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Investigating visual communication design students' understanding of sustainability through design practices

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Abstract.
Knowledge and skills are essential components in promoting Sustainable Development Goals (SDGs), higher education institutions are expected to equip students with foundational competencies in sustainability. However, implementation remains disconnected from students in practice, risking a partial understanding of sustainability. This study conducts a qualitative case study with a research flow informed by the Practice-Based Research (PBR) framework to examine the relationship between Visual Communication Design (VCD) students' sustainability perceptions and their design outputs. Ten VCD students from the third and fifth semesters at a XYZ university were asked to design a digital sustainability campaign poster without direction toward any specific sustainability dimension. Reflections on this practice were collected through in-depth interviews to uncover their design rationale, which were then analyzed using comparative thematic analysis. The findings show that all participants spontaneously narrowed sustainability to the environmental dimension, translated into explicit visual strategies, and made prominent environmental claims, with minimal verification and unclear referencing. Personal reflection and empathy emerged as entry points for understanding, but without being grounded in in-depth research, they risk producing misleading claims. None of the participants were found to be familiar with the term greenwashing. The study concludes that students' design practices remain vulnerable to greenwashing risks due to an incomplete understanding of sustainability. This study recommends strengthening ethical literacy and information verification within sustainable design curriculum to produce substantively responsible Visual Communication Design graduates.
Keywords: Sustainable Development Goals, Visual Communication Design Students, Practice-Based Research, Sustainable Design, Greenwashing

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Introduction

In the 2030 Agenda for Sustainable Development, published by the United Nations in 2015, the 4.7 subgoal states that by 2030, all learners have acquired the knowledge and skills needed to promote sustainable development (Irfa & Lubis, 2024). However, according to the 2024 SDGs report published by the UN, progress on this particular goal has been slow since the agenda's inception. The report suggests an urgent need to implement sustainable practices in national education systems.

In accordance with the 4.7 subgoal of the SDGs, higher education institutions are expected to provide foundational green skills and more agile upskilling opportunities, and to integrate Education for Sustainable Development (ESD) across all degrees (Irfa & Lubis, 2024; SDSN Australia, 2025). However, if ESD is considered superficial, disconnected from the field of study, or implemented only

as part of the institution's sustainability efforts, it may lack students' motivation and understanding of sustainability as a complex issue (Hyytinen et al., 2023).

A minimal baseline understanding of sustainability may yield only partial implementation of sustainability. In an article published on the American Institute of Graphic Arts (AIGA) Eye on Design platform, Benedetta Crippa, a designer and lecturer at Konstfack University, argued that the exploration of sustainability in the design industry is rife with absurdities. Solutions often do not address all the symbolic, material, and structural aspects important to achieving sustainability (Miller, 2020). For example, in packaging designs, a solution may achieve visual and practical effectiveness yet remain environmentally unsustainable (Erlyana & Nadya, 2018). More broadly, prior studies indicate that waste management campaigns focus primarily on managing discarded waste. In contrast, effective reduction of littering and responsible waste practices requires greater engagement at the individual and societal levels (Chandra & Erlyana, 2025). These findings suggest that sustainability-focused design solutions often exhibit weaknesses in other dimensions, which may affect their sustainability value. Sustainability is generally understood as encompassing three interconnected dimensions of environmental, social, and economic, which should be considered collectively when assessing the sustainability of a practice or solution (Iverson, 2016).

Moreover, within the environmental dimension, as awareness of ecological issues has increased, green marketing practices and sustainable product innovation have become essential for industry practitioners (Djunaid & Vishnuvardhana, 2024). The partial implementation of sustainability can lead products, services, or businesses to fall into the category of greenwashing. Greenwashing is a marketing act of presenting products or services that align with environmental correctness or ecological consciousness, without actually implementing them, as they seem to be (Basso et al., 2023). Frequently, greenwashing is judged through the lens of visual communication. Green advertising serves as a primary mechanism in greenwashing by utilizing nature imagery to enhance consumers' perceptions of a brand's ecological responsibility (Ende et al., 2023). For example, according to Adfree Cities (2024) A LinkedIn advertisement by Lloyds Banking Group (see Figure 1) was banned due to its promotion of a strong "green" image, despite the bank's ongoing financing of fossil fuel projects.

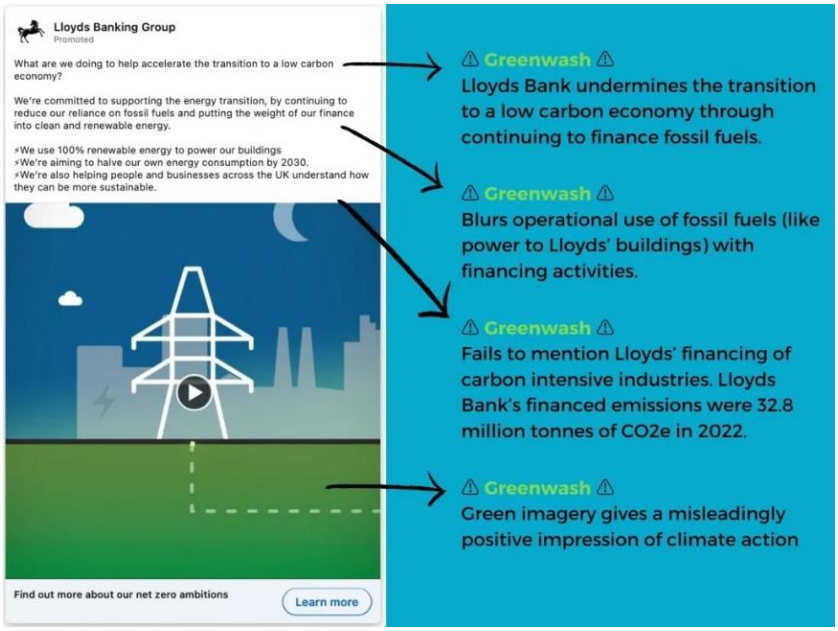


Figure 1. Lloyds Banking Group LinkedIn ad
Source: [Adfree Cities, 2024]

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This underscores the critical need for visual communication design students and graduates to develop competencies beyond aesthetic sensibilities. Multidisciplinary awareness must be broader, encompassing ethical, environmental, social, and communicative dimensions of sustainability. The experiences of visual communication design students and graduates will help interpret the client's requirements for the message to be delivered (Sansoni et al., 2023). Moreover, students are part of generations that will continue the sustainability efforts implemented until today (Veronica, 2025).

One of the challenges is the lack of awareness and education about sustainability among designers, production teams, and clients (Bonsu et al., 2020). For instance, although students understand that visual communication design may play a significant role in sustainable development, most are unaware of greenwashing and its relationship to visual communication design (Sansoni et al., 2023). This suggests that students are familiar with the term "sustainability," but the formal introduction of the subject is still unevenly implemented.

Higher education institutions are one of the key players in shaping and supporting the future of sustainable development (Handayani et al., 2024; Hyytinen et al., 2023; Kohl et al., 2022). Particularly, because of their ability to scientifically research and develop models for sustainable approaches, they also influence policies (Kohl et al., 2022). Students are also a crucial part of higher education. By deepening their understanding of the complexity of sustainability, students may develop greater interest in contributing to sustainability-related issues while strengthening their critical capacity to explore and develop more sustainable solutions. Therefore, sustainability must be integrated into all design practices, and the curriculum must be planned and positioned in accordance with current industry practices (Faludi et al., 2023). For now, the curriculum is considered overly technical and commercial, lacking a realistic dimension of sustainability (Bucio-Gutierrez et al., 2025). To develop an effective, sustainable design curriculum, it is important to understand students' current beliefs, perceptions, behaviors, and skills regarding sustainability (Hyytinen et al., 2023; SDSN Australia, 2025).

However, there remains minimal literature on design students' perceptions and practices regarding sustainability (Chellappa & Rohatgi, 2025; Micklethwaite, 2022; Sansoni et al., 2023). The existing studies focus on understanding students' perceptions through collected questionnaires (Chellappa & Rohatgi, 2025; Sansoni et al., 2023) and understanding students' learning experiences by reviewing the curriculum structures and approaches (Micklethwaite, 2022). Current literature has not yet explored how students' perceptions are incorporated into design practices, as design outputs are considered the final act of knowledge communication (Skains, 2024). Furthermore, the applied methods in prior studies did not explore the process of creation or how the internal thoughts, emotions, and experiences of students affect outcomes. Without such understanding, sustainability education may not adequately address the ways in which students construct and communicate sustainability through design. A superficial understanding of sustainability may lead students to reproduce simplified environmental messages without critically examining the complexity or validity of the claims they communicate, potentially increasing the risk of misleading sustainability communication or greenwashing.

Addressing this gap, this study contributes by examining the relationship between students' sustainability perceptions and their design outcomes through a practice-oriented approach, revealing how sustainability is interpreted, negotiated, and materialized during the design process. This study aims to examine the reality of sustainability practices among visual communication design students, particularly by understanding how students' perceptions shape creative decisions before institutional intervention. The identified gap between students' perceptions and practices may serve as one consideration in evaluating the effectiveness of existing sustainability education strategies. Analysis of the visual outputs may also contribute to the development of class materials, learning activities, and project briefs that encourage more informed design approaches to sustainability-related issues, while helping identify the knowledge, research, and critical considerations that students need to prepare before engaging in the design process. Combined, these insights may provide a foundation for developing learning approaches that focus not solely on academic outcomes but also support students'

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meaningful engagement with sustainability issues and reduce their vulnerability to potential greenwashing risks.

Method

The overall methodological approach of this study is a qualitative case study. The research subjects are VCD students, while the primary research objects are their sustainability-related design artifacts, supported by interview data. However, the research flow was adapted from the principles of Practice-Based Research (PBR) because the relationship between the creative process and the resulting artifact is important to this study. This positioning rests on the premise that creative practice generates tacit knowledge, as decisions and understandings emerged through materials engagement and the activities in the making, and these are not always fully articulable through purely discursive methods (Gaver et al., 2022; Vega et al., 2023). Creative practice can also contribute to learning through changes in learners' mental representations (Venkatesh, 2021). This study therefore examines students' design artifacts as manifestations of their design thinking and decision-making processes. In this context, design outputs are treated as material manifestations of participants' understanding and creative decisions, reflecting how abstract perceptions are translated into tangible visual outcomes. Therefore, through the implemented methodology, this study explores students' reflections as they are expressed through the design process and its resulting artifacts.

The research context is limited to a single private university in Indonesia (focused on XYZ University), thus categorizing it as a single case study. This limitation is intended to maintain the research focus on the practices of Visual Communication Design (VCD) students in responding to sustainability issues. XYZ University's VCD program frequently incorporates sustainable design as a topic across multiple courses, with its prevalence increasing in higher-semester courses, while maintaining a strong industry orientation.

The study purposively selected ten VCD students from the third and fifth semesters. These semesters capture intermediate stages of the curriculum, where students have acquired foundational design principles but are still developing conceptual and critical frameworks. Within each semester, students with mid-range GPAs were purposively selected to represent average academic performance, rather than exceptional or underperforming cases (Geçer et al., 2023). This approach allowed the study to focus on students with relatively typical academic performance while allowing curriculum stage to vary. This sample size is considered adequate given the narrow and specific aim of the study, the relatively homogeneous participant profile within a single institutional context, and the depth of dialogue enabled by participants discussing their own design work directly, factors that collectively support sufficient information power despite the small sample (Malterud et al., 2016).

The research flow, as shown in Figure 2, is adapted from the PBR framework (Skains, 2024), which includes identifying research issues, formulating research questions, conducting the practice, analyzing and reflecting on the practice results, and synthesizing the contribution to knowledge. However, as this study is PBR-informed and the researcher did not serve as the practitioner, the stage of "conducting the practice" is represented through the collection of students' design artifacts. Furthermore, reflection was primarily undertaken by participants through elicited interviews, whereas analytical interpretation was performed by the researcher using thematic coding and artifact mapping.

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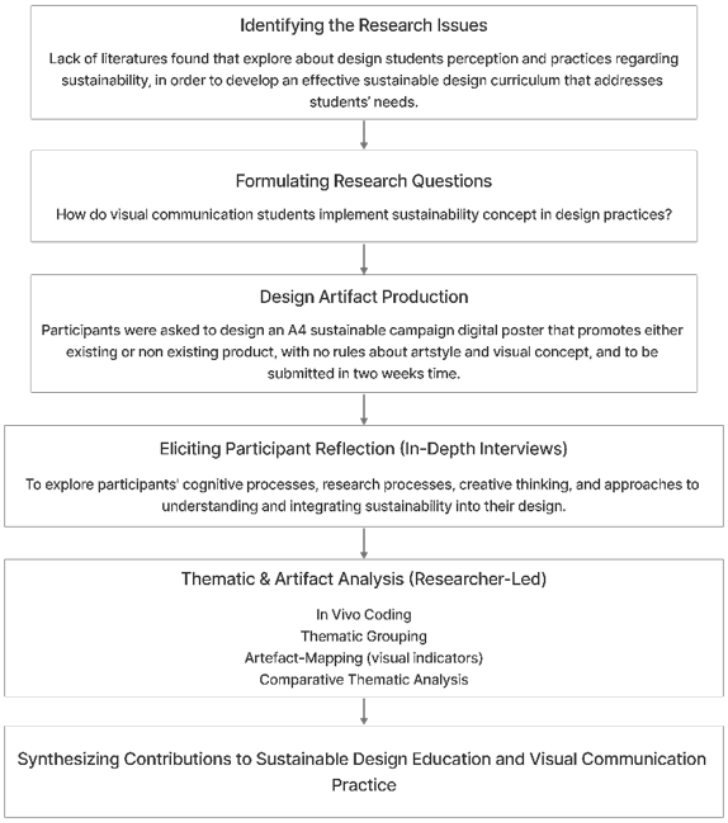


Figure 2. Adapted PBR stages
Source: [Created by Author]

In the first stage of data collection, participants were instructed to design a digital sustainability poster. The poster was required to be in A4 format and to be part of a sustainability campaign for a specific product. The design task provided students with a broad sustainability-related brief and did not prescribe a particular sustainability dimension or require them to address environmental sustainability specifically. Students were therefore given the opportunity to interpret sustainability according to their own understanding and translate that interpretation into a visual communication artifact. Participants were free to choose any product, ranging from real market brands to a self-created one. The visual style and the poster concept are also non-prescriptive, allowing participants to explore and align their designs with their chosen product. This task was designed to simulate an industry context, which required designers to produce visual solutions based on client needs. The project was conducted independently over two weeks outside of scheduled instruction and remained separate from academic assignments. This approach aimed to mirror authentic design workflows, allowing participants sufficient time to conduct research and explore various subthemes. The primary artifacts collected were digital posters, supplemented by two or three design sketches and explanations of the design to provide supporting context.

After the artifacts were collected, in-depth interviews were conducted individually through Zoom meetings using a semi-structured interview format to explore participants' thinking processes, research processes, creative thinking, and approaches to understanding and integrating sustainability into their designs. During the interviews, participants were also asked about their knowledge of greenwashing. When participants indicated that they were not familiar with the term, a brief explanation of greenwashing, including an example, was provided. Participants were then asked to reflect on their designs in relation to the potential for greenwashing or misleading sustainability claims.

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This was done to explore the extent to which students understood and were conscious of the potential consequences of their design decisions.

The interviews were recorded with the participants' consent. The recorded interviews were transcribed and coded in vivo to reflect the participants' ideas as closely as possible to how they expressed them. The codes were then categorized into themes to establish connections between the identified ideas. The interview data were subsequently translated into English for the purpose of this manuscript.

A comparative thematic analysis was conducted between the themes identified from the interviews and the visual indications found in the design artifacts. Visual indications refer to visual elements, composition, typography, color, imagery, textual claims, and other features relevant to the themes identified from the interviews. The purpose of the comparison was to identify alignments, tensions, and gaps between participants' stated meanings and their embodied design practices. The posters were also examined visually to identify similar visual strategies implemented across the artifacts based on design principles, composition, and visual styles. The resulting patterns and comparisons constitute the analytical core of this study and aim to provide insights for enhancing sustainable design education.

Potential greenwashing risk was not identified solely based on the presence of environmental visual elements. Instead, the analysis considered the relationship between environmental claims, their visual representation, and the availability of supporting information or evidence. Claims were examined for whether they were sufficiently specific, substantiated, and consistent with available information, while visual representations were considered where they could create ambiguous or potentially misleading environmental impressions. Accordingly, this study refers to potential vulnerability to greenwashing rather than determining that participants engaged in greenwashing practices.

Results and Discussion

Figure 3 shows all ten posters designed by participants in accordance with the instructions. These posters are not arranged in a specific order, as the purpose is to support the visual analysis of the artifacts in Table 1. Table 1 summarizes the thematic analysis results from the interview data, the keywords used to develop themes, and the analytical interpretation of the comparative findings.

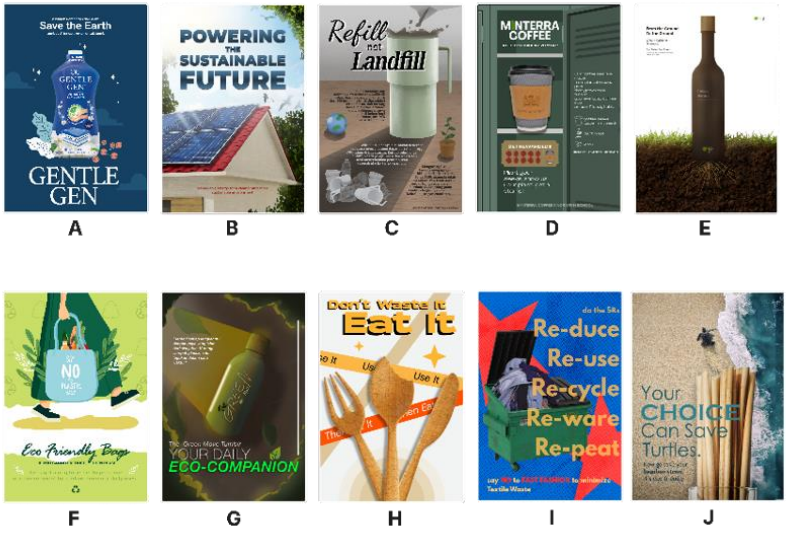


Figure 3. Sustainable campaign posters that have been designed by participants
Source: [Author's Documentation]

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Table 1. Results of thematic comparative analysis of interview data and artifacts.

Themes (According to Interviews)	Keywords (Interviews)	Indications in Artifacts (Poster)	Comparative Interpretation
Digital platforms work as the main source for identifying sustainability issues	• Google • Pinterest • ChatGPT • TikTok	Poster C in Figure 3 includes data source information in the form of an institution or organization name.	Generally, the poster design does not explicitly identify sources of inspiration or references. The source is identified only when the participant explicitly includes it in the data explanation of an infographic-like poster.
Internalization of sustainability as the starting point of conceptualization	• Lived experience • Daily life • Things I like	The use of "you, your" pronouns and the word "daily" in posters D, F, G, and J.	The textual sustainability message is narrating the impression of relatability as part of designers' empathy.
Explicit visual strategies in communicating environmental messages	• Clean • Natural • Earth • Highlight • Center	Visual composition with center alignment and product as focal point in posters A, B, E, F, G, and H. Earthtone color palette domination in posters C, D, E, F, G, H, and J. The claim for a sustainable product is clearly stated and prominently positioned within the visual hierarchy in posters A, D, E, F, G, and J. Visualization of objects employs a realist or semi-realist approach, as evident in posters A, H, I, and J. Sustainability icon or symbol usage in posters D, F, and G.	Participants understand that, to communicate the sustainability message efficiently, posters must be designed straightforwardly. This idea is achieved through visual elements typically associated with nature or the earth. All posters are implementing this idea through different approaches.
Sustainability is about the involvement in extending a product's lifecycle.	• Single-use product • Recycle • After use	Visual narration through the layout composition that aligns several elements to create an invisible line or to look connected, as can be seen in posters E and J.	Most posters suggest an alternative product choice with a longer life cycle. Alignment is used to implicitly communicate how the promoted product sustains other elements in nature.
VCD students' awareness and uncertainty towards greenwashing	• Never heard of • Must research • Part of the work • The main product can be misleading	Misspelling in poster I. Ambiguous visualization of the product, as can be seen in posters D and F.	The research conducted by participants cannot guarantee that the posters produced are fully free of greenwashing.

Source: [Created by the author]

Students' understanding of sustainability and environmental visual communication strategies

Although the design brief did not specify an environmental dimension of sustainability, all participants independently developed posters addressing environmental concerns. The topics represented in the posters are motivated by the objective to persuade target audiences, particularly younger generations, to increase their use of products with longer lifecycles. These are reflected on how most of the communicated message is emphasized by inviting audiences through a claim about a more

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environmentally friendly product. This indicates that participants predominantly understand sustainability within the environmental dimension.

"...maksudnya kayak your choices itu bisa memengaruhi apa yang akan berada dalam ekosistem sekitar, misalnya di laut ataupun di daratan." (...like, I mean, your choices can affect what ends up in the surrounding ecosystem, like in the ocean or on land...) – Participant J, Semester 3

"Lebih ke pengurangan limbah dan aftermath setelah penggunaan itu tuh kita juga bisa pikirkan lagi." (It's more about waste reduction, and the aftermath after use is also something we can think about again.) – Participant H, Semester 3

This finding is significant because it reflects how students operationalized the broad concept of sustainability when translating it into a concrete design task. Rather than treating sustainability as encompassing multiple interconnected dimensions, their visual interpretations were concentrated on environmental protection and ecological concerns. This was also reflected in the visual communication strategies employed by the participants. Most participants employed explicit environmental visual communication strategies, such as positioning green products and ecological messages as central focal points, using environmentally associated visual elements, and applying earth- and green-colored palettes. Figure 4 illustrates the identified visual communication strategies implemented by the participants, including a visual narration strategy identified through the interviews, in which some participants sought to connect visual elements through lines within the poster.

"Kalau misalkan udah habis terus ditanam, dia bisa tumbuh jadi pohon. Akar ini juga melambangkan manfaat dari produknya itu sendiri, di mana dia menguatkan akar rambut." (...If it's used and then planted, it can grow into a tree. The roots also symbolize the benefit of the product itself, where it strengthens hair roots...) - Participant E, semester 5



Figure 4. Identified visual communication strategies in participants' posters
Source: [Author's Documentation]

Furthermore, according to some participants, minimalist and clean visual composition creates honest and environmentally positive impressions. This has also been a popular concept in communicating ecological messages in the visual communication design industry (Gumber, 2023; Liu, 2025; Qian, 2025; Wibowo & Zainudin, 2024). The characteristics include a limited color palette, bold typography (e.g., sans-serif in large type), and a dominant use of white space in the composition

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(Gumber, 2023; Liu, 2025; Wibowo & Zainudin, 2024). However, given these characteristics, most participants' posters cannot be classified as fully minimalist. Not all characteristics are found together in every poster. For example, in Figure 3, poster B employs bold, sans-serif typography; however, it is visually dense, with minimal whitespace. Another example is from poster E. Although the whitespace is considered wide and the color palette is limited to greens and browns, the applied typography is a small sans-serif. These examples indicate a distinction between participants' conceptual understanding of minimalism and its formal visual implementation. For participants, minimalism was primarily associated with straightforward communication and the removal of irrelevant elements rather than with a specific visual style or set of formal characteristics. This suggests that participants recognized minimalism primarily as a communicative principle, while their application of the concept did not consistently correspond to the formal characteristics commonly associated with minimalist visual composition.

Taken together, the findings on how students understood sustainability and implemented environmental visual communication strategies indicate a distinction between the broader conceptual definition of sustainability and how participants operationalized it in their design practices. While sustainability encompasses multiple interconnected dimensions, participants predominantly associated it with environmental protection and ecological concerns. Similarly, their understanding of visual strategies such as minimalism was primarily based on their perceived communicative function rather than on the formal visual characteristics associated with the style. These findings highlight the importance of strengthening students' understanding of sustainability dimensions and the relationship between visual form, composition, and the messages or meanings constructed through them when developing sustainability communication strategies. Such understanding can support more deliberate decisions regarding appropriate visual approaches for communicating sustainability.

Students' Current Practices and Their Implications for Potential Greenwashing Risks

Across interviews, it is found that all participants use digital platforms such as search engines, generative AI, and social media at the first stage of their research process. The objective was to validate the sustainability issues to explore and identify design inspirations. The interview data suggest that participants either identify sustainability issues online and internalize them into their daily lives, or vice versa.

"Saya langsung ke ChatGPT untuk nyari-nyari produk sustainable yang cocok…Terus, saya langsung research juga di Pinterest gimana ambil-ambil referensi" (I went straight to ChatGPT to look for suitable sustainable products... Then, I also went straight to Pinterest to research and pull references.) – Participant E, semester 5

"Lihat-lihat permasalahan tentang sustainability di koran-koran, Kompas, di IG, di TikTok…."(I looked into sustainability issues in newspapers, Kompas, on IG, on TikTok….) - Participant J, Semester 3

"…dari situ aku pikir apa yang aku suka…terus aku lihat-lihat dari Google riset-risetnya gimana caranya biar aku juga bisa ngelakuin itu kehidupan aku sehari-hari. Karena beberapa baju aku pun semuanya thrifting." (...from there I thought about what I like... then I looked into research on Google, how I could actually do that in my everyday life. Some of my clothes are all thrifted too.) – Participant I, Semester 3

The sources of internet references in most posters are not explicitly identifiable. In an advertisement campaign poster, the source of information is rarely visible. However, it is common to find tags or additional information at the end of the poster (commonly used in the bottom-right corner for printed posters), such as a logo, tagline, website, location, telephone number, and disclaimer (Hagen & Golombisky, 2025). According to the same literature, tags are important elements of advertising, as they serve as secondary reference points for audiences after viewing the poster. Among the participants' posters, only one uses an infographic approach that incorporates tags into the design (see Figure 5). This indicates that most posters were not designed to enable tracing of the source of information or to direct audiences to the next action. Therefore, digital platforms are used in the

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research process solely to help participants' understanding of sustainability issues. In terms of its implications for visual outcomes, it has not been used to facilitate any action or further involvement.



Figure 5. One of the participants' posters that includes tags
Source: [Author's Documentation]

According to the International Organization for Standardization (ISO, 2016), when communicating environmental claims, verification is especially important because such claims are expected to be supported by competent and reliable evidence, while vague or unsubstantiated claims can contribute to misleading environmental communication. Moreover, ISO (2016) prohibits broad claims such as "environmentally friendly," "earth friendly," and "green," as well as the use of specific symbols without verifying compliance with applicable requirements. Specifically, claims of sustainability achievement are prohibited because the parameters for determining sustainability are still under study. However, most participants' posters applied broad environmental messages through low verbal anchoring (Bünzli & Eppler, 2024). In particular, most posters did not provide sufficient information to explain or substantiate the environmentally sustainable propositions being communicated.

For example, in Poster F, the copywriting reads, "Say no to plastic bags," and "Eco-friendly bags. If you cannot reduce, then reuse." Although the intended persuasion to discourage the use of plastic bags is clear, the verbal text explaining what makes the so-called "eco-friendly bags" more sustainable cannot be found. This may create a gap or ambiguity in audience interpretation, as the environmental proposition is presented without sufficient information to explain its basis. Similarly, the proposition of reusing may be interpreted as suggesting that simply reusing any bag would make it environmentally friendly. While such an interpretation was not directly tested among audiences in this study, the absence of further explanation leaves the environmental proposition open to such ambiguity. This finding highlights the importance of an approach that develops students' awareness and sensitivity toward conducting deeper research, not only for design purposes but also to consider the ethical and legal implications of communicating complex and sensitive issues such as sustainability.

The need for deeper research and verification is also supported by the findings in Figure 6 and Figure 7. In Figure 6, poster E, which employed visual narration in its design, is identified as conveying inaccurate claims. The illustrated product is from the Caffeine Shampoo line, with the claim that the packaging can be planted and will grow into a tree. However, upon further investigation, it was found that the O'right packaging that can be planted is from a different product line, the Recoffee line, and that the packaging design of the claimed product differs. Furthermore, as can be seen in Figure 7, one of the posters contains an illustration of a seed paper sleeve that can be planted and grown into

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peppermint. According to Marisa & Astutik (2024), seed paper is produced by embedding seeds into the paper, resulting in a coarse and uneven texture. However, the coffee sleeve illustration did not represent this characteristic of seed paper. Combined with the color that is sufficiently brown to resemble kraft paper, a common material used in coffee sleeves, this may create ambiguity in the visual representation of the communicated message.

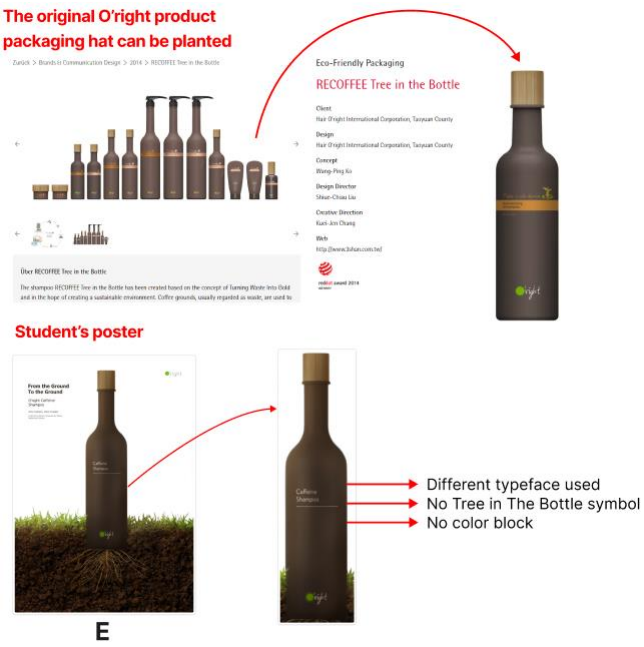


Figure 6. Comparison of the illustrated environmentally claimed product in student's poster and the original product
Source: [Author's Documentation]



Figure 7. Comparison of the illustrated seed paper cup sleeves in student's poster and the real seed paper cup found in the market
Source: [Author's Documentation]

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Combined with the explicit environmental visual communication strategies implemented by most participants, these practices may be highly vulnerable to greenwashing risks. Many studies have found that the use of natural color palettes or green visual elements is often associated with greenwashing practices, as they can effectively elevate audiences' positive perceptions of advertisements or brands (Basso et al., 2023; Ende et al., 2023; Fella & Bausa, 2024; Kostan & Salendu, 2020). The implementation of minimalist concepts may also create potential for oversimplification (Gumber, 2023). Without sufficient research and verification to substantiate the environmental messages communicated through the designs, such visual strategies may contribute to misconceptions, misunderstandings, or misperceptions regarding the intended messages and the actual environmental benefits being communicated. Consequently, designers may become vulnerable to unintentionally communicating or supporting unsubstantiated environmental claims. Therefore, it is important for visual communication designers to critically verify the authenticity of certifications and sustainability claims incorporated in the designs.

Students' Empathy and Reflections in Sustainability-Related Design Practices

Generally, in the process of understanding environmental sustainability problems, participants tend to find connections between the sustainability issues they identified and their daily experiences. This is also reflected in how participants communicate their messages, through messages that sound personal and direct. By using the "you" pronoun in an advertisement, participants try to connect and engage with audiences (Laksana et al., 2025). It directly involves audiences in the communication, resulting in internalization of the accepted message (Cui & Zhao, 2014). This practice can be linked to how empathy is applied during the process of creation and as a medium for communication (Wang & Hwang, 2014), in which designers seek to position themselves in audiences' positions, as if they were facing the same issue. This empathic process arises from participants' personal reflections that are translated into visual communication strategies. Participants did not empathize with audiences by analyzing their characteristics; rather, they relied on personal internalization, which led them to assume that it might affect audiences in the same way.

."ada quotes yang saya taruh di sini, terus juga tulisannya adalah your daily eco companion. Jadi, benar-benar, saya merasa kalau dengan saya buat poster ini, orang bisa merasa tergerak untuk pakai produk ini." (…so there's a quote I put here, and the text also says "your daily eco companion." So honestly, I feel like by making this poster, people could feel motivated to use this product) - Participant G, semester 3

This suggests that personal reflection can function as an entry point for students to engage with complex sustainability issues and translate their understanding into communication intended to influence others. However, because this process is primarily grounded in participants' own experiences, it may also lead to assumptions about how audiences will perceive or respond to the communicated message. Therefore, personal reflection and empathy can support students' engagement with sustainability-related design practices, but may benefit from being complemented by research into the intended audience and the broader context of the sustainability issue.

Across the interviews, when asked about greenwashing, none of the participants were familiar with the definition of the term. After receiving a brief explanation of greenwashing and an example, participants were asked to reconsider whether their designs had the potential to communicate misleading environmental claims. Most semester 3 participants expressed doubts about their designs and identified the product materials as a potential source of greenwashing. Furthermore, participants across semesters recognized the need for designers not only to receive project briefs but also to conduct in-depth research and avoid overclaiming when communicating sustainability-related issues.

This response indicates that although participants were initially unfamiliar with the concept of greenwashing, they demonstrated the ability to critically reconsider their design practices when provided with a framework for understanding potential misleading environmental communication. For example, Participant H reconsidered the sustainability of the edible cutlery beyond its final product

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and reflected on the environmental implications of its manufacturing process. In contrast, Participant C reconsidered the environmental claim in their design but did not identify the same potential concern.

"Setelah mendengar term greenwashing, saya kembali memikirkan secara flow produksi dari pembuatan edible cutleries ini kan pasti juga perlu manufaktur juga ya… takutnya itu selama tahap produksi ini walaupun hasil akhir produknya sustain tapi dalam pembuatannya itu limbahnya itu tuh nggak sustain." (After hearing the term greenwashing, I started rethinking the production flow of making these edible cutleries. Like, it definitely needs a manufacturing process too… and I'm worried that even if the final product is sustainable, the waste generated during the production stage itself might not be sustainable.) — Participant H, semester 3

"Kayaknya nggak, soalnya aku cuma nekenin tentang penggunaan barang yang dapat digunakan, yang dapat di-reuse." (I don't think so, because I was only emphasizing the use of items that can be used, that can be reused) — Participant C, semester 5

These responses suggest that students' reflective capacity can be activated and deepened when they are introduced to concepts that provide a framework for critically examining their own design decisions. The responses also suggest possible variation in the depth of reflection across participants from different semesters, although this study does not provide sufficient evidence to establish a developmental difference.

Overall, these findings indicate that students' capacity for personal reflection and empathy can provide a strong foundation for engaging with complex issues such as sustainability. However, this capacity needs to be supported by grounded research and verification. Personal reflection can help students establish an initial connection with a sustainability issue and consider how to communicate it to others, while research and verification can extend this reflection beyond personal assumptions by providing a basis for understanding the issue, the audience, and the environmental claims being communicated. Thus, sustainability-oriented learning may benefit from approaches that do not only encourage students to empathize and reflect, but also guide them in grounding those reflections and design decisions in reliable information and evidence.

Conclusion

Through this study, it is found that a key gap in Visual Communication Design students' perceptions and practices lies in the lack of in-depth research and verification. This may contribute to a partial understanding of sustainability as a complex and multidimensional issue, as well as to design practices that are not sufficiently grounded in evidence or aligned with the intended purposes of sustainability communication. Consequently, these conditions may increase students' vulnerability to potential greenwashing risks.

However, this study is limited to a single case study at a single university, with a small number of participants. These samples cannot represent the entire population of visual communication design students, who may exhibit different design practices. The conducted practice-oriented approach did not directly observe how the designs were created. Information about factors influencing designs was collected only through interviews. This limits the ability to capture real-time decision-making and spontaneous design actions. Furthermore, the research findings remain based on a single type of visual communication medium, and the given design task was only a simulation that may not really capture all the corresponding factors in the reality of a professional industry context.

Further research is needed to examine in depth how students' backgrounds influence their perceptions and practices, as can be seen through the findings that the reflections might be different in different semesters. It is also important to understand visual communication design students' research process, a study on whether the current learning approach in sustainable design education promotes the construction of students' sensibility and awareness to research deeply about the

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complex dimensions of sustainability. There is also a need to examine visual communication designers' involvement in greenwashing practices and the ethical considerations when they are tasked with design projects that include misleading information.

The study concludes that current visual communication design students' practices remain vulnerable to potential greenwashing risks, mainly because sustainability is a complex issue that may not yet be fully understood across its different dimensions and disciplinary perspectives. This indicates a need to further develop sustainable design learning approaches that emphasize in-depth research and strengthen students' sensitivity to the importance of verification throughout the design process. Such learning approaches may also build on students' existing capabilities to reflect on their design decisions and empathize with their audiences, while encouraging more critical and responsible engagement with sustainability-related issues.

Declarations

Artificial Intelligence Use Statement

ChatGPT was used to refine the wording and improve the clarity of the authors' original writing in this manuscript. It was used alongside Grammarly for language editing purposes.

Author Contributions Statement

Indira Febriany: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Visualization, Writing Original Draft, and Writing Review & Editing.
Dita Apriliani: Conceptualization, Data Curation, Funding Acquisition, Investigation, Methodology, Project Administration, Validation, and Writing Review & Editing.
Celine Marcella: Project Administration

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Conflict of Interest / Competing Interests Statement

The authors declare that there are no financial, professional, institutional, or personal interests that could have influenced the research or publication of this manuscript.

Ethical Approval / Ethical Compliance Statement

This study involved low-risk educational research and did not require formal ethical clearance under the applicable institutional procedures. The university and participant identities were anonymized. Participants were informed about the purpose and procedures of the study, and informed consent was obtained prior to data collection. Moreover, the collected data were used solely for research purposes.

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