in interior design. The use of suitable materials and environmentally friendly finishing has a significant impact on the health of its residents [4]. Using environmentally friendly materials such as natural materials is an essential aspect of safe finishing raw materials. However, natural materials will no longer be the right choice when designers only exploit materials that exist in nature without reforestation and conservation efforts. If this happens, then what happens is only environmental destruction under the pretext of making environmentally friendly buildings. In selecting materials, a designer does not just choose; the use of
certified eco-materials and legal materials is one way a designer can eradicate illegal logging and environmental destruction.

The bamboo material was chosen because of the abundance of these raw materials built around the school. In addition, the life cycle of bamboo is relatively fast and easy when compared to wood. The construction adapts to the contours of the land and plants, not the plants that have to match the building. The construction of this school did not cut down any trees on the land. The building adapts to the existing trees without having to cut or move them.

One of the giant classrooms serves as an exhibition space to display students' works; their works also use recycled leftover materials. In the center of the room, there is an installation of patchwork decoration that accentuates the room. Then there is another interesting thing, namely on several bamboo poles written the names of important people in the realization of this school building and the names of the school's alumni. It adds meaning to the room; a pillar makes it valuable when an accent and meaning are added. The interior design is exciting, filled with second-hand decorations. The most exciting thing about this school is its curriculum related to the sustainability of nature and its understanding of nature. All product designs in its class come from nature, such as bamboo and stone.

Another thing that is also interesting about this green schoolroom design is in the hall (performance room), which is designed to be open without any walls, but only covered with or consisting of an arrangement of bamboo, and thatch is added at the top (Figure 2 and Figure 3). It gives a sound effect that reverberates in the room, so there is no need to add it with loudspeakers when holding a show.

![Figure 3](image.jpg) Exhibition hall and staging room in Green School Bali

Then there is also a toilet which is quite eye-catching there, all the walls are still made of bamboo, and the unique thing is that they use soil to clean dirt instead of water (Figure 4). It is one solution to reduce water use; in fact, the dirt can be used as fertilizer or biogas too, so that nothing is wasted, everything can be used, this is following the principle of zero waste. Exciting additions are hand washing basins made of stone and old tires and soap bottles made of natural stone.

![Figure 4](image.jpg) Toilet and sink

Overall, the interior design applied at the Green School Bali has implemented excellent ecological principles. The room fulfills system functions ranging from lighting, air conditioning, and acoustics, energy-efficient and at one with nature. Meanwhile, in terms of aesthetics, it is also fascinating because of some unusual and unique shapes that have adapted to natural forms that are organic and not
rigid. In addition, there is an additional meaning from the room by writing names on bamboo poles as an element of decoration and providing values such as memory to make it more valuable.

Designers should also think about environmental ethics as part of design planning. The following are some basic principles from Naess explaining five important basic principles why the application of environmental ethics in interior design work is so important. The first principle, biospheric egalitarianism, states that all creatures have the same position in nature so that forms of life have their uniqueness, including humans, precisely to enrich not to dominate others, let alone exploit and destroy whatever they do [8]. In connection with this principle, as part of nature, designers should remain aware of their existence in coexistence with various other natural communities that also have the right to develop. Second, humans must participate in planning nature to maintain harmony; humans must participate following ecological wisdom [8].

Regarding design planning, designers play a wise role in integrating user interests with natural and environmental conditions. Third, humans must realize themselves by developing their potential in an ecological environment [8]. For designers, this can mean self-expression can be done through creativity in and concerning the ecological environment. Fourth, a mutually beneficial symbiotic relationship between humans and nature, humans have the right to meet their needs with nature, and vice versa [8]. Designers have the right and are required to utilize the potential of natural resources available strategically that can be profitable and maintain nature conservation. Fifth, changing both as individuals and as a community as an ecopolitics movement [8]. Here we need a policy in principle that is deemed necessary related to the environment with input from various parties.

Interior and building designs that apply the green design concept will influence the users of the room, as written in the experimental research conducted by Karsli that when he applied the interior design studio with the green design concept, it could affect the people in it as much as 87.5% that they will apply sustainable design method during their personal life [6]. A design with a powerful green design principle will make students indirectly behave following the design of the room they occupy.

3.2. Establishing a habit in Green School Bali

Habitus is a Latin word that refers to a typical or habitual condition, setting, or situation, especially in the body [9]. Habitus is symbolized in authentic human nature. Its embodiment has three meanings in Bourdieu's work. First, in trivial reasoning, the habitus exists only as long as it exists 'in the head' of the actor (and the head is part of the body). Habitus cannot be separated from the body; it automatically becomes a habit even in the mind. Second, habitus exists only in, through, and is caused by the praxis of actors and the interactions between them and the environment surrounding them: the way of speaking, the way of moving, and making things.

Regarding the way of acting, unconsciously, it has been carried away and has become an unavoidable habit of becoming a sign and characteristic for a person. In this case, empathic habitus is not an abstract and idealistic concept. It is manifested in behavior and is an integral part of it (and vice versa). It has become one in one's body and soul. Third, the 'practical taxonomy' discussed in Chapter Two, which lies at the heart of the generative schema of the habitus, is rooted in the body. Male/female, front/back, up/down, hot/cold, these things are accessible to the five senses – in terms of reasoning and rooted in sensory experience – from the person's point of view, which symbolizes [10]. Things that have become commonplace are obtained based on sensory experiences related to what is felt and experienced by the five senses.

So habitus can be formed by following patterns, behaviors, and experiences planned to become an unavoidable habit. When students are no longer in the box or habitual environment, the behavior of their mind while in that environment will remain embedded and will not be quickly released when he moves. It is what green schools are trying to create to shape the behavior and habits of a child who will continue to care about their environment. The habitus was obtained and deliberately created by the founders by getting used to interacting with conditions and environments that care about the environment, for example, in terms of architecture, interiors, the overall environment, then the second
based on the program created at the school, goals, vision and mission, activities at school, learning programs that support habitus who care about the environment.

The policies instilled by the founders can create a community that cares about the environment. They created a learning environment to be a friendly place. They teach students how to plant crops, use the natural ingredients on their own, and collaborate with local people to guide the environment. The mission of Green School is to build a community of learners making our world sustainable. The way is to educate for sustainability, through community-integrated, entrepreneurial learning, in a wall-less, natural environment. Our holistic, student-guided approach inspires and empowers us to be changemakers. We believe in three simple rules underlying every decision: be local, let the environment guide people, and envisage how our grandchildren will be affected by our actions. The eight respect values that guide us are Integrity, Responsibility, Empathy, Sustainability, Peace, Equity, Community, and Trust.

The curriculum applied in this school is based on green design, students are given compulsory subjects according to school standards in Indonesia, but green concept values are always inserted in each of these activities. They also have additional subjects, specifically green design, given to regular students and guest students who want to take this class. They provide opportunities for residents to be able to attend this nature school in addition to paying for it using garbage. Students are taught to plant, harvest, and manage themselves in this nature school activity, right down to their cooking. All students are provided with lunch here, which comes from the produce of their garden.

This school aims to form a new habit for its students. The habit itself is the activity that it has done repeatedly to become a character embedded in a person's behavior. In this school, students are accustomed to interacting with nature directly; they experience planting activities, processing the planted materials, to reprocessing the rest. Coupled with a design that strongly reflects environmentally friendly and energy-efficient, it will inspire students to continue this habit, even though they graduate from this school. Their mission is to nurture changemakers with a passion and a relentless commitment to sustaining our world. We believe each one of our students has a unique potential to affect change and make a difference, whether that is through starting their permaculture farms, setting off a global movement to ban plastic, advocating for climate change right out of college, or following their passion for pursuing a university degree. Meet some of our changemakers and hear how their ideas are shaping the world.

It is interesting to give awareness to students to respect the environment apart from building design and product design in the room; there are also signs in the school environment that always remind them to apply habits that respect the environment. It becomes close to them. Something that is done repeatedly, over time it will become used to it, then it turns into a habit which then becomes a character that cannot be separated. Here are some pictures of the signs in the Green school environment to train students' habits (Figure 5).

![Image](image_url)

**Figure 5.** Green sign/instruction to Green School Bali students

This sign looks simple, but it is pretty eye-catching. The media they use to convey information is quite interesting, such as drawn wood, a delaminating paper that provides transparent information about their vision and mission always to be remembered. They also sort waste into different categories and order waste from leftover materials in attractive shapes.
At this school, they have been taught how to grow various crops such as rice and mint leaves consumed every day; all the food available is everything they grow themselves and long-term plants such as trees. Then for wilted plants and dirt are also used as compost. So awareness of cause and effect starting from planting, consuming, and processing waste materials has been well implemented in this school. They also have a shrimp pond where they are cultivated and, at the same time, a cattle farm. Furthermore, other facilities to support schools activities are sports arenas, laboratories, and libraries. They have several practice rooms for producing compost from organic waste that has been sorted. Then, land to grow their crops, such as rice fields to grow rice and produce their rice. Also, other crops in the garden, such as corn and mint leaves. Rice packaging is converted into bags; coir bottles are made of natural stone (Figure 6).

This nature school aims to provide awareness to students to become a generation that cares and continues to take care of the environment wherever they are. It is evident from several graduates of this school who continue their studies to various parts of the world and continue to apply their green design principles and take action to care for the environment. Because most of the students are foreigners, so when they graduate, they also spread to various parts of the world. One of their alumni has contributed at a young age. Sisters Melati (17) and Isabel (15) Wijsen Valedictorian were just 10 and 12 years old in 2013 when they started Bye Bye Plastic Bags. They remember being inspired by a lesson in school about people who changed the course of history and asking themselves, ‘What can we do as children living in Bali, NOW, to make a difference?’ The answer was-Bye Bye Plastic Bags a campaign to end single-use plastic bags in Bali, which has grown into an internationally recognized movement for sustainability and youth empowerment. Then, Clover Hogan is a green changemaker, climate activist, researcher on turning anxiety into the agency, and founder of Force of Nature; she is mobilizing the emerging generation of leaders in the face of the climate crisis. She has worked alongside the world's leading authorities on sustainability within Fortune 500 companies' boardrooms and inside classrooms across the U.K. Also, Nicholas Saye only spent one year here, but it profoundly impacted his journey. He shares: "I only felt the true impact Green School Bali had on me after I left. It is where developing my interpretation of what sustainability meant to me and what my journey with sustainability would be." Today, Nicholas is studying design at I.E., University, where he could spend an exchange abroad in Mexico. In Mexico, he discovered a variety of cactus that are widely harvested, and together with some friends who shared his passion for sustainability, they have launched a line of locally-sourced wallets made of cactus bio-leather: Tumbao [11].

Higher education institutions have an essential role in sustainability. They are vital agents in the education of future leaders that will contribute to the victorious United Nations Sustainable Development Goals (SDGs) implementation. The geography of SDGs this implementation is very heterogeneous, but it is clear that higher education institutions contribute decisively to creating a mindset that facilitates the dissemination of SDGs principle [12]. So it is a crucial time for building a sustainable habit for students. Through education and design will make people familiar with the sustainable concept.

How design contributes to the habit – because every person uses this product and sees it every day, they are familiar with it, become a habit, and become principal. We can see how every detail of the design is unique and functional.

Figure 6. Gardens, recycling laboratories, and recycled products of Green School Bali
How amazing the green school makes an impact on the environment through education. Imagine every people who graduated from this school will be the leader of a sustainable environment in the future; they will share their knowledge and their concern with many people. However, it is not easy; our difficulty is still many people who do not understand this situation's urgent. Our planet is already in danger; we can see in the documentary film "An Inconvenient Truth" is a 2006 American concert/documentary film directed by Davis Guggenheim about former United States Vice President Al Gore's campaign to educate people about global warming. The film features a slide show that he has presented over 1,000 times to audiences worldwide [13]. This film changed many people, including the founder of this school, John and Cynthia Hardy. Since the film's release, An Inconvenient Truth has raised international public awareness of global warming and reenergizing the environmental movement. The documentary has also been included in science curricula in schools worldwide, which has spurred some controversy [13].

People can learn from this school to start changing and not close their eyes to this situation. Global climate will continue to undergo significant warming in response to ongoing emissions of CO2 and other greenhouse gases to the atmosphere [14]. Therefore we do not close our eyes toward this case. We need to realize that we need to start our project to reduce global warming by establishing the sustainable habit. Then, a designer needs to consider the point of sustainable design. The designer needs to think about the material, the sustainable raw material, and how the design can educate people about the environment.

Today, sustainable urban design is challenged to create positive attitudinal shifts, to change social perceptions that green buildings are not merely a trend and that sustainable architecture is a way of experiencing nature in environmental design. Practitioners need to cultivate and sustain a more robust sustainability vision through continually thinking of ways to ramp up long-term solutions for creative integration of spatial designs, systems, and materials with technological innovations purposed for the urban buildings of tomorrow [15].

Of all the efforts of Green School Bali in achieving world sustainability, almost all programs are not profit-oriented. Although tourism education and Kul-Kul farm make money, the proceeds from the business are fully used for scholarship financing. Although different from the KLH concept, which prioritizes economic profit, the Green School Bali programs can impact the economic distribution of the local community. Green School Bali has considered the social and economic impacts by involving the surrounding community, although the main focus is nature conservation [16].

Green School Bali had already applied sustainable design and sustainable curricula to familiarize the students with and understand the global warming issue and reduce it. Through the students, they make a change to the world to spread caring with the environment.

4. Conclusion
From the description above, it can be seen that all space facilities and building designs, and spaces in this Bali Green School have consistently utilized natural energy as much as possible. By not eliminating the aesthetic elements and system elements in it. Sustainable Design has been applied following lighting systems, energy-efficient ventilation, and the use of sustainable materials. Thus, people who directly interact with the design of such a building will feel familiar with everything applied. Coupled with the activities and green design curriculum implemented in this school which always involves sustainable thinking, it will undoubtedly be a good provision for students when they graduate from this school.

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