Place-based education with Teaching Green Building for ESD

A qualitative study exploring the perceptions and place-based approaches of secondary teachers with the architectural features of green buildings for teaching ESD in green schools Hanoi, Vietnam

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Abstract

This qualitative research investigates how educators in Hanoi, Vietnam, perceive and utilize place-based approaches in teaching green buildings (TGBs) to deliver education for sustainable development (ESD) lessons. The study involved twelve middle-school teachers from five green schools. Interview was the primary data collection of this research. After conducting interviews with participants, thematic analysis was employed to identify five key themes: (1) benefits, (2) limitations, (3) suggestions, (4) planning with TGBs, and (5) teaching activities with place-based education (PBE). The findings revealed that TGBs’ design patterns support their teaching and serve as a tool to foster a stronger connection with nature and the environment, ultimately enhancing pro-sustainable elements in ESD. However, these instructors encounter significant challenges rooted in Vietnamese cultural context and a lack of support from school. Teachers can implement some place-based teaching principles into their lessons, but to maximize the teaching potential of TGBs, they must place greater emphasis on the role of place within TGBs and encourage students to be more mindful when learning with TGBs.

Keywords: Place-based education, Teaching Green Buildings, Education for Sustainable Education, Architecture for teaching, Thematic Analysis
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1. Introduction

Prior to beginning my studies in Sweden, I had the opportunity to visit a green school in Vietnam. This encounter prompted me to investigate the possible educational advantages of green building elements. Unlike typical schools, where the emphasis is on indoor study and outdoor physical education, the green school I visited seemed like a mentor and resource hub for children, providing ample sustainable materials. However, I was fascinated but uncertain about the particular style of education it represented and what the notion of ESD was at the time. During my master's degree, I studied the theoretical underpinnings of Education for Sustainable Development (ESD) and the components that go with it. It is the beginning point for further investigation into this topic.

There is now a significant worldwide trend across nations toward a greater emphasis on the concept of Education for Sustainable Development (Nguyen, 2018; Olsson et al., 2016; Wiek et al., 2015). Many educational institutions have made Education for Sustainable Development (ESD) a fundamental component of their curricula, experiencing dramatic transformations to conform with this paradigm-shifting type of teaching. Green School Bali in Indonesia, Uaso Nyiro Primary School in Kenya, and the Australian International School in Singapore are notable examples of environmentally conscious educational environments that actively involve students and educators in the use of instructional resources pertaining to sustainability.

The introduction of Cole's Teaching Green Building idea in 2013 represents the awareness that green buildings can successfully transmit narratives via their design. As a result, two unique techniques arose in the field of green building education. The first method entails analyzing how the school can successfully convey the ideals of sustainable development to its pupils (Barnes, 2012; Cole & Hamilton, 2020). The second approach, on the other hand, primarily proposes that educators use green buildings as an instructional tool for promoting sustainability, but there is little research in this area aside from a study conducted by Kerlin et al. (2015) that examines teachers' perceptions of their practices within green buildings. The status of research on the use of green buildings to impart Education for Sustainable Development (ESD) is marked by a lack of comprehensive inquiry.
Furthermore, the government of Vietnam has proved its commitment to ESD via educational policies that prioritize holistic student development. Vietnamese National Curriculum 2018 included new material and methodologies with the goal of changing student behaviour (Bogiaoducdaotao, 2018). Meanwhile, several green schools, such as Genesis School, Green School in Hanoi, and Maya Village School in Phu Vien, have emerged in Vietnam to promote and implement ESD in education. According to Plan No. 3520/KH-SGDT (Sogiaoducdaotao, 2022), the "Green School Construction - For a Green Hanoi initiative has nominated 39 schools in Hoan Kiem province to become green schools, demonstrating Vietnam's attempts to progress towards a more sustainable education system. Nonetheless, there has been no study to date into how Vietnamese teachers apply ESD with green school buildings.

1.1. Aims of the thesis

Based on the literature discussed above, there is a need for more school-based research on ESD by using teaching green building, particularly in the context Vietnam. As a result, the primary objective of this thesis is to investigate how teachers in four secondary schools perceive the potential benefits of integrating green building features into ESD. A secondary objective is to examine the ways in which Vietnamese educators employ place-based strategies to effectively utilize the resources provided by these green buildings for instructional purposes. The research questions that this thesis aims to address are as follows:

Research questions:

1. How do teachers perceive their overall experiences when using green buildings to teach sustainability?

2. What place-based pedagogical approach with TGB do the teacher use to teach ESD?
1.2. Structure of this thesis

This thesis will continue with a theoretical framework by providing empirical work related to the thesis topic. This chapter is followed by a methodology chapter that describes and discusses research design, methods for data collection and analysis, problems and validity, and research ethics (Chapter 3). Chapter 4 summarizes the findings of the research. The thesis concludes by revisiting the results and discussing the overall interpretation of the findings in relation to the theoretical background (Chapter 5). The final chapter (Chapter 6) offers a conclusion that summarizes the entire thesis and highlights its limitations.
2. Definitions of Study Terms

- **Green School:** “It’s a school where the community works together to support global sustainability and climate action. A green school prepares students to lead the world toward a healthier, cleaner, more sustainable future”
  
  (Center for Green Schools | Advancing Green Schools, n.d.)

- **Green Buildings:** “the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s lifecycle, from siting to design, construction, operation, maintenance, renovation, and demolition”
  
  (US EPA, 2015)

- **Example of green schools around the world**

  Bali green schools: [https://www.greenschool.org/bali/](https://www.greenschool.org/bali/)
3. Literature review

This chapter introduces the concept of Teaching Green Building (TGB) along with other key components, including the Whole School approach, Place-based Education, and Education for Sustainable Development (ESD). These components are discussed in relation to the study objective.

3.1. Education for Sustainable Development

3.1.1. Defining Education for Sustainable Development

Before understanding the role of Teaching Green Building for ESD, it is necessary to identify the concept of ESD. Basically, education for sustainable development (ESD) is a paradigm in education that aims to educate learners with the knowledge, skills, and values necessary to construct a sustainable future (Leicht, 2018). That is to say, knowledge, competence, and values are important in implementing ESD, and the current study needs to identify these three components clearly to provide a clear concept of ESD in teaching.

With regards to the content of ESD, topics relating to sustainable living stand out as the main knowledge domain. These domains include the elimination of poverty as well as issues related to climate change, biodiversity, and sustainable consumption and production (Rieckman, 2018). In addition, 17 Sustainable Development Goals (SDGs) by the United Nations are also used as the themes for ESD (United Nations, 2015). These goals cover a variety of dimensions of sustainability, including environmental, economic, and sociological factors. These critical themes indicate the ESD does not only contain environmental topics but rather a broad range of disciplines as well.

Regarding the competency development of ESD, Rieckmann (2018) provides further elaboration on the essential competencies for ESD. These qualities include:

- Ability to think systematically and critically: Systems competency and Critical competency.
- Ability to envision the past, present, and future: Anticipatory competency.
- Ability to reflect: Normative competency and Self-awareness competency.
• Ability to collaborate and develop strategies: Collaborative competency and strategic competency.

Last but not least, ESD acts as a structure for the instillation of values that are congruent with sustainable development. The Bonn Declaration, which UNESCO published in 2009, emphasizes the ESD's foundation in fundamental values like justice, equity, tolerance, and responsibility. It also advocates for gender equality, social cohesion, and the alleviation of poverty. Moreover, respect is emphasized as a fundamental component of ESD by UNESCO (2005). This respect encompasses regard for oneself, one's community, one's differences, one's environment, and one's descendants, as outlined in the Earth Charter.

In conclusion, the components that constitute ESD include knowledge of sustainable issues, competence in ESD, and its values. These three components do not stand separately; rather, they intertwine with each other to educate learners to become aware of the current problems and develop their ability to develop pro-sustainability actions to deal with them.

3.2. Teaching green buildings

3.2.1. Defining Teaching Green Buildings

To comprehend the role of Teaching Green Building within the context of education for sustainability, it is imperative to delineate the concept itself. Despite its emergence as a relatively recent concept, the integration of architectural practices into pedagogical approaches possesses historical underpinnings and has evolved in conjunction with the sustainability movement.

The concept of architecture serving an educational role found its early articulation in the 1997 work "Architecture as Pedagogy" by David Orr. Orr (1997) presented concepts aimed at reshaping school design into a setting that nurtures creativity, enhances ecological awareness, and promotes civic engagement. From his perspective, schools were viewed as integral components within a larger framework, serving as tools to facilitate interdisciplinary learning.

Over the years, propelled by the global emphasis on sustainability and the propagation of Agenda 21 (Kolbasov, 1992) for sustainable development, the concepts of green and eco-schools were
formulated to align with the overarching notion of a holistic school-wide approach to sustainability. The school grounds were transformed to be greener to promote ESD at school.

Gradually, the trajectory of development pivoted towards acknowledging green school buildings and their educational significance (S. K. Barr et al., 2014; Cole, 2014; Derr, 2017). Building upon the theoretical tenets of architecture for teaching and the holistic school approach, (Cole, 2013) proposed the conceptual definition of Teaching Green Building. This construct posited that a green building could serve as an instructional tool by educating building occupants about sustainable concepts through its design (Cole, 2013). This interpretation broadened the scope of green building design from mere ecological attributes and sustainable systems to encompassing socio-cultural metrics that enhance educational inspiration.

Subsequently, more research has been conducted to confirm the teaching function of green buildings. To explain the concept of Teaching Green Building clearly, three fundamental teaching dimensions—What, How, and Why—are going to be used for this explanation (Hofman, 2015).

The "What" dimension centers on the content of Teaching Green Building, which is Green Building Knowledge. The domain of Green Building includes facets such as green infrastructure, sustainable landscape, energy and atmosphere, water, materials, and resources, indoor environmental quality, economic impacts, beauty and inspiration, and local and healthy food systems (Cole, 2018, p. 113–114).

The "How" aspect explores the educational techniques and tactics that form the foundation of Teaching Green Building. To elucidate how green buildings effectively engage in and facilitate Education for Sustainable Development (ESD), Cole (2014) created a framework that establishes a connection between architectural features and ESD principles. Cole (2014) argues that the utilization of green buildings in educational settings promotes embodied learning through a variety of engagement strategies. Figure 1 shows four engagement strategies of TGB with the living occupants for ESD.
The vertical axis depicts the potential for buildings to provide a variety of educational opportunities, ranging from passive to active, for those inside them. The horizontal axis represents a continuum of engagement that occurs either at an individual level, a social level, or somewhere in between. From “The Teaching Green School Building: a framework for linking architecture and environmental education” by Cole, L. B. (2014). The Teaching Green School Building: a framework for linking architecture and environmental education. Environmental Education Research, 20(6). [https://doi.org/10.1080/13504622.2013.833586](https://doi.org/10.1080/13504622.2013.833586)

- Formal to Informal Engagement: These strategies range from structured integration into lesson plans to more casual, unstructured activities.
- Passive to Active Engagement: Students may engage passively through guided instructions, exploring the passive features of green buildings, or actively through hands-on experiential activities.
• **Individual to Collective Engagement:** Initially, students may draw from their personal prior knowledge to grasp sustainable concepts within the buildings, and then expand this understanding to include social aspects, sharing their knowledge about the sustainable features with others.

These strategies align with the design principles of green buildings that promote embodied learning by engaging students' sensory experiences and encouraging them to construct knowledge during the learning process. Activating multiple sensory systems during learning can enhance students' retention as it bolsters their episodic memories (Fägerstam, 2012). This effect is also corroborated by Bærenhold (2022). In Bærenhold's study (2022), it is emphasized that embodied learning highlights the favorable outcomes of physical activity on cognitive functions, including increased motivation, attention, and learning, along with enhanced memory abilities.

Additionally, learning within a green building can be categorized into informal and formal learning modes. *Informal learning* refers to the process of learning sustainable knowledge through individual’s interaction with the green buildings. In other world, the building itself through the indicators of design patterns transmit knowledge to the students. Research extensively explores this facet (Cole, 2013, 2014, 2018; Cole & Altenburger, 2019; Soliz et al., 2011).

Conversely, *formal learning* entails the integration of green building features into the curriculum and teaching practices to convey sustainability lessons. While Kerline et al. (2015) explored formal learning, their research offers a panoramic view of teachers' perceptions and practices without delineating precise pedagogical strategies. Intriguingly, the study revealed that while teachers recognized green buildings as pedagogical hubs, the integration of green building attributes into the curriculum was perceived as a constraint on creativity—a result that contradicts other scholarship (S. Barr et al., 2014; Cole, 2018; Mathie & Wals, 2022). This field requires further exploration.

The final dimension, "Why," encapsulates the rationale behind Teaching Green Building. Central to the teaching of green buildings is the imparting of tangible knowledge and an experiential understanding of sustainability to building occupants. The objective is to cultivate environmental sensitivity, nature-oriented attitudes, and a sense of personal responsibility toward environmental
stewardship. Furthermore, the pursuit of sustainable skills and actions serves as the aim of ESD. In essence, Teaching Green Building utilizes green school structures as dynamic venues for learning, fostering a sense of place, engendering environmental responsibility, and catalyzing transformative actions toward a sustainable future.

In addition to the benefits of the Teaching Green Building approach, there are also certain drawbacks that could pose challenges for educators, as highlighted by Cole (2013). The first of these disadvantages lies in the complexity of the elements inherent to Green Buildings, which can prove challenging for teachers to comprehend fully. Addressing this issue necessitates increased training opportunities provided by the school to enhance teachers' understanding of the functionalities of green buildings, as suggested by Kerline et al. (2015).

The second drawback relates to the perceived lack of engagement that green buildings offer from a teaching perspective. Bar (2011) suggests that teachers can actively participate in the building's design process as a solution to this issue. By doing so, teachers gain a deeper understanding of how to effectively utilize the building's features for their teaching endeavors.

3.2.2. Teaching Green Building (TGB) with Whole School Approach (WSA)

As previously indicated, the progression of Teaching Green Building is intricately intertwined with the advancement of the Whole School Approach (WSA). Indeed, for green buildings to effectively assume their role, their efficacy relies on synergistic collaboration with other school components to underpin ESD practices. As with most typical educational trajectories, the evolution of the Teaching Green Building model has exhibited variances across temporal phases.

The role of school physical surroundings in contributing to the overall sustainability of the school is first presented in the Whole-School Methods studied by Henderson & Tilbury (2004). However, it was not explicitly specified how a green physical environment supports ESD in teaching. Until 2011, Bar presented a comprehensive school-wide framework that emphasized facility design or green buildings as one of three key components, together with school culture and a constructivist curriculum. This approach emphasized the integration of indoor-outdoor building design to reinforce educational objectives, foster project-based and student-directed activities, and cultivate a deep connection to the environment for pro-sustainable behaviors. This
framework highlights the critical role of green buildings in furthering sustainability education and emphasizes the importance of collaboration with other aspects of the school.

However, the teaching buildings do not gradually become the primary determinants of the whole school's approach to sustainability. Instead, the concept of green building was integrated to demonstrate the school's commitment to sustainability and serve as a means of conveying the school's sustainable practices. For instance, the green building incorporates a solar panel system, aiming to signal the school's dedication to conserving energy and utilizing clean energy sources. Additionally, it contributes to pedagogy and learning within the classroom by offering educational resources, various learning environments, and support for teaching and learning. (Mathie & Wals, 2022).

As previously mentioned, green buildings create an ideal environment for Education for Sustainable Development (ESD), facilitating valuable contributions to ESD teaching and learning. However, to effectively use a school's green building as a teaching tool, it is essential to consider various interconnected factors beyond the building itself. Furthermore, existing literature offers limited research addressing guidance for educators utilizing green buildings for education. Additionally, clear pedagogical methods for Teaching Green Building have not yet been established.

In this current study, the author places greater emphasis on examining the TGBs in the teachers’ lesson plan as a teaching tool. Subsequent sections will offer an overview of prior research related to the approach of utilizing TGBs for teaching ESD in school settings.

3.2.3. Previous research on Teaching Green Building for teaching Education for sustainable development in the school context

The primary focus of research on the usage of TGB for ESD in the school context primarily revolves around its impacts on sustainable knowledge and pro-sustainable behaviors, together with the research on the implementation of TGB within the whole school. Concerning the study to investigate the impact of TGB on knowledge about sustainable issues and environmental sustainability, the research conducted by Alimin et al.(2021) in Green School Bali. The research established that the sustainable architecture and eco-friendly environment of the school encourage students to be familiar with the concept of the environment. The result is familiar with
Cole's (2013) research; however, the author added that the personal aspects of learner’s knowledge about the environment alongside the social and physical aspects of the school promote knowledge regarding sustainability and the environment within green buildings. Another quantitative study on this topic was undertaken by Cole & Hamilton (2020) who discovered that pupils who attend TGB schools had much more awareness about sustainability and the environment than those who attend non-TGB schools. It did not, however, increase over time and only affects pupils the first time they approached the building. Furthermore, teaching green building was not the primary element influencing students' pro-sustainable actions; rather, school practices did. The result of Cole & Hamilton’s research indicated that the role of educational institutions in the implementation of green building concepts for ESD is noteworthy. Another qualitative study by Kerline and colleagues (2015) undertook an examination of the impact of teaching green building on American middle-school educators who transitioned into a green building environment for a year. Their findings highlighted challenges arising from the comprehensive integration of teaching green building throughout the curriculum and instructional practices, attributing these hurdles to inadequate training opportunities regarding green building features provided by the school. Cole & Altenburger (2017) found the underscores the necessity of a multifaceted approach to incorporate TGB across various educational channels. Fragmented integration of sustainability concepts without interconnection of each element in the school might lead to a disjointed understanding of sustainability among students.

3.3. Place-based pedagogy and Teaching Green Building

Teaching Green buildings aligns with Place-based education (PBE), sharing common goals of fostering human-place connections and pro-sustainable behaviors. In this sense, a green building can be viewed as both a place and a learning venue for sustainability education (Cole, 2018)

3.3.1. Place in PBE and place in TGB

To gain a comprehensive understanding of Place-based pedagogy, it is essential to delve into the unique attributes associated with a particular location. As Wattcho & Brown (2011) elucidate, the concept of place goes beyond mere geographical coordinates; it revolves around forging deep emotional connections with specific points on Earth's surface. (Mannion & Lynch, 2018) extend
this perspective, highlighting that place is a complex concept interwoven with culture and society, embracing not only human beings but also the wider natural world. Within the realm of place-based education, each facet of a location carries its own narrative, imparting invaluable educational significance (Mannion et al., 2013). In the context of Teaching Green Building, Cole (2018) underscores the centrality of place as one of five main perspectives of TGB, aiming to use the concept of place in physical environment of buildings that encourage the establishment of deep human-nature connections. Moreover, these characteristics of place-based education find clear expression in building design within the Teaching Green Building context. Cole (2014) introduces a comprehensive framework encompassing four pivotal design principles that facilitate the teaching of Green Building and the imparting of sustainable literacy. These principles encompass:

- Conveying information: This principle involves the presentation of visible information enriched with verbal or visual content, such as signage, brochures, or websites.

- Enabling physical engagement: Designing architectural elements that directly invite users to interact with or influence them.

- Fostering social interaction: Creating spaces within the building that actively encourage social engagement, thereby promoting sustainability, as exemplified by hosting meetings of energy clubs.

- Establishing social norms: Designing the building to seamlessly accommodate practical approaches that cultivate a culture of sustainable practices within the school environment, exemplified by the provision of visible recycling stations.

Given the diverse scope of sustainability contexts, Teaching Green Building is proposed as an educational approach that bridges the gap between constructed and natural environments. This suggests a novel avenue for place-based education, as much of the existing research on teaching sustainability through place-based education typically focuses on outdoor settings (Hill, 2013; Sobel, 2004; Soliz et al., 2011; Wattchow & Brown, 2011)
3.3.2. Place-based education approaches

Generally, place-based education involves directing students and teachers to engage with their communities, utilizing the community as a learning environment (European Commission, 2022; Mathie & Wals, 2022). One of the key objectives of place-based education is to enhance the sense of place (Vander Ark et al., 2020), which encompasses the intricate connection between humans and their surroundings (Gruenewald, 2003; Langran & De Witt, 2020; Sobel, 2004). This sense of place revolves around two fundamental and interrelated concepts, namely place attachment and place meaning, which the researcher will delve into below. Place attachment implies the sentimental connection between individuals and specific locations, and normally it contains two facets which are place dependence and place identity (Kudryavtsev et al., 2012). Place dependence pertains to the ability of a place to fulfill an individual’s needs by offering an environment conducive to their demanding activities (Kudryavtsev et al., 2012). For example, the students might form their place dependence with green buildings because this building provides space for them to do learning activities or for their playing. That is also an aim of Teaching Green Building by creating more meaningful activities for the students about sustainable learning, so students can engage more with the space in TGB (Cole, 2014).

Place identity involves the degree to which a place acts as the representative of one’s personal identity or becomes a part of the self’s definition. For instance, the students in a teaching green building might attach to the school buildings because the aspect of correlate with nature or the promotion of environment protection in this building remind them of their personality- people who love nature and want to protect the environment. Last but not least, place meaning is the concept of the symbolic significance that people connect to a setting and reasons why they attract themselves to a place (Kudryavtsev et al., 2012). Amid the crisis of globalization, the earth and the nature are facing pressing global issues, the role of developing sense of place is important than ever. Gruenewald (2003) identifies the work on the person-place relationship as an essential prerequisite before humans involve in any actions to protect the Earth. However, some scholars mentioned the phenomenon of placeless due to the fast growing of digital mobility and problems from modern life (Kane et al., 2016) resulting in the alienated feelings for their place that they are living (Wattchow & Brown, 2011). However, this concept of placeless and the sense of placeless according to Wattchow & Brown (2011) is put in
the context of natural and residential areas, while if the sense of placeness can happen in a built environment like school green buildings is still yet an unresolved question.

In order to increase the level of place in PBE, Mannion & Lynch (2015) developed three place-based typologies. The teachers should consider if (i) an activity might be *place ambivalence*, disregarding place's significance (e.g., conducting lessons outside due to good weather), (ii) *place sensitivity* (e.g., teaching about food in a garden), or (iii) *place essentiality*, directly linking learning to specific locations (e.g., studying WWII in a Budapest square). In order to develop deeper place-based responsiveness, Watchow and Brown (2011) suggested four signposts for outdoor education which are

- **Embracing the Act of Being Present in a Location:** This underscores the importance of actively engaging with our immediate environment and heightening our levels of consciousness. For educators, it's essential to cultivate a sense of curiosity to unlock the potential inherent in the places they find themselves.

- **Harnessing the Influence of Narratives Rooted in Specific Locations:** Utilizing the power of stories and narratives to connect individuals with the experiences associated with a particular place.

- **Becoming Apprentices of Outdoor Environments:** Engaging with and disengaging from a location through a layered knowledge system encompassing elements of ecology and geography.

- **Expressing Place-Based Experiences:** Encouraging students to reflect subjectively on their experiences in a place and express these reflections. Watchow and Brown (2011, p.73)

These signpoints are well-suited for Teaching Green Building because it supports the development of a place-responsive pedagogy, not limited to only outdoor spaces (Watchow and Brown, 2011). Hence, it extends beyond the outdoor areas of Teaching Green Buildings and encompasses its interior spaces as well, viewing Teaching Green Buildings as places for both learning and teaching.

In addition to techniques for incorporating more place-based elements into teaching, Smith (Smith, 1999) identifies five distinct attributes of place-based education (PBE) pedagogy that help educators grasp its essence. The first attribute emphasizes that place-based pedagogy directs attention to specific place-related issues, enabling learners to acquire knowledge that extends to broader and more remote
domains. The second and third attributes address the shift in roles for both students and teachers in place-based education, moving away from a teacher-centered approach. In this shift, students become knowledge creators while teachers act as facilitators, guiding students in assimilating concepts (Smith, 1999, 2007). This role of teachers as storytellers, using narratives to connect students and places, is emphasized by Wattchow and Brown (2011). Fourthly, the subject matter explored in place-based education is influenced and guided by students’ curiosity and questions, embodying inquiry-based learning. Lastly, PBE fosters a partnership between the school and the community, a reciprocal interaction where the community actively engages in the classroom, and students play a role in the community.

These components align with a more recent framework developed by Vander Ark et al., (2020), which outlines six design principles of place-based education. This framework retains nearly all aspects of Smith's framework (community as a classroom, learner-centered, inquiry-based learning) and adds three more principles. The first principle involves using local places as models to understand global issues and recognize connections and opportunities in the global context. Given the global challenges humanity faces, educators should incorporate global perspectives when teaching students to become global citizens. They can learn through practices rooted in their local contexts and connect them with the global community (Hawkins, 2014). In the context of Teaching Green Buildings, the goal is to create an educational environment where students not only learn about sustainability but also live with it. The combination of Teaching Green Buildings and the whole-school approach contributes significantly to addressing global issues, aligning with the UNESCO 2030 Roadmap (UNESCO, 2020). Moreover, the community encompassed by the whole-institution approach and Teaching Green Building extends beyond the local community to include global communities (European Commission, 2022). Therefore, incorporating a global dimension into PBE when applied to Teaching Green Buildings is essential.

The second principle focuses on interdisciplinary approaches. Because the knowledge of a place is complex and encompasses different aspects from various fields such as ecology, history, social sciences, and economics, project-based learning is recommended as the primary method to connect PBE with different subjects. Alongside the complexity of Education for Sustainable Development (ESD), interdisciplinary approaches are also suggested as effective for teaching this concept (Leicht,
The final principle involves establishing a systematic approach for students to transform their community through the curriculum.

### 3.3.3. Barriers to apply PBE

However, place-based education presents certain challenges that educators must take into account in order to effectively implement lessons that utilize the connection with place-based education. Place-based education requires teachers to invest time and efforts to conduct lesson related to this field (Yemini et al., 2023). Consequently, teachers often gravitate towards selecting locations that are convenient and close to them, such as school premises or easily accessible natural environments, mainly due to their heavy workloads (Bentsen et al., 2009).

Another issue surfaced through a qualitative evaluation conducted in the Czech Republic by Cincera et al. (2019). The research revealed a disconnect between the perspectives of teachers and students when applying place-based education. While teachers believe they are empowering students to manage tasks and engage in autonomous learning, students hold differing viewpoints. The results indicated that, at times, teachers implementing place-based education may not fully embrace a learner-centered approach and may still exert control over the learning process using teacher-centered methods. This barrier was also highlighted by Smith (2007). Additionally, Sloan (2013) suggested that teachers must exercise caution when guiding students in place-based education. It is imperative for students to care for the place responsibly; otherwise, they might develop a sense of entitlement that contradicts the core values of Education for Sustainable Development (ESD).

### 3.3.4. Previous research on place-based education for ESD with school facilities

Previous research has shed light on how educators approach place-based education (PBE) within the school environment, specifically in terms of utilizing school facilities. Initially, studies centered on school grounds and gardens as the primary school facilities for PBE with a focus on teaching Education for Sustainable Development (ESD). However, researchers subsequently shifted their attention to other school facilities, especially as institutions aimed to become more sustainable themselves. For instance, Green (2012) conducted research in a primary school in Australia, demonstrating that a learner-centered and inquiry-based PBE approach, involving students in the process of revamping their school garden through hands-on experiences and project-based methods, resulted in a deeper understanding of sustainability. Children engaged
with local geographies and diverse literacies, thereby becoming more invested in the places where they learned.

Additionally, Green & Somerville (2015) conducted quantitative research at Gippsland School, another primary school in Australia. Here, teachers employed an interdisciplinary, project-based, and inquiry-based approach to place-based pedagogy. The research revealed that school grounds offered students a wealth of ecological knowledge, particularly related to food. Importantly, food garden learning helped teachers connect with global concepts of food.

Reeves (2022) described how Discovery School, equipped with a zero-net energy building, embraced place-based pedagogy within its school facilities. Teachers transformed the school into a learning hub, challenging students to explore the school's sustainable systems and operations actively. This approach aimed to maximize the school's functionality and foster transformative experiences. Additionally, teachers leveraged the resources of the green building to create immersive lessons. The story indicated that in order to employ place-based education within the school buildings, it is necessary to support from the from coaching and professional development. Unlike natural places which the information of it can collect from different sources, the green building design features of each has unique features and teaching opportunities that the teachers are unable to find elsewhere. Therefore, the research suggested that the place-based education in TGBs needed regular support and instruction from the school.

Another illustration comes from Elmer-Dwett and Hanley (2022), who discussed the Academy for Global Citizenship school's net-positive energy campus. Throughout the campus, various opportunities for authentic learning experiences were provided. The story suggested that the students foster a sense of responsibility towards the place. They needed to be constantly encouraged to investigate the building’s system and operate it.
3.4. Concluding comments and reflections

Upon reviewing the existing research and analyzing the theoretical framework pertaining to Teaching Green Building (TGB), the Whole School Approach, and Education for Sustainable Development (ESD), it becomes evident that there is a notable gap in the research on the practical application of TGB for ESD. Several scholars, particularly Cole, have proposed TGBs as educational tools for teaching ESD and have discussed their potential for lesson planning (Barnes, 2012; Barr et al., 2014; Cole, 2013, 2014, 2019; European Commission, 2022). However, these discussions have largely remained at the suggested stage. Furthermore, the existing research has primarily focused on students, overlooking the perspectives of teachers who utilize these tools for teaching. To the best of my knowledge, except for the study conducted by Kerlin et al. (2015), there has been limited exploration of teachers' perceptions and experiences of using teaching buildings as part of their formal teaching.

Additionally, the realm of place-based pedagogy in conjunction with TGBs remains largely unexplored. The narratives shared by Elmer-Dwett and Hanley (2022) and Reeves (2022) are anecdotal observations from eco-schools in various U.S. school districts rather than formal research studies. Lastly, it is worth noting that research related to TGBs for teaching ESD and employing place-based education (PBE) approaches has predominantly taken place in developed countries. In contrast, there is rare research in this field in developing countries, such as Vietnam. This thesis endeavors to address this research gap and make a meaningful contribution to the field.
4. Method

This section explains the method used in this research, as well as the choices made regarding the qualitative study design that was used, information about the sample (teachers and schools), the method of data collection and data analysis, and the ethical aspects to consider.

4.1. Study design

A qualitative study design has been adopted because of its relevance to the study’s objectives. The aim of the research is to determine how teachers perceive and use the sustainable features of green buildings for teaching Education for Sustainable Development (ESD). Therefore, the qualitative method, which uses the interpretation of words as data, can provide rich and deep data from the participants (Braun & Clarke, 2013). That approach was also used in a similar research study conducted by Kerlin et al. (2015) when he investigated the perceptions of teachers about the potential of a one-year-old green building for teaching ESD. Besides, a qualitative approach is suitable for the condition of the research due to the following limitations:

1. Time limitation (One month for data collection and analysis)

2. Challenges for approaching teachers. It took time to connect with the school organization and ask for their permission. Only three teachers from four schools accepted the invitation to join the research.

3. Restricted means only one researcher can do research.

Under that condition, it required an approach that did not need a large sample of participants but also provided rich and detailed information (Cohen et al., 2017), and the qualitative approach is the most appropriate one.

"To ensure methodological rigor in research design, scholars must align their choice of research paradigm with their ontological beliefs regarding the nature of reality" (Mills et al., 2006 p.2). The reality that the researcher in this research wanted to pursue was the educational potential of green buildings for teaching Education for Sustainable Development (ESD) from the perspective of teachers. In order to explore that aim, an epistemology of constructivism was adopted as the foundational premise. This allowed the researchers to recognize that teachers actively construct
their understanding and decision-making processes concerning the integration of pedagogical approaches with green building features.

Moreover, it was acknowledged that teachers' interpretations are subjectively influenced by individual lenses such as language, gender, social class, race, and ethnicity, as suggested by Denzin & Lincoln (2005). Because of the subjectivity and context-dependent nature of teachers’ experiences and perceptions in this research, the application of purely observational and positivistic scientific methods would be insufficient. Instead, the contextual understanding provided by constructivism proved essential in comprehending the various challenges and opportunities that teachers encountered in their actual teaching practices.

Additionally, the study acknowledged that interactions between teachers and coworkers, students, and other members of the school community may have an impact on their decision to use green buildings for teaching ESD. Hence, the tenets of social constructivism, as presented by Jackson (2011), were deemed significant, emphasizing how individuals create meaning through their social interactions.

In conclusion, the adoption of a constructivist perspective in investigating the educational potential of green buildings for teaching ESD enabled researchers to embrace the subjectivity of teachers' experiences, consider context-specific challenges, and recognize the importance of social interactions in shaping pedagogical decisions. This approach enriched the research by providing a deeper and more comprehensive understanding of the complexities inherent in utilizing green buildings as educational tools for sustainable development.
4.2. Data collection

4.2.1. Interview

In the context of constructivist qualitative research, various methods such as interviews, focus groups, and observation are recommended for gaining direct insights into teachers' viewpoints (W., 2014). For this study, interview was chosen as the primary data collection method, while the other two methods, focus groups and observation, were not utilized due to specific reasons:

Regarding the focus group method, prior research exploring the educational potential of green buildings (Kerlin et al., 2015; Soliz et al., 2011) has highlighted some drawbacks. These studies found that members of dominant groups could monopolize the conversation, limiting the participation of other teachers and hindering the free expression of opinions. Additionally, teachers might feel pressured to conform to the group's prevailing views, inhibiting the sharing of their genuine perspectives. Moreover, given the diverse subjects taught by the teachers and their varying schedules, arranging a meeting that included all three teachers from each school was logistically challenging.

The second method considered is observation, which provides a reality check by verifying whether teachers' statements align with their actions (Edmonds & Kennedy, 2020) or uncovering unnoticed features within teaching sessions (Cooper & Schindler, 2014). However, the timing of the observation was not suitable for this research. The researcher traveled to Vietnam during April and May, which coincided with the end of the semester when teachers were focused on exam preparation rather than emphasizing Education for Sustainable Development (ESD). Consequently, the researcher could not directly observe the teachers' authentic practices with green building features at school during this period.

Given the drawbacks associated with focus groups and the unsuitable timing for observation, the researcher opted to utilize interviews as the primary method for this study. Interviews were deemed more suitable as they allowed participants to share in-depth and detailed experiences and perspectives related to the research topic. Furthermore, interviews proved more feasible given the time constraints and limited participant pool (Braun & Clarke, 2013; Cohen et al., 2017).
In conclusion, based on careful consideration of the advantages and limitations of various research methods, interviews were chosen as the most appropriate approach for this constructivist study. Interviews provide a valuable platform for capturing rich and nuanced insights from teachers, ensuring a deeper understanding of their perceptions and experiences related to using green building features in Education for Sustainable Development.

4.2.2. Semi-structured interview preparation

A study guide was prepared in advance for the semi-structured interview. The guide consisted of four primary questions, following the instructions of Braun & Clarke (2013). Developed opening and closing questions: Questions for asking teachers’ background information (name, teaching subject, years of teaching experience, and way of integrating ESD with green buildings at school).

Sequence of questions: Went from overall questions to specific topic-based questions. The questions guide is attached in Appendix II. Once the interview guide was constructed, the researcher proceeded to recruit participants for the project. Subsequently, the researcher visited the schools in person to observe the facilities and coordinate appropriate meeting times with each participating teacher. The interview lasted from 30 to 60 minutes per interview. The interview was recorded and stored on One Drive by the researcher.

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4.2.3. Context of the study

The Hanoi Department of Education and Training has initiated the program "Building Green Schools: For a Green Hanoi" for the period 2022–2025, as delineated in Plan No. 3520/KH-SGDT (Sogiaoducdaotao, 2022). The primary objective of the plan is to instill environmental consciousness and promote sustainable practices among administrators, teachers, staff, and students through the implementation of the green school initiative during the specified timeframe.
As part of the program, an evaluation is conducted to assess the effectiveness of environmental conservation measures in schools by incorporating the green school model and specific criteria. The model and criteria encouraged the participating schools to undergo architectural renovations, integrating sustainable and technological features such as water and energy treatment facilities and green spaces on their campuses.

The program was initially launched in four main districts of Hanoi: Hoan Kiem, Thach That, Hai Ba Trung, and Dong Anh. During the 2022 phase of the program, the focus was on expanding the initiative to encompass more schools in Hanoi. Various instructional activities were introduced to educate students about sustainable living practices within the school setting. An evaluation of the program's implementation results at schools was scheduled for December 2022.

To access the list of schools nominated for the program in December 2022, the researcher utilized the websites of each district and contacted them via email to seek permission from the schools and the participation of teachers. The email clearly outlined the aim of the research, the concept of education for sustainable development, and the green school features.

4.2.4. Participants

School

The researcher reached out to the schools included in the nominated list via email to seek permission for their participation. Four secondary schools responded positively to the email and expressed their support for finding teachers who would be willing to participate in the research. Four schools, including public, private, and international schools, were nominated in the program "Building Green Schools: For a Green Hanoi". These schools were equipped with sustainable features, promoted ESD at school, and had teachers using the features of a green school for teaching.

Subsequently, the researcher conducted visits to these four schools for observation purposes. However, due to the sensitivity of confidential information pertaining to the schools, this research refrained from using any pictures taken directly during the visits. Instead, the study provided a descriptive account of the school context and facilities. The information about the school was briefly introduced in the table (see Appendix I).
Teachers

The population of the study consisted of 12 secondary school teachers in Hanoi, Vietnam, who utilized green buildings to educate about education for sustainability. The teachers voluntarily participated in the projects after reading the research objectives on the school notices and hearing introductions from other teachers. Two sampling techniques, convenience sampling and snowball sampling, were utilized to capture the characteristics of the sample population. Because the research relied on the teachers' willingness to participate, the backgrounds of the teachers varied, and they taught different subjects.

To be specific, most of the teachers were class teachers responsible for instructing all required subjects. Among the participants, there were two teachers who specialized in teaching the green construction project, four teachers who taught English, two teachers who taught literature, two teachers who taught biology, and two teachers who taught science. The ages of the instructors ranged from 25 to 35 years old, and their years of professional experience ranged from 2 to 15 years. There were nine women and three men among the participants.

All of the teachers interviewed demonstrated a comprehensive understanding of teaching about education for sustainability and were familiar with the green construction features in their schools. They were also well-acquainted with implementing regular activities within green spaces based on the lesson content, their own motivation, and the available time. The participants instructed students aged 12 to 14, corresponding to grades 6 to 8.

4.3. Problems and validity

During the data collection process, several potential issues and considerations arose while conducting semi-structured interviews. Firstly, the use of specialized terms such as "green buildings" or "education for sustainable development" could lead to confusion for the interviewees, potentially hindering the smooth flow of the interviews. Secondly, unforeseen events or technical problems might occur during the interviews, particularly in online settings where internet connection issues could disrupt Zoom interviews or other technical difficulties could arise. In face-to-face interviews, selected locations might present challenges such as noise or other environmental disruptions. Additionally, there was a possibility that the desired
information might not be elicited from the interviewees during the interview process (Flick, 2018).

To address these potential drawbacks, the researcher implemented several solutions. Difficult terms were explained to the interviewees during the interview process to ensure clarity and mutual understanding. Additionally, the author prepared backup devices and meeting links for online research to promptly handle any technical issues that might arise.

For face-to-face interviews, the researcher proactively assessed the chosen locations in advance to ensure a comfortable and conducive environment for the interviews. To ensure the desired information was obtained from the interviewees, pilot interviews were conducted with three teachers who had experience in education for sustainable development and green buildings. Their feedback and insights were invaluable in refining the interview guide. Subsequently, the researcher incorporated additional sub-questions in questions 3 and 4 to provide further clarity about the perceptions of teachers and their practical experiences. Furthermore, to streamline the interview process and make the interview guide more concise, the number of questions was reduced from 7 to 4 main questions. These adaptations aimed to enhance the effectiveness of the interviews and ensure that relevant and meaningful data could be collected successfully.

4.4. Data analysis

During the interview process, two instructors responded in Vietnamese, while the remaining teachers provided their responses in English. Consequently, the transcription process initially prioritized the Vietnamese responses and then translated them into English for further analysis. This involved a meticulous review of the transcriptions to correct any errors that may have occurred during this process.

For English-speaking instructors, their responses were transcribed using the "Transcribe audio to text" feature in Microsoft Word, resulting in text-based data. These transcriptions underwent multiple iterations of listening to the audio recordings to minimize transcription errors. The interviewees received each transcription along with notes highlighting any messages that were unclear so they could review and confirm the accuracy of their responses.
Subsequently, NVIVO software was used to conduct thematic analysis, adhering to the six-phase process of thematic analysis of Braun & Clarke (2013).

Phase 1: The researcher familiarized themselves with the dataset by thoroughly reviewing it multiple times. To ensure data fidelity, Braun and Clarke (2013) suggested using a repeated strategy. The author also generated notes to facilitate analytical thinking when examining the data, particularly regarding the overall experience of teachers with the TGBs, the roles of TGBs as a place in their teaching, and place-based techniques employed by teachers in relation to green buildings.

Phase 2: Building on the familiarity with the code tags and concepts developed during the transcription reading process, coding was undertaken. Relevant data segments were coded, focusing on recurring patterns and individual meanings related to teachers' experiences and the concept of place in relation to TGBs and place-based methods. The researchers also thought about figuring out the role of place in teachers' answers by using Mannion and Lynch's typology (2015), Wattchow and Brown's signpoints (2011), and the design patterns for place-based education suggested by (Smith, 1999) and Vander Ark et al. (2022) as references when coding for place-based approaches with the teaching green buildings. These findings were categorized systematically using a coding system. Contradictory views among teachers were recorded, employing the continual comparative techniques suggested by Glaser & Strauss (2017). The researcher categorized responses from interviewees belonging to the same school during this phase and consistently compared their findings to identify any contradictory concepts within the same themes. Additionally, a comparison was made between the newly developed codes and codes previously developed from the answers of the same teacher to identify conflicting notions or concepts.

Phase 3: The third phase involved generating themes by identifying codes that shared common basic ideas and concepts and addressing the research questions. The original codes related to the study issue were consolidated into single themes.

Phase 4: Codes were thoroughly reviewed to ensure no coding possibilities were overlooked. Additional coding was conducted to incorporate more codes into the dataset when necessary. Concepts lacking empirical evidence were excluded. A mind map was created to visualize the relationships between the themes and ensure their coherence. The researchers also examined whether the themes were connected to the entire dataset.
Phase 5: In this stage, themes were defined clearly with a detailed analysis. The themes were considered to determine the significance of the topic and to show their connections with other themes in the dataset.

Phase 6: Finally, the researcher presented the identified themes and showed the connections among the themes on a mind map (see figure 1)

4.5. Ethics

The research adhered to the ethical standards set forth by the Swedish Research Council (2017) through the implementation of several actions. Firstly, a comprehensive document was provided to the school and the teachers, which outlined the study's details and addressed any concerns related to their rights and well-being. This document included a consent letter, an explanation of the study's purpose and methodology, as well as information on how the gathered data would be analyzed.

Furthermore, the researcher ensured that the participants were informed of their rights, which included the following:

- The right to withdraw from the project at any time,
- The right to review and consult the transcript of the interview,
- The right to confirm and provide feedback on the results of the study,
- The right to have all their information kept confidential, with clear explanations of how the data would be stored and analyzed.

Both the researchers and the participants signed this document, and any questions from the participants were addressed before proceeding with the interviews. Throughout the interview process, the researcher reiterated these rights to ensure that the participants were continually aware of their entitlements and could exercise them if necessary.
5. Findings

In this chapter, the researcher delves into the perspectives of the participants regarding the educational potential of green buildings for sustainability and explore the place-based pedagogical strategies they employ when choosing particular green building features for educational purposes. This analysis revolves around addressing two primary research questions. The first question focuses on participants' viewpoints regarding their general experience of using green buildings to teach ESD. The second query concerns the approaches of place-based education applied when considering Green Buildings as a place containing aspects and materials for teaching. Below, you will find a thematic map that visually represents the themes and subthemes related to these research questions (see figure 2).
Figure 2

Thematic map for presenting teachers’ overall experiences with TGBs and place-based approaches with TGBs

Overall teaching experience with TGBs for teaching ESD
(Question 1)

Benefits
- Increase students’ interest and curiosity
- Enhance teachers’ creativity in teaching

Limitations
- Culture difference
- Insufficient support from school
- The difference of content of ESD in each subject

Suggestions
- Whole-school approach

Place-based approaches when using TGBs to teach ESD
(Question 2)

Planning with TGBs
- Curriculum
- Students’ interest

Teaching activities with TGBs
- Learner-centered activities
- Teacher-centered activities
5.1. Benefits

The green buildings provide opportunities for instructors to diversify the learning environment. This method contributes to the students' interest in their course. Many teachers stated that using green buildings to teach about ESD inspires and engages young students because they learned about something they could see in person, which motivated them to inquire about further information. The teachers at four institutions share the same opinions regarding these matters. In particular, the instructors, Teachers 1 responded.

Teacher 1: Students are always motivated when they can learn about things that are close to them. The students had a lot of fun with their expressions when they saw real solar panels and learned how they work rather than only seeing them in the video. [...] At first, the students felt normal with these features, but after the teacher pointed out some special thing underneath, like how the solar panels provide electricity for the building" and what product in the classroom is using electricity from the solar panels, they seemed interested.

The passage highlights an advantage of engaging in the authentic environment of TGBs: stimulating children's curiosity. When children are exposed to real-life experiences in nature or in, they become more engrossed in their lessons and actively seek additional information from their teachers. Consequently, they acquire a greater understanding of the world around them, which I believe is the initial stride towards cultivating their appreciation for the environment and everything it encompasses—an essential aspect of ESD.

Moreover, the authentic green elements present in green buildings acted as a link between educators, educational institutions, and the natural world. This facilitated the encouragement of pro-environmental behaviors in environmental sustainability more effectively.

Teacher 7's example further reinforces this notion.

Teacher 7: In grade 8, we have an environmental protection lesson. With the features of a green school, we have a green garden, a green roof, and green school grounds with plenty of trees. Each class was assigned to take turns taking care of the plants. That way, the students learn how to take care of the environment.
Exposure to objects in the green buildings enhances the sensory experience of the students, as captured in the quote below by Teacher 11:

**Teacher 11:** In my literature class, all the subjects in the green buildings and in the schoolyard can instruct students to write descriptive text about ESD. Last time, we learned how to describe some green initiatives. The students could go around the school, observe, touch, and find out what technologies were used to keep the energy for the school instead of sitting in the class to recall, image, and write down.

The excerpt portrays the sensory experiences that children have within a green building, where they can observe, listen, smell, and touch various elements permitted by their teachers. These experiences aid in enhancing their knowledge and emotions. It is important to note that individuals possess diverse learning styles, making generalizing challenging. While some students excel in theoretical learning, others exhibit a keen interest in hands-on experiences. The assortment of learning materials found in green buildings caters to the needs of different learning styles.

Additionally, participants emphasize another benefit of outdoor encounters in relation to this topic: the positive impact of incorporating green building features into classroom instruction, particularly in fostering teachers' creativity. When questioned about their strategies for teaching ESD in green buildings, Teachers 5 provide noteworthy insights.

**Teacher 5:** For some lessons, I did not need to prepare many videos or pictures; I only needed to bring the items that I could find in the buildings. Show them how it works and how it affects them. ESD is a complex subject. Having authentic visual aids helps me explain the lesson way easier.

The quotes highlight how teachers can adapt their teaching strategies thanks to the features of a green building. These features assist teachers by providing visual aids, enabling them to adapt their instructional strategies more effectively. Furthermore, the green building creates an environment that promotes student self-reliance in the learning process. The materials available within the building serve as supplementary teachers, offering information and facilitating lesson delivery. Students can read and engage with these educational resources, thereby enhancing their knowledge acquisition during their interactions with these valuable learning materials.
5.2. Difficulties

Even though the benefits and the teachers in the interview had experience using the green features in teaching education for sustainable development in their lessons, many of them expressed that ESD and the application of using green features are still "a new concept, and the applications still have some limitations" for them. Therefore, the participants also referred to the limitations and obstacles that may hinder the process of practice.

The cultural differences appeared unexpectedly but were frequently mentioned by the teachers.

**Teacher 5:** ESD and using TGBs are from the West and are more suitable for countries there. The weather there is less polluted and nice compared to Vietnam, and teachers there have a tradition of being with nature. ESD has lasted in these developed countries for a long time. Like other trends in education, we try to adopt another teaching method from a developed country without doing much research on it. I am not sure how long.

The statement indicated that Vietnamese teachers tended to associate the origin of this approach and the concept of Environmental and Sustainable Development (ESD) along with teaching using Green Buildings (TGBs) with Western countries. They elaborated that this methodology was better suited for the contexts of these Western nations, where sustainability was a significant concern and it aligned with teaching traditions. In contrast, they expressed skepticism about the effectiveness of this approach in a country like Vietnam. This mindset posed a challenge when it came to implementing this methodology. In fact, one teacher even demonstrated reluctance towards frequently adopting this method: this method is going to last.

**Teacher 6:** I use this since the school wants it. However, sometimes I am scared that this methodology does not last long. It is just something trendy. To be honest, I feel demotivated sometimes.

Another challenge that frequently emerged from the teachers’ answers was the lack of support from school. Among all the problems mentioned, the most prevalent limitations, according to the participants, are time constraints.
**Teacher 6:** Because I know the teachers, we've got crazy math; it's a lot of tests every two weeks, so to then kind of prioritize things like sustainability and using buildings is hard for us sometimes, especially at peak times.

As evident in the provided excerpt, Education for Sustainable Development (ESD) is still regarded as a sub-subject within the education system, resulting in limited allocated course time. Consequently, teachers face time constraints when it comes to delivering and incorporating ESD content within the given timeframe. Despite the inclusion of ESD in core subjects such as mathematics, literature, and science, teachers must strike a balance between imparting foundational subject knowledge and assessing the students' understanding. As a result, aspects of ESD may not receive the prioritization they deserve in the teaching process.

Despite the presence of numerous scientific concepts within green buildings that can be utilized for ESD instruction, some teachers have expressed limited awareness of these concepts. They tend to focus solely on tangible features that are easily visible or recognizable, while other aspects of the building systems remain largely unexplored or unexplained, leaving them with a partial understanding of the buildings in which they work.

**Teacher 7:** My school is a private school, and the school focus promotes some features that can help them attract parents’ attention, such as the main hall, IT room, or those like. The teachers were also introduced through features of the school tour. As a biology teacher, I have more chances to work with features of the green building compared to other teachers.

The author also asked him if the school has some signage to explain to visitors, teachers, or students about the function of green buildings.

For this reason, the teachers explained that the school only provided maps to guide the visitors about the different areas of the buildings that highlight the function of the school for school activities like learning, meetings, etc. The school did not really notice the function of the green buildings. That problem also appears in the school 1, 2, 4 (see Appendix 1).

Whereas only the teacher in school number 3 (see Appendix 1) expressed that the schools had clear guidance on the functions of the green buildings. This was described by the teacher.
**Teacher 12:** The school tour at the very beginning of the school was provided when the teacher started working in the school. The manager offers a school tour for each teacher, and the information about the green building and function of the building was noted on the school’s website.

Relatedly, teacher 3 explained that school 3 (see Appendix 1) also has signs with clear guidance for the teachers and students about the function of the green building in each area.

According to the excerpts above, most of the school did not pay attention to introducing the teachers and students to the special features of the school buildings. Because of that, when I asked the teachers about some features of green buildings in their school that I could find on the website, like sustainable materials at school or water treatment at school, these are the features that I can find on the school website, but the teachers seem to not pay attention to them:

**Teacher 9:** The school does not mention that we need to use green buildings for ESD. I teach biology, so I only focus on places like the school garden and trees when I can easily relate them to my ESD lesson about the environment. The water treatment, site location, etc. are things that I really do not know and want to link to my lesson. In the past, we mainly stayed in the classroom, the outdoor space was for PE. I did not know the concept of place or use design materials for teaching.

In the quote above, it is apparent that the educators underestimate green building features since they do not see the direct outcomes and benefits, and the school does not really encourage them to do so. Moreover, they favor the space that green buildings can provide, like green gardens and schools, so they can change the environment for teaching. The features inside the school buildings that can be used as authentic visual aids do not attract them very much.

This lack of training from the teachers also affects the content of ESD for teaching, the researcher also asks if teach students about social or economic aspects of ESD by using these features in the green buildings. The teachers 8 gave a noteworthy sharing:

**Teacher 8:** Social and economic aspects of ESD are too complex. The facilities of ESD are not enough for us to explore. I still prefer slides or videos to transfer the messages of it.
This mindset is intriguing because it highlights that the teachers might overlook the social and economic dimensions of green buildings, even though these aspects are integrated into the design and even carry much information about sustainability. In simpler terms, they tend to concentrate solely on the visual and material aspects they can readily identify in the building without actively seeking out other facets that could enhance their teaching.

The characteristics of the lesson are also a challenge for the teachers in terms of applying ESD and school building features. Teachers 2 and 8 are literature teachers, and they emphasized this in their answers.

**Teacher 2:** ESD is focused on our school, but I only see that science teachers and ESL teachers have more chances to apply that than I do with my literature. Because many of my subjects are to teach students about significant literacies in Vietnam and other countries, I can only teach students about argumentative essays that include social issues, so I can have several lessons about it.

Relatedly, the teacher also explains more about the perceptions of teachers in her subject about ESD and green buildings.

**Teacher 4:** Only a few teachers and I in my department think about taking children outdoors and using different features of the school for teaching. Other teachers think that using these features in school is normal for science subjects because the content of our lesson restricts us from using the green buildings.

The absence of collaborative engagement from fellow educators can have a detrimental impact on instructors' morale while utilizing TGBs as learning tools.

**Teacher 4:** I feel sad and alienated sometimes when I rarely see other teachers teaching literature like me using TGB's features.
5.3. Suggestions

Lastly, the emphasis is placed on the practical aspects of the utilization of features of green buildings since the participants suggest some examples that can motivate other teachers and themselves to apply green building features for teaching ESD.

Most teachers shared the same suggestion that the school needs to encourage teachers more to utilize the green building features for teaching ESD.

Teacher 6: The whole school needs to act it out. ESD and using school buildings merely appear in some parts of the curriculum. I think the school community needs to frequently communicate about it. Encourage others to do it. It will encourage us to apply this concept more.

In the above comments, the roles of the schools seem to be important in the way that they can turn green buildings into teaching hubs. The teachers believe that with increased support, communication, and resources from the school, they and other teachers will be more motivated and empowered to incorporate ESD into their teaching using the features of green buildings.

Following that, there are two primary themes that explore place-based approaches when it comes to Teaching Green Buildings for Environmental and Sustainable Development (ESD) education. Each of these themes will encompass various interconnected sub-themes, offering in-depth analysis.

5.4. Planning with TGBs

When the teachers provided rationales for their use of TGBs features in teaching ESD, almost all teachers emphasized that their connection with green buildings’ features was primarily driven by the influence on curriculum control and the enhancement of students’ engagement. In this context, the role of place, specifically teaching in a green building, was not a significant focus.

Teacher 4: The goal of the curriculum is to connect the lesson with experiential learning. In the overall lesson plan for my ESL faculty, each lesson will have a short suggestion of using outdoor spaces or school features for teaching. So, I always try to think about the school building first when I teach.

She also explained the importance of curriculum in teachers’ planning.
**Teacher 4:** Curriculum from each school is the main decisive factor that the teacher must follow. The teachers can use a variety of teaching approaches, but the outcome and the content of the lesson still needs to follow the curriculum. Besides, the suggestions from the curriculum also needed to be considered.

In actuality, the curriculum's guidelines had a significant impact on how Vietnamese teachers used a particular location as an educational tool. This can be attributed to the fact that place-based education was a relatively new concept in Vietnamese educational practice, and as a result, teachers were uncertain about how to effectively engage with it. Recognizing the significance of the green buildings in their teaching was new for them.

Another maneuvering factor that facilitated teachers’ methodology with place, here is the green buildings, was the students’ enthusiasm. The teachers emphasized that the level of interest displayed by their students had a substantial influence on their choice to include a specific location in their teaching. They indicated a willingness to prioritize their students' enthusiasm over the actual functionalities and resources offered by a place.

**Teacher 12:** Answering for how I include TGBs in my teaching. The reason is my students feel motivated when learning somewhere outside of class. This is the first thing that comes to my mind. Sometimes, we learn about ESDs and nature. I allowed them to go to the school grounds, they just stayed there discussed together and sat quietly somewhere to learn. […] The features of the place are nice, but I still prefer things that intrigue my students.
5.5. Teaching activities with Teaching Green Buildings

To gain insight into the place-based approach adopted by the teachers, it is essential to comprehend the activities they employ within the classroom setting involving the chosen place for teaching. Summarizing these activities based on the teachers' responses, two distinct sub-categories emerge: learner-centered activities and teacher-centered activities.

According to the teachers' feedback, when using Green Buildings as a teaching space, they preferred to organize activities that encouraged students to construct their own knowledge. Students were given the opportunity to independently explore the Green Building features selected for the Environmental and Sustainable Development (ESD) lesson, while teachers provided information related to sustainability in connection with these features. Students were encouraged to conduct mini-research using these elements, formulate their questions, and collaborate in groups to explore them through project-based learning.

**Teacher 10:** I briefly instruct the students then let’s them self-explored. [...] Students can do mini project in group because they like working with friends. They shape their questions, investigate, and give me the answers.

They also pointed out that certain aspects of green buildings that allowed students to explore independently were the elements in the botanical garden and the trees on the school grounds. These features were familiar to teachers, and they knew how to use and teach with them. However, when it came to involving technologies or other aspects of green buildings that were unfamiliar, teachers mentioned that the activities would be less self-guided due to the complexity and cost of these sustainable elements. Therefore, they preferred activities where students primarily observed while they delivered lectures about the sustainability concepts behind these features.

**Teacher 4:** We pointed out solar panels for students. They observed from far distance or outside of the fence to guarantee they will not ruin them. I will ask them a list of questions about ESD issues with it.

Or
Teacher 3: I do not think it is a good idea to let students explore the air quality by themselves. I can explain to them that they do not need physical touch.

Another instructional approach commonly employed by instructors using the TGB is teacher-centered storytelling. Typically, educators employ the practice of crafting a fictitious protagonist to serve as the central figure, constructing a narrative arc that intertwines with an Environmental and Sustainable Development (ESD) lesson. Nevertheless, the narrative was not fundamentally grounded in the TGBs; rather, they served as a backdrop for the unfolding of the story or as the contextual framework within which the narrative was conveyed.

Teacher 5: I frequently connect the green building features with a story about ESD. For example, I told them a story about a girl who escaped her imprisonment for 20 years and saw the outside world for the first time. Instead of teaching the students in the classroom, I opted to have the class in the schoolyard. I asked the class how they felt when they were given the opportunity to be outside of the classroom for a major class. The answers were quite interesting, and it led the class to visualize and sympathize with the main character in the story and deliver the message of equality for them.
6. Discussion and Conclusion

The significant outcomes have been deliberated under two overarching themes: Teachers’ general perceptions of using teaching green buildings to teach ESD and the place-based approaches utilizing green building to teach ESD. These themes provide insights to address the two primary research questions. The subsequent section will analyze these results in the context of existing literature on Education for Sustainability, green buildings in education, the whole school approach, and place-based theories.

6.1. Teachers’ general perceptions of using teaching green buildings to teach ESD

- **Design patterns of TGBs support ESD learning**

To begin, the finding indicates that the architectural elements of (TGBs) provide valuable educational materials for teachers in teaching ESD. Instead of passive observation through slides, students engage in a multisensory and verbal-action learning experience. They can physically touch, smell, and interact with elements like water-saving systems, plants, soil, and solar panels within the school environment. This embodied learning is a primary objective of TGBs, as it actively engages learners both mentally and physically as students explore the building (Cole, 2013; Cole, 2014). Research has consistently shown that this multisensory approach enhances students’ attention (Baerenhold, 2022; Fägerstam, 2012). Traditionally, previous studies have associated embodied learning with outdoor settings. However, the results of this research also highlight that embodied learning can occur within the designed features of the built environment, such as those found in TGBs.

Furthermore, teachers’ descriptions of lessons with green features provide new perspectives on how design patterns in TGBs serve as teaching materials. It is evident that teachers prefer items that students can easily access and manipulate. In contrast, other design patterns like building signage, social norms, and interactions within buildings are not utilized as teaching materials. Teachers explain that they do not notice these features because they are accustomed to teaching in traditional schools, where the primary function is classroom-based and outdoor spaces are mainly for physical education. Using design patterns in a building for teaching is not the methods that they normally use. This highlights that design patterns in TGBs is a new concept for Vietnamese teachers, suggesting a need for pre-training in this topic or involving teachers in the school design process for better
understanding (Cole & Altenburger, 2019; Kerlin et al., 2015; Mathie & Wals, 2022).

In addition, through the teachers’ description of their teaching lessons, it also partly reveals how students can engage with TGBs in or formal lesson. With guidance from teachers, engagement can be more flexible and dynamic. Specifically, students initially engage formally with the building when TGBs are used as teaching tools. Then, pupils passively engage with the building as part of guided lessons provided by teachers, including lectures on the sustainable functions of building's features. For instance, Teacher 5 might explain to students how the energy system in schools works. Subsequently, students freely explore the building through experiential activities facilitated by teachers to deepen their understanding of sustainability (active engagement). Moreover, based on teachers' grouping strategies, students may engage individually with the sustainability lessons within the building or collaborate in groups for information sharing (see figure 1)

- A tool to environmental sustainability with nature

The majority of teachers emphasized that green areas within Teaching Green Buildings serve as a means to connect students with nature and facilitate the delivery of more ESD lessons. They noted that cities like Hanoi suffer from a shortage of green spaces, despite ESD's central focus on the environment. This deficiency is exacerbated by traditional school designs, which provide little exposure to nature and hinder effective ESD teaching. Natural green spaces are often distant from urban areas. Consequently, the biophilic design of TGBs, which prioritizes bringing nature into schools and strengthening the bond between humans and nature (Cole, 2018), makes it easier for teachers to impart lessons related to environmental sustainability. Furthermore, teachers observed that the presence of green spaces within the building positively impacts students' well-being during lessons, fostering a sense of calmness when immersed in the building's natural surroundings. The functions of green spaces for stress reduction are mentioned in substantial research (Faber Taylor & Kuo, 2009; Kaplan, 1995). Given the current circumstances where children have limited exposure to natural environments and possess limited ecological knowledge, the incorporation of green spaces within Teaching Green Buildings becomes crucial. This is particularly important in densely populated urban areas that lack natural landscapes, as it can significantly contribute to enhancing students' connection to their surroundings.
• A new concept but it with lots of barriers

Teachers’ perspectives regarding the implementation of Education for Sustainable Development (ESD) using Teaching Green Buildings (TGBs) are marked by contradictions. While many educators take pride in teaching within environmentally conscious schools and view the green spaces as innovative learning environments that facilitate student engagement with nature and the imparting of sustainable life principles, extensive discussions often lead them to a collective realization. This realization is that while these teaching techniques are appealing, the concepts of ESD and TGBs appear more suitable for Western countries. The assumption underlying this sentiment is that Western environments are more pleasant, less polluted, and have a well-established history of ESD. Consequently, these teachers perceive these teaching methodologies as trendy methodology but cannot last long. This perspective is intriguing because, despite ESD being a global concept, it is still regarded as foreign when applied in the Vietnamese context. This resonates with findings from Nguyen’s research in 2018, which indicated that Vietnamese geography teachers also consider ESD and environmental concepts as trendy topics rather than central aspects of their teaching. Furthermore, one teacher expressed doubts about the long-term viability of these concepts in Vietnam, which, in turn, dampened their enthusiasm for frequent utilization due to perceived unsuitability within the Vietnamese context. This seldom-addressed finding underscores the role of cultural differences as a hindrance to the effective use of TGBs in ESD teaching.

Another recurring theme in interviews pertains to the lack of support from schools, particularly in terms of training related to the green features and technologies present in the buildings. Such training is crucial because each building boasts its unique design patterns and systems, making it impossible for teachers to find the information in other sources except from the architecture or the administration of the school. Some of these technologies prove too intricate and challenging for teachers to grasp, instilling fear of dealing with complex systems without a comprehensive understanding, as they could inadvertently affect the entire school system. Consequently, teachers require substantial encouragement and guidance from their respective schools to effectively leverage the resources offered by TGBs (Cole & Altenburger, 2019; Kerlin et al., 2015; Mathie & Wals, 2022). Furthermore, teachers advocate for enhanced communication among schools regarding sustainability. While teachers typically determine their teaching methodologies independently, novel concepts like sustainability and TGBs, still unfamiliar within the Vietnamese context, necessitate comprehensive
support and motivation from the entire school community. Some teachers noted that they are among the few who actively bring students to the green spaces within schools, while other teachers in their departments prefer indoor settings. This sense of isolation among teachers is palpable. Administrative support is validated as crucial for teacher performance (Portey, 2021), and teachers in research conducted by Cincera et al. (2019) highlighted the motivating influence of collaborating with co-workers on conducting project-based ESD learning. However, this research provides explicit descriptions of teachers' opinions concerning the shortage of collaboration among colleagues when utilizing TGBs, potentially serving as a valuable contribution to future investigations in this domain.

Lastly, an additional impediment to the application of TGBs, as mentioned by some teachers, is the familiarity of school buildings. They express reluctance to teach ESD using school features because students are already well-acquainted with these aspects, leading to reduced student engagement. Instead, they prefer to transport students to more distant locations such as forests, zoos, or scenic parks, which they perceive as captivating, often discovered through online sources. This phenomenon aligns with the concept of "sense of placeness" posited by Kane et al. in 2016, suggesting that technology can disconnect individuals from local environments, fostering a stronger connection to digital spaces. However, this issue necessitates further research to delve deeper into its nuances.

6.2. Place-based education approaches with the TGBs for ESD

It is clear from the teachers' descriptions that they are successfully putting Smith (1999) and Vander Ark et al. (2020)'s place-based pedagogy principles into practice. They prioritize a learner-centered approach, encouraging students to actively explore and construct their knowledge during TGB lessons (Smith, 1999; Smith, 2007). Additionally, they integrate the concept of education for sustainable development (ESD) into various subjects and employ project-based learning methods. Educators establish a strong connection between the instructional content and the TGBs, particularly in the context of food-related topics. Through activities like gardening and planting within the school garden, students are exposed to narratives that highlight the hard work of local or global farmers. This observed shift in pedagogical approaches marks a departure from historically predominant teacher-centered and theoretical approaches in Vietnamese education. Instead, educators are increasingly adopting a learner-centered approach that connects knowledge to real-world narratives, encompassing both local and global perspectives. This pedagogical shift aligns with the guidelines outlined in the
National Curriculum (Bogiaoducaotao, 2018), indicating that Vietnamese educators are adapting their teaching methods to promote greater student autonomy. However, further research involving students is essential to validate this claim, as suggested by the findings of Cincera et al. (2019), who found that while instructors perceived themselves as fostering a learner-centered environment in place-based learning programs, students perceived certain limitations imposed by instructors who maintain more control over the educational process than expected.

When applying the signposts of Wattchow and Brown (2011) to assess the place-responsive activities in Vietnamese classrooms, it becomes apparent that activities that help students connect with TGBs are still rare. For instance, teachers seldom mention various aspects of TGBs in their teaching or employ storytelling methods to facilitate students' connections with TGBs. The role of TGBs as places of learning has not been fully explored, highlighting a gap in understanding. This problem is further emphasized by the fact that using a place for teaching remains a blind spot for teachers, who often adhere to the traditional perception of place as a one-way relationship where humans impact places without considering that places also exert an active influence on human life (Gruenewald, 2003; Mannion & Lynch, 2018).

This mindset is again evident in teachers' instructional strategies involving TGBs. In their responses during interviews, teachers rarely mention activities aimed at promoting sustainable behavior within the lesson. Instead, they often link sustainable behavior to other places, like homes or forests, rather than attributing it to TGBs. TGBs primarily serve as providers of teaching materials for teachers and students, with little mention of what actions are taken to reciprocate this support. Sloan (2013) pointed out that teachers sometimes use a location for instructional purposes without teaching students about responsible space use, which raises concerns. Consequently, students may develop the perception that they have the right to use the space however they please. The research findings underscore the importance of educators not only using TGBs as teaching resources but also instructing students on the responsible and considerate use of these spaces, taking into account the preservation and protection of the environment.
7. Conclusion

The research results provide insight into the viewpoints of educators about the significance of environmentally conscious schools in advancing education for sustainable development (ESD) and the use of place-based educational approaches in ESD teaching. It is apparent that educators acknowledge the pedagogical significance of teaching green buildings (TGBs) and exhibit a preference for architectural attributes that are readily accessible and controllable for both educators and students alike. Furthermore, under the guidance of educators, the incorporation of teaching green buildings (TGBs) in educational settings fosters active student involvement using diverse instructional methodologies during Education for Sustainable Development (ESD) lessons. Terrarium gardens, commonly referred to as TGBs, play a crucial role in assisting educators in cultivating students’ affinity for nature and their admiration for the environment. This is achieved by capitalizing on the environmentally friendly characteristics of TGBs, which in turn contribute to the effective delivery of educational content about environmental sustainability.

However, educators have also voiced the perspective that these educational methodologies are better suited for Western countries. The presence of cultural disparities in education might at times impede the adoption of this technique, resulting in a diminished level of motivation. Furthermore, educators have underscored the need for heightened assistance from educational establishments, including not just instructional endeavors but also the efficient propagation of sustainability ideas across the educational framework. Additionally, the significance of fostering teamwork among educators in order to successfully execute these ideas was emphasized. Ultimately, the uncommon utilization of TGBs in educators' teaching methods might be attributed to their excessive familiarity with these qualities, which may not effectively engage students due to a lack of novelty.

Moreover, the study highlights the possibility for educators to integrate place-based design into their teaching methods by utilizing TGBs. However, it is imperative to build a more robust correlation between the notion of location, particularly within the framework of Teaching Gardens and Beds (TGBs), and the precise instructional content being delivered. It is important for educators to continually prioritize the promotion of responsible use of Teaching Green Buildings (TGBs) as instructional tools. This involves directing students to exercise care and desist from excessive exploitation of the resources made available through the designated platform.
Study limitations and further research

Although the researcher is content with the research results, several limitations warrant consideration. The exploration of tangible and intangible features of green school buildings, excluding the school grounds and garden, remains incomplete. Thus, conducting experimental research with well-trained teachers and receiving guidance on utilizing these features for ESD teaching could offer valuable insights into their practical experiences. Furthermore, the current research predominantly focuses on environmental topics within ESD. Future investigations should delve into social and economic aspects, employing green building features for teaching.

Additionally, the research only involves teachers as participants. Future studies should incorporate students' perspectives when teachers utilize green building features, moving away from traditional teaching methods. Furthermore, since the research suggests the need for school support, exploring administrative perspectives could provide further insights into teaching practices.

The diversity of participants, including social science and science teachers, adds value, but it also poses challenges. The diverse backgrounds of teachers may not fully reveal in-depth versions of their actual teaching practices with place-based strategies due to the distinct characteristics and methodologies of each subject. To address this, further research could focus on teachers of specific subjects to identify common place-based strategies and perceptions when employing green building features for ESD teaching.

Finally, the research's location primarily covers Hanoi, limiting the sample's representativeness for other green schools in Vietnam. Moreover, the participation of both public and private schools introduces variations in school settings, curriculum, and green building implementation for ESD teaching. As such, the results may not universally apply to all schools. Expanding the scope to include other green schools across Vietnam or within South Asian schools sharing similar cultural contexts would enhance the research's representativeness.
References


Cole, L. B. (2013). The Teaching Green School


Mathie, R., & Wals, A. (2022). Whole School Approaches to Sustainability Exemplary practices from around the world. https://doi.org/10.18174/572267


No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析


# APPENDIX 1

<table>
<thead>
<tr>
<th>Name of school</th>
<th>Type of school</th>
<th>School facilities</th>
<th>Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>Public school</td>
<td>-</td>
<td>National curriculum.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green garden</td>
<td>The values of ESD was found in the textbook Canh Dieu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green school ground</td>
<td>Green buildings’ elements are not mentioned in the curriculum for teaching.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trash classification system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air ventilation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location that is convenient for local transport</td>
<td></td>
</tr>
<tr>
<td>School 2</td>
<td>Private school</td>
<td>-</td>
<td>National curriculum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green school grounds with diverse plants and trees, each was labeled with a unique QR code for information.</td>
<td>Cambridge checkpoint textbook</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>Green buildings’ elements are not mentioned in the curriculum for teaching.</td>
</tr>
</tbody>
</table>
| School 3 | International school | - Be situated near a big lake in the center of the city.  
- Eco-friendly grounds, roofs, and gardens that serve as learning spaces.  
- Air ventilation systems in place to monitor air quality,  
- Sustainable water treatment system | Cambridge Lower Secondary Checkpoints (included ESD topics and global issues)  
Green building features are mentioned in the curriculum |
| School 4 | Private school | - U-shaped design building  
- Green garden  
- Green school ground  
- Solar panel | Oxford or Cambridge check point  
National curriculum  
Green building features are not mentioned in the curriculum |
**APPENDIX 2**

**Interview questions**

1. **Question about teaching buildings for green schools along with explanation for it**

To start with, I would like to explain my definition of "teaching building" for sustainability.

It has features to immerse students in an environmentally friendly atmosphere, such as alternative forms of energy, the use of sustainable building materials and furniture, increased day lighting, green school grounds, a green roof, or a learning garden. Or any outdoor place that you can teach at school.

Have you ever noticed these features? How do you know about these features? (School tour, colleagues)

How does your school use these spaces for teaching and learning?"

2. **Questions about Education for Sustainable Development**

The researcher explained the similarity between the definition of ESD and the content of the program "Building Green Schools: For a Green Hanoi" (the content of the program was explained in the context of the study) because the teacher might have confusion about the term.

To what extent do you think your teaching has included ESD?

3. **Give an example of a lesson that uses green building features for teaching ESD.**

What did you do to include the green building features in the lesson about ESD? What was the topic of the lesson? What features did you use? What was the outcome of it? How did the student react? What were the advantages and disadvantages that you could find? What improvements did you make or suggest for improving that teaching method?

4. **Questions about planning for ESD with green building features**

When planning a lesson that you must teach about sustainable values,
• What factors affect your decision to choose green building features for sustainability teaching?

• How can you raise the students’ interest when using "teaching buildings" as a learning space or learning tool?

• Do you use materials that you can use in these spaces for teaching?

• Rock, trees

• Waste management system

• Alternative energy

• Etc

Closing question: Thank you so much for your time! Do you have anything to add?