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With nature in mind: 'Green metaphors' as an approach to reflect environmental concerns and awareness in landscape design

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Abstract

The human-environment relationship forms the philosophical foundation of landscape architecture. To move beyond the common dualistic human-environment thinking in environmental design education, exploring and highlighting new ideas is important and necessary. A caring sensitivity and a change in awareness of our responsibilities are preconditions to creating these new ideas that will result in deeply responsive environmental designs. Here, responsibility includes ecological awareness and understanding interconnectedness. "Green metaphors" are results of such an awareness and understanding. Green metaphors in environmental design are accepted as an approach for reflecting environmental concern.

This study aims to understand how green metaphors are being used by landscape architecture students in design studio. One hundred and three poster presentations of senior students that explain the metaphorical thinking behind their design concept for a residential landscape design were analyzed in order to determine the frequency of green metaphors. Twenty-seven projects with green metaphors were analyzed in depth to understand the most emphasized issues in their approaches to the human-environment relationship.

1. Introduction

The human-environment relationship forms the philosophical foundation of landscape architecture. As a profession intervening in the environment, shaping and modifying it in order to create more affordable environments that satisfy users' needs and enhance human experience, where do we place nature in the spectrum of our professional responsibilities?

Since design always affects ecological processes, it has a necessary relationship with ecological science (Nassauer, 2002). Wenk (2002) criticizes design and planning professions for ignoring the possibility of creating landscapes as living instruments that address urban environmental issues. Landscape architects must understand nature and environmental issues, but the topics and the methods for how they should learn these topics is much less clear (Nassauer, 2002). Another issue is the common dualistic human-environment thinking in environmental design education: there remains a need to move beyond this dualistic thinking by exploring and highlighting new ideas. There is a tendency in environmental education to insist that every institution of higher education should make the cultivation of ecological intelligence an essential part of every student's learning experience (Heffernan, 2012).

Our era, in which the demand for solutions to environmental problems is increasing, witnesses the endeavors of humans who strive to develop alternative views and approaches that will alleviate, rather than compound, the environmental crisis. Along with many other professional disciplines, landscape architecture has a part in meeting these demands and joining these endeavors. Users are in demand of highly responsive environments, but are landscape architecture students being educated and instilled with the needed responsibility and knowledge to meet these demands? This paper aims to investigate, through design studio outcomes, what students learn in terms of knowledge, awareness, and applicability regarding the human-nature relationship and environmental issues during their education.

Design studio is accepted as one of the most important learning areas where environmental issues such as awareness, sustainability, conservation, eco-design, etc., can be discussed and practiced. For example, sustainability is a common environmental term that is used in design studios (Keumala et al., 2016; Kjøllesdal et al., 2014). However, this is a limited term that is considered with limited approaches in design studios; are design studios really qualified to create and develop essential awareness and sensitivity in students? Are there any alternative approaches? In this study, we focused on using metaphors in design studio and providing a new way for designers to gain a deep understand of environmental issues. Metaphors are common means for environmental designers to provide meaningful grounding for complex design undertakings. They are especially invaluable when the designer confronts novel situations and strives to share unfamiliar ideas. Metaphors can help designers displace old meanings, generate new patterns of enunciation, and bridge ideas that were formerly unrelated (Muller and Knudson, 2009). Muller (2006, p. 186) asks: "How might an architect's articulation of the design task evolve by borrowing from ecological understandings? What new sorts of architectural ecologies -of benefit to humans and non-humans- might result?" Casakin (2012) defines metaphorical reasoning as an educational approach that can play an important role in the design studio; metaphors are valuable problem-solving strategies and are suitable for improving design education. In this study with a similar approach, we analyzed landscape architecture students' ecology and nature-grounded metaphors that is "green metaphors" and, through these metaphors, we sought to understand students' approaches to environmental problems and their level of awareness. The concept of metaphors was used in a broader sense in the study in order to include design concepts with weak metaphorical thinking in the evaluation process in order to create a deeper understanding of the ecological approaches used by the students. Instead of design concepts, the emphasis on metaphor aims to highlight the inno-

vative and creative contributions of metaphors to design studios and to encourage their use in design education.

2. Landscape architecture design studio

The design studio is defined by Casakin (2012) as an educational environment where students are expected to acquire and integrate theoretical and practical knowledge; enhance their level of expertise and competence; grasp, present, and defend design ideas; acquire new techniques and skills; and form their own ideas and judgments through being exposed to a variety of views from their instructors, mostly in the form of the master-apprentice system.

Classes such as environmental/landscape/architectural design project based on design studio practice have been accepted as the most important part of the educational curriculum in schools of design (Casakin, 2004) and design studio has been seen as essential for design education (Johnson and Hill, 2002). The studio is based upon the educational philosophy of "learning by doing" and has developed both as a venue and as a pedagogical medium (Alon-Mozes, 2006). It is a dynamic and generative framework, in which faculty members guide students through the processes of discovery, analysis, idea generation, and proposal development (Johnson and Hill, 2002).

Project classes are mainly based on and conducted as design studios; in this context, landscape architecture curricula do not significantly differ from architectural studios, and therefore both disciplines share the same design methodologies (Gazvoda, 2002; Alon-Mozes, 2006). In most schools, as the student moves through the studio curriculum, the project types and scope increase in complexity. The level of performance in the studio is accepted as an indicator of mastery of specific skills, competencies, and domain knowledge at certain stages of the students' development (Curry, 2014). Within the scope of (Karadeniz Technical) University's Landscape Architecture Department curricula, the same approach (increases in complexity) mentioned above has been ef-

fective in structuring the design studio classes. In this context, first-semester design studio classes begin with the Basic Design Principles and Project class and the curriculum includes the Environmental Design Project (EDP) I, II, III, IV, V, and VI classes in the following semesters. The studio classes proceed from the abstract to the concrete, from less complexity to greater complexity in terms of the design subject, area, and user types. The studio classes are preconditioned, that is, if a student fails any of the EDP classes, they will not be able to take the next EDP class. Students receive one-on-one criticism from the project tutors in the studio environment for two days a week. Students can also criticize each other during presentations and discussions in which the whole class participates. With the increased complexity in the scope of projects, students are confronted with the task of transferring the knowledge gained from service classes to their projects. Thus, students are expected to reflect their studio experiences in the next project class and synthesize their theoretical knowledge from other classes in their projects (Mumcu et al., 2018).

3. Combining ecology and design: Green metaphors

Design studio, according to Johnson and Hill (2002), is a prime vehicle for students to strategically engage ecological knowledge within the context of a cultural problem. Nassauer (2002) advises that a landscape architecture curriculum that builds a clearer relationship with ecology should sharpen – not blur – students' understanding of design as cultural action. Johnson and Hill (2002) state that established design professions have increasingly recognized the need for ecological awareness and responsibility, and have begun to adopt ecological guidelines for professional practice. Since design excellence must be judged by both aesthetic and ecological criteria, concerning design with art but not ecological criteria is ethically unacceptable in the fields of design. The decision to pursue ecological sustainability without art is also flawed, because art may be uniquely capable to reach human hearts and

minds (Johnson and Hill, 2002). In this context, the place of ecological approaches in design studio is important in terms of instilling these priorities in students. But are ecological approaches being applied relevantly, and how much are they being understood? For example, do ecological approaches in professional practices really reflect a deep respect for the beauty of life as Orr's work put forth who calls for responsible design in space and time, and in human and nonhuman terms (Johnson and Hill, 2002)? Referring to a transformation that is needed to move from design with nature to a design that includes humans in nature, Johnson and Hill (2002) ask: "How can we envision new relationships between science and art and ecology and design?" Based on the idea that metaphors are essential to imagining a future in which design and ecology enjoy a closer relationship, Johnson and Hill (2002) accept the role of metaphors in the language of landscape architecture. According to Muller and Knudson (2009), in efforts to make projects that address ecology effectively and that help to "improve our relationship with nature," architects must recognize the inherent predisposition toward metaphors in ecology. With such an approach, the efforts of designers can be viewed as both conceptualizing architecture in a more ecologically-oriented way and opportunistically thinking about ecological systems as an important part of the palette out of which designers construct and reconstruct the world. Architectures and ecologies become co-creative, overlapping, and enmeshed (Muller and Knudson, 2009). In this sense, metaphors can be useful tools at establishing innovative ideas for invoking responsibility and gaining awareness. They can assist in formulating problems afresh, allowing designers to solve them with greater sensitivity, intensity and effectiveness (Muller and Knudson, 2009). Kopnina (2016) defines metaphors as one of the crucial dimensions of environmental education and education for sustainable development. Also, Casakin (2006) suggests that training students in the use of metaphors can be considered particularly helpful in the design studio, as

they will contribute to an enhancement of design thinking capabilities and will yield a better understanding of the design process.

Metaphors are defined as cognitive strategies that are used to deal with design problems in order to define, restructure, and resolve them (Casakin, 2004; Hey et al., 2008). Using metaphors facilitates the generation of innovative solutions (Casakin, 2012) by allowing the designer to think unconventionally and encourage the application of novel ideas to design problems (Casakin, 2007). By juxtaposing the known with the unknown in an unusual way and creating comparisons with another concept or situation, metaphors help in understanding a design situation in terms of a remote concept not normally associated with design, and so enables the understanding of the design problem from different perspectives (Goncalves et al., 2014) and enhances design problem-solving (Casakin, 2012). Generally speaking, it can be said that the use of metaphors played a more significant role in the definition of a concept, (Casakin, 2004), they provide the designer with a starting point in the earlier stages of the design process, in which initial decisions are often difficult to make (Casakin, 2006). Metaphors have a powerful effect on changing and transforming a design ethos into a more ecologically sensitive one. This happens, Casakin (2004) explains, because when a metaphor becomes a part of a conceptual system it may modify it, change the designer's perception of a particular situation, and trigger new insights.

Muller (2009) states that as environmental design develops new metaphors, it also modifies its own culture; the emerging identity formation of architectural culture results in new designs. According to Muller (2009), in order to meet the need for the development of life-enhancing and ecologically sustainable living spaces, the idea of developing better-performing, less wasteful, and less toxic building assemblies is insufficient. Instead, designers must engage in a more fundamental reflection as to how design problems are to be expressed and to what extent the potential for environmental change

can be molded to new design expressions (Muller, 2009). In the contemporary world, which is characterized by daily reminders of the degradation of our natural surroundings, such awareness of metaphors as productive agents of change would seem to encourage the seeking of notions that lead to greater environmental atonement (Muller, 2009). Similarly, Nerlich (2012) defines metaphors as some of the most potent framing devices available in human language with reference to environmental discourse and politics. Since metaphors carry with them values, assumptions, visions and ideologies which shape thinking and acting, one has to be aware of their implications for social and economic policy (Nerlich, 2012).

A caring sensitivity and a change in awareness of our responsibilities are preconditions for creating these new ideas that will result in deeply responsive environmental designs. Here, responsibility includes ecological awareness and understanding interconnectedness. "Green metaphors" are results of such an awareness and understanding. Green metaphors in environmental design are accepted as an approach for reflecting environmental concern and believed to be productive agents of change in contemporary environmental design culture that encourage the seeking of notions that lead to greater human-environment harmony (Muller, 2009). As a kind of green metaphor, landscape-oriented metaphors reflect a larger cultural paradigm shift from human-centeredness to human-situatedness and can address the degradation of natural systems and the effacing of singular ecologies that characterize current development practices (Muller and Knudson, 2009). Successful landscape metaphors invoke environmental qualities and the goals of design undertakings, sensitize designers to their work and to the world, and prompt a manner of thought that seeks solutions to architectural problems in environmental settings and solutions to environmental problems in architectural configurations (Muller and Knudson, 2009). In particular, certain kinds of landscape metaphors are believed to be more likely to result in projects that

are truly sustainable and ecologically responsive and enable "deeply green" architectural innovations to occur. "Dynamically emulative" and "specifically interactive" landscape metaphors are of this kind, which will lead designers to a path of deeply green design thinking. While "dynamically emulative" landscape metaphors refer to the "infinitely variable and non-static" attributes of the landscape that inform design, a metaphor that depends upon an understanding of the ecological and climatic subtleties of a given place to engage a building with the landscape can be called "specifically interactive." Built landscapes that emulate those found in nature might be event-laden, dynamic yet supportive, and characterized by coherent complexity and luminous, ambient, and thermal richness (Muller and Knudson, 2009).

According to Dobrin (2010), the metaphor "green" has been adopted as a way of indicating environmentally conscious political positions. To "go green" implies active participation in environmentally or ecologically sound practices—it is to advocate environmental protection, to be attuned to nature. Green has been naturalized as a metaphoric representation of nature and environment (Dobrin, 2010). Examples of green metaphors can be found in literature: as the metaphor of ecologist G. E. Hutchinson for the landscape as an "ecological theatre, the living stage" (Johnson and Hill, 2002); environmental problems as "ozone hole" and "acid rain"; biodiversity as "the library of life"; forests as "the lungs of the Earth" (Väliverronen and Hellsten, 2002); architecture as "ecological niche", "organism" (Muller, 2009), minimal output of greenhouse gas emissions as "low carbon" or "clean energy" (Nerlich, 2012). Most environmental problems are not immediately apparent to the human observer—for example, the detection of ozone depletion or global climate change requires highly sensitive and sophisticated technical machinery, scientific theories, and mathematical models. Green metaphors help to make these terms become more imaginable and also evoke strong emotions (Väliverronen and Hellsten, 2002). For example, in the context of

climate change, the metaphor "low carbon diet" opens up the frame of losing weight and counting calories, and then transfers its connotations, values and expectations onto the issue of reducing carbon dioxide emissions. As in this example green metaphors can be used to shape expectations and visions of the future in an effort to affect social and political actions in the present (Nerlich, 2012).

In environmental design, by using green metaphors, architecture becomes a dynamic process rather than a fixed object, responsive to the environment, and an event to be activated (Muller, 2009). The IBN (Dutch) Institute for Nature Research in Wageningen, designed by the German firm Behnisch & Partner, is conceptualized as a complex organism and can be given as an example of a green metaphor. The building's design was aimed at creating a functional, user-friendly research facility that worked in harmony with nature, i.e., versatile and ecologically sound. The design does not dominate its rural setting, but embraces the landscape; all the workplaces are in direct contact with indoor and outdoor gardens. Two indoor gardens provide the focus for daily activities and function as informal meeting areas. Beyond this, they are an integral component of the building's energy concept in that they improve the performance of the external envelope (URL1). Each of the three office wings is situated between two of the gardens and is said to "grow between the gardens." The atria that are created serve as the offices' "lungs," providing warmth in winter and coolness in summer, thus enabling a dramatic downsizing of the heating system and obviating the need for air conditioning altogether. Because the greenhouse roofs provide a first layer of protection against the elements, the office facades become light and "porous" centers of sensation, a skin that actively and selectively absorbs and transmits (the wanted) and refracts and transforms (the unwanted). With offices that are facing and open to gardens, the atria become the Institute's social "heart," where scientists gather, conduct research, and confer (Fig. 1) (Muller, 2006). Through its incomplete, "weak formed" spatial configuration, the IBN is ever-adaptable to changing needs, to the disquiet of persistent animation within. Therefore, the IBN reflects a contemporary understanding of both "the unity of the organism, and the dynamic, interactive relationship that organisms have with their environments."

The goal of this essay is to provide an explanation for green metaphors in use by landscape architecture students in design studio, and relate this to the question of our relationship to nature that is at the heart of professional practice of landscape architecture. We ask whether using green metaphors is likely to result in projects that are truly sustainable and ecologically responsive. With a goal toward environmental sensitivity and awareness, landscape architecture students' use of green metaphors would seem inherently advantageous.

4. A case study: Green metaphors in students' residential landscape design projects

This study aims to understand how green metaphors are being used by landscape architecture students in

a) The plan of the IBN with three office wings and two inner gardens

b) The view of the IBN building from outside and its "porous skin"

c) The inner gardens of IBN building as the "lungs" and "social heart"

Figure 1. *IBN Nature Research Institute, Wageningen, the Netherlands (Behnisch & Partner, 1996) (URL1).*
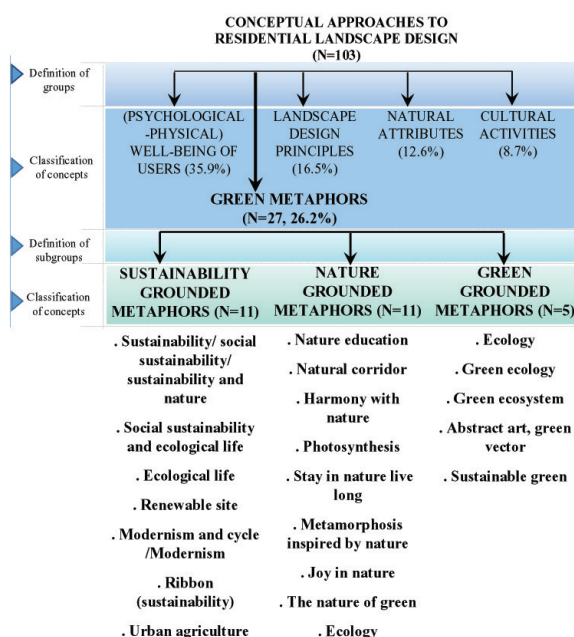
design studio. Through these metaphors a deep insight into students' human-environment relationship conceptualizations can be gained and new approaches to strengthen their conceptualizations can be developed. One hundred and three poster presentations of landscape architecture senior students that explain the metaphorical thinking of their design concepts for a residential landscape design were analyzed in order to determine the frequency of green metaphors.

The study was conducted in (Karadeniz Technical) University, Landscape Architecture Department. The student projects were all housing estate environmental designs from three different years and five different sites. The students' projects belonged to the EDP-VI class in the 7th semester, that is, the last of the design studios that are accompanied by a tutor within the scope of the curriculum. Although the design sites in the projects are from different locations, they are all gated communities that include 7-9 high-rise residential buildings and all are located in the Trabzon city centre. Therefore, they exhibit similar physical, ecological, and social characteristics. The projects included in this study were all conducted with the same studio approach, each of which consisted of 6-7 groups

of different tutors with 9-11 students in each group. While giving the design subject and the site, the students were not limited to adopting an ecological approach and the tutors also did not limit the conceptual approaches to a specific area. The students determined their conceptual approaches based on various findings as a result of their research and analysis within the scope of the design site and subject. In this latest project, students are expected to develop an advanced, creative, and powerful conceptual approach to the design problem. Advanced analysis of the site and users (with techniques such as GIS, SWOT, etc.), synthesis presentation, original scenario design, concept presentation, land use, sketches, plans, sections, views, planting design, general and technical detail solutions, CAD presentations, 3D modeling, models, and technical report stages are carried out in a 15-week period. However, in this study, the materials submitted in the project class were not used; instead, the poster presentations, which contained written and visual narratives prepared by the students as part of their homework, about their projects were used (Mumcu et al., 2018).

In context of Spatial Behavior class students were asked to prepare homework about their environmental design studio project (EDP-VI) of that term. The students were requested to explain their approaches in conceptual, formal and pragmatic dimensions and informed that the score from homework will comprise 50% of their final score thus encouraged to pay strict attention. There was no restriction that the students use written and visual materials related to their projects. They were free to prepare their projects as they wished in line with the titles given. They were not informed about the content of this research in order to prevent any influence on their representation. By doing so the number of students who considered and discussed environmental issues without prejudice was determined.

Content analysis method was adopted in the study. The written texts in the poster presentation that explained the conceptual approaches were analyzed in this context. Content analysis is a

Figure 2. The phases and results of content analyses; students' conceptual approaches and green metaphors.

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technique for systematically describing the form and content of a written or spoken material. This technique is described as suitable for any kind of material including publications, recorded interviews, and reports and so on. Content refers to the specific topic or themes in the material and quantification (expressing data in numbers) of these forms the basis of a content analysis (Sommer and Sommer, 2002). The explanations in presentations were evaluated and 27 of them that reflect a concern for environment were categorized in terms of their problem definition and approaches to landscape design. The others who used concepts unrelated to environmental issues or did not make any clear problem statements were excluded. The classification was carried out by a team of 5 landscape architects, all of whom were experienced in landscape design education, including the authors of this study. As a preliminary study, the authors read all the texts in the conceptual approach presentations and made preliminary assessments and identified the main conceptual topics. In the next stage, all the landscape architects in the team evaluated the same texts and classified them into predetermined groups. Each student's approach was separated into a specific group based on the majority vote of the evaluators. Then, for those who had an environmental approach, the first two stages were repeated; the authors determined the sub-conceptual topics and, through the evaluations of the team, the conceptual approaches with environmental concerns were classified (Fig. 2).

5. Results

Twenty-seven projects with green metaphors were analyzed in depth to understand the most emphasized issues in their approaches to the human-environment relationship. The categorization of 103 projects revealed five groups: (psychological-physical) well-being of users (35.9%), green metaphors (26.2%), landscape design principles (16.5%), natural attributes (12.6%), and cultural activities (8.7%) ($\chi^2=25,010$, 4 df, p<0.00) (Table 1). The statistical significance of the distribution indicated that the students' con-

Table 1. Classification and frequencies of students' design concepts.

Design Concepts	Frequency	Percent	Valid Percent	Cumulative Percent
Well-being of users	37	35,9	35,9	35,9
Landscape design principles	17	16,5	16,5	52,4
Natural attributes	13	12,6	12,6	65,0
Cultural activities	9	8,7	8,7	73,8
Green metaphors	**27**	**26,2**	**26,2**	100,0
Total	**103**	**100,0**	**100,0**	

ceptual approaches were not random; especially reflects the priority given to the health of users and environmental problems by students. Green/ecological approaches are common in student works, which reveals the significance level of such approaches for students. Furthermore, despite the fact that the natural attributes group reflects the attribution of the physical features (e.g., the sound of water, a leaf pattern, a rainbow) to spatial components, which are therefore treated as different from green metaphors, the frequency of natural attributes can also reflect the importance of nature with respect to students. Twenty-seven green metaphors found in this study were listed in Figure 2. These metaphors can be dealt with as two groups; metaphors that emphasize harmony with nature and

Figure 3. *Sustainability grounded design concepts and poster presentation samples.*

metaphors that emphasize the need for change. These two groups, which complete each other in essence, show parallelism with the discussions of current environmental issues. The most cited metaphors (green, nature, and sustainability) were discussed in detail.

5.1 Sustainability grounded metaphors

One of the most frequent concepts among the green metaphors was sustainability (N=11). The written explanations in the students' presentations that focused on this concept were generally more extensive than other groups

Table 2. Sustainability grounded metaphors; students' explanations of conceptual approaches presented in Figure 3.

Sample	Concept	Explanation
Fig. 3.1	Socially sustainable ecological life	The urban environment is getting more and more away from the natural environment and sustainability within the speed of daily life. The desire of the current investments to make a profit as soon as possible makes it impossible for the housing to be transformed according to the changing needs and demands of the people living in the city. As a result, our lifestyles are becoming increasingly distant from sustainability. It was aimed to establish an ecological and social settlement that considers social ties, natural environment and energy efficiency as a solution to the problems of housing estate production with the area to be designed.
Fig. 3.2	Sustainability and nature	Day by day with the speed of daily life, urban environments recede from natural environments and sustainability. Our lifestyles increasingly recede from sustainability. The aim of my design is to create a settlement that pays regard to social ties, natural environment, and energy productivity and sustainability in terms of ecological and social processes.
Fig. 3.3	Urban agriculture-vertical agriculture	As a result of the accelerating urban-rural interaction and the structural changes experienced in agriculture, implementing urban agriculture activities that play a dominant role in the nutrition of cities was aimed.
Fig. 3.4	Renewable site	The rain garden in the site, consists native plants of the region the rain water to be taken from the roofs was directly given to this garden. This rain water will be cleaned with plants that can live both in the water and in the absence of water and will be delivered to underground water resources in the city without being polluted.
Fig. 3.5	Modernism and cycle	Despite the negative effects of modernism on human and landscape, application of the more humane and ecological features of the postmodern approach to the project area are aimed. Despite modernism's attempt to slaughter nature, ignoring the topography-climate-landscape trilogy, the aim of the design is to recover the landscape as much as possible, to offer it to people at a reasonable level of capacity. Despite modernism's attempt to overthrow the traditional and vernacular, and the effort to put people into certain life style patterns, to regain the concept of neighborhood and proximity, to integrate people into the landscape, to take people out of certain life patterns through the human-landscape relationship are aimed.

and tended to include ecology-related terminology, such as relationships and cycles in the ecosystem. This may be an indication that the students are transferring information from their other classes on this subject. Sustainability grounded metaphors heavily emphasized environmental problems, depicting a humanity that recedes from natural life day by day, and set goals such as environmental restoration, conservation, and improving the quality of life. In addition, the approaches underlying the environmental problems, such as modernism and positivism, and alternative approaches, such as post-modernism, can be mentioned. Some students highlighted the social pillar of the sustainability term with an emphasis on neighborhood relations. Although the emphasis was on the degradation of nature, students used the term "sustainability" mainly in terms of nature's instrumental value and a force for humanity's good. These human-centred approaches have led students to explain the functional benefits that are often directed to users in residential design solutions (Fig. 3).

5.2. Green grounded metaphors

In this group, decreasing green areas, the peace that green and nature provide to humans and harmony with nature were heavily mentioned (N=5). Green is sometimes considered as a color and sometimes as nature itself; in particular, the peace effect of green color was emphasized. The problems caused by decreasing green spaces in human beings (and parallel to this, the need for more green spaces and peace) and the necessity of increasing green spaces were frequently mentioned. However, in general, the use of the green and nature concepts, alternately and equivalent with each other, is salient. Therefore, it can be said that students accepted "green" as referring to nature and used them interchangeably (Fig. 4). While the approaches focusing on the physical and spatial features such as the increase or predominance of green spaces in their designs were classified as green, design approaches that state human-nature relationship / harmony, the contribution of nature / natural features to human health were

classified into the title of nature.

5.3. Nature grounded metaphors

In this conceptual approach group, various features of current human-nature relationships, such as humanity distanced from natural life, disturbed human-nature harmony, new lifestyles away from a relationship with nature, or positive features of nature, such as renewal, metamorphosis, and flexibility, are discussed (N=11). The term "nature" was used in varied approaches; in some cases, feelings such as peace, comfort, and joy that nature provides to humans were mentioned, while others mentioned harmony, education, or natural forms such as valleys that point to the human-nature relationship. As in the case with green metaphors, the term "green" was frequently used with the term "nature"; green and nature were used alternately. Mainly, the instrumental value of nature was mentioned (Fig. 5). And design decisions about using color, smell, natural forms, different textures, using natural elements such as water, rock, creating topography in a natural way or mimicking morphological formations such as valleys in nature are discussed. In this context, the conceptual approaches in this group are generally distinguished from the green approaches mainly dealing with green spaces with their emphasis on natural characteristics (perceptual, emotional or physical).

6. Discussion

This study aims to understand the awareness and sensitivity levels of landscape architecture students that used green metaphors in their environmental design projects. In total, 27 housing estate landscape designs were analyzed in detail. The terms/words mainly used for naming metaphors were "green", "nature", and "sustainability". Especially, students used green and nature terms alternately and frequently; this reflects the fact that they accept these terms as interchangeable. Furthermore, green and sustainability terms more frequently dealt with their relationship with ecosystems and ecology. The analyses showed that the green metaphors were used with an anthropocentric approach that privileges users' needs and

Figure 4. *Green grounded design concepts and poster presentation samples.*

benefits, and focuses on improving life quality for them. The same tendency of university students was also found by Kopnina (2016), who determined that before taking an environmental ethics class, students discussed nature in economic terms, supporting the instrumental view of the environment. In this study, we found that even though students mentioned the wholeness of ecosystems and humans' harmony with
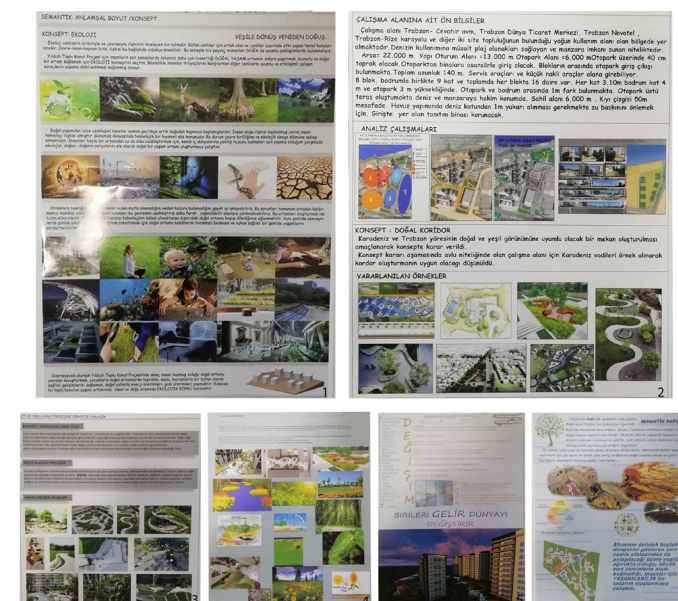

Figure 5. *Nature grounded design concepts and poster presentation samples.*

Table 3. *Green grounded metaphors; students' explanations of conceptual approaches presented in Figure 4.*

Sample	Concept	Explanation
Fig. 4.1	Green (ecology)	In order to give the city more natural increasingly green areas, the spaces are nested in green and nature. The idea is to help people live in harmony with nature, educating them and improving their skills. The design aims to give the feeling of being in the city life and at the same time intertwined with nature. With the idea that the people living in big cities would want to be away from the crowds and in the nature, the project tried to give more space to the green areas.
Fig. 4.2	Green ecosystem	In our era, humans increasingly degrade nature; our settlements are expanding into natural areas. As the natural world is being destroyed, humans' need for the peace provided by green and natural areas grows. The integration of natural life to humans' living style and designing green and in harmony with nature, in accordance with users' social needs, were goals for this site. In this direction, I tried to propose a solution that deals with the green, nature and peace together in line with the needs of the people.
Fig. 4.3	Green vector	The green color evokes the feeling of peace and is desired to be a part of people's lives so it is decided to use this color in the project. Creating spaces in green, to capture green harmony in spaces are aimed through the design. It is intended to make people feel the emotional dimensions of green as excitement, happiness, and visual beauty.
Fig. 4.4	Ecology (Return to green)	Natural habitats such as water gardens, fish ponds are created. The proposed design will be an area where blue and green will provide integrity. The continuity of the green spaces that start around the houses and continue all the way to the beach means peace and freshness to the people and the increase of the green. The continuity of the green areas will be promoted with the vertical planting.
Fig. 4.5	Sustainable green	In a world in which green areas are decreasing, humans should be familiar with green and water areas in order to support natural life.'

nature, they did not consider the processes and cycles in nature, and they did not consider ecosystems as webs of interactions between animate-inanimate and human-nonhuman beings. In fact, human cultures and ecosystems exist in a reciprocal relationship. To ignore this reciprocal relationship of human culture and ecosystems – or to ignore the fact that every landscape place, no matter how large or small, includes multiple species and biophysical processes that will be affected by human actions – turns away from a fundamental reality of the landscapes we share with other people and other species (Johnson and Hill, 2002).

Unfortunately, no design metaphors were found that were grounded in ecological analyses of the site and mentioned the benefits to nonhuman beings. This finding reveals the difficulty that students have, while reflecting the knowledge they gain in ecology and related classes onto design studio practices. Also, the need for interventions in design studio emerges. Johnson and Hill (2002) believe that landscape architects must collaborate more deeply with applied ecologists and find ways to interpret and apply new understandings from ecological science in physical planning and landscape design. Moreover, we must understand the implications of our work in order to consider both social equity and ecological sustainability.

Briefly, while the definitions and emphases of green metaphors referred to environmental problems, the suggested solutions and determined goals were shallow in terms of environmental responsibility, awareness, or sensitivity. The need for students to learn and think more deeply about environmental ethics is apparent. This finding encouraged researchers to analyze the proportion of environmental ethics-related classes in the curriculum. The curriculum of the department consists of 33 compulsory and 15 elective courses (URL-2). It was determined that there were no classes under the name of "environmental ethics" or simply "ethics." The content of the classes was also controlled based on the idea that the classes could indirectly indicate the subject. In the Landscape Ecology (2nd semester, compulsory) class, the relationship between landscape and ecology is taught; in the Spatial Behavior (4th semester, compulsory) class, changes in the human-environment (nature) relationship in the historical process, the Enlightenment Era, the effect of modernism-positivism, and alternative approaches (such as post-modernism and romanticism) are taught. The Sustainable Recreational Use Planning (5th semester, elective) class includes sustainability and the relationship between conservation and use, the Greenways (6th semester, elective) class teaches the concept of a greenway, why such a concept has emerged, and a

greenway's functions, whereas the National Park Management (7th semester, elective) class describes protected area management and planning.

There is no class on the concepts of environmental ethics and the role of landscape architects in the context of environmental ethics, and the information given is quite fragmented, unrelated, and incomplete. This demonstrates the reason why the students had such a fragmented understanding of environmental ethics in the context of the design studio, their human-centered understanding, and their lack of theoretical knowledge. Furthermore, a need is also revealed for innovative approaches in design studios that teach ways to reflect this knowledge in design decisions. Hough (2002) declares that the time has come for a shift in the definition of design: from an academic discipline that teaches students to impose their ideologies on the rest of society to the idea of the interdependence of life processes. However, most important is not teaching students how to consider ecological knowledge in the design process, providing students awareness and responsibility in terms of the environment and nature. It's especially important that they don't see humans as superior to nonhuman beings in nature, that they don't privilege humans in environmental design, and that they accept the intrinsic value of nonhuman beings and processes in nature prior to more deeply reflecting ecological knowledge in landscape design. As Paul et al. (2014, p.376) state, "Arguably perhaps, green sells well. But just by adding more green colors in an urban development master plan may not necessarily guarantee in achieving a sustainable green outcome".

7. Conclusion

As a profession intervening in the environment, shaping and modifying it in order to create more affordable environments that satisfy users' needs and enhance human experience, where do we place nature in the spectrum of our professional responsibilities? A caring sensitivity and a change in awareness of our responsibilities are preconditions to create new ideas, which will result in deeply responsive environmental

Table 4. *Nature grounded metaphors; students' explanations of conceptual approaches presented in Figure 5.*

Sample	Concept	Explanation
Fig. 5.1	Ecology	This design concept has been chosen in order to provide users a natural living environment in which they will feel peaceful and the nature. Thus, while meeting the needs of users, it is ensured that ecological processes that work in harmony and interaction with other living things are included in daily life. The human-technology relationship causes environmental pollution and deterioration of ecological balance. In order to move people away from such an environment I tried to create a natural living space by dealing with ecology and the components of nature in my design. In summary, the aim of this project is to bring people back to their natural environment, to ensure the healthy development of children as a whole with soil, water and animals in natural environments, to produce energy and food in a natural way. In short, the living environment of this housing estate builds an ecological bridge between man and nature.
Fig. 5.2	Natural corridor	Creating a place that will be in harmony with the natural and green landscape of the Black Sea and Trabzon region is aimed. Since the study area has courtyard properties it is thought that constructing a corridor that emulate the Black Sea valleys would be appropriate.
Fig. 5.3	Stay in nature live long	One of the main aims of design is to integrate nature to design. Nature exists with the soil and the hills, the trees and the grass, the water and the rain, and the wind with the sun. The more a design remains connected to nature, the more it becomes permanent. It can renew itself continuously. For this reason, we can achieve long-term designs by making use of nature's self-renewal feature. Reflecting nature in designs allows for meeting basic psychological needs such as feeling peaceful, having fun and relaxing.
Fig. 5.4	Photosynthesis	Photosynthesis With the proposed design people can spend time within the beauty of nature and intertwine with nature. Based on the concept, creating spaces with greens and natural elements is aimed. Color and fragrance gardens were created by using different ground covering plants, so that part of nature was transferred to the area.
Fig. 5.5	Change; inspired by nature	Change is the state of transition from one to another in two reciprocal occurrences, differences occurring in a given time period. Culture, technology, physical, social, economic, impacts are the most important factors of change. Change requires flexibility and creativity. Nature shows us that being flexible is the most important force in adapting to change. With millions of species that live in nature, it changes without ever stopping and also shows constant resistance to the negative effects of change at the same time.
Fig. 5.6	Harmony with nature	The study area is one of the natural formation areas that have the characteristics of landmark for the city. A landscape design that does not disturb the processes of nature and keeps the proportion of hard surfaces to green surfaces at minimum level is proposed. A settlement with mainly green surfaces and without harming the topography, which is more liveable for humans, is created.

designs. Here, responsibility includes ecological awareness and understanding interconnectedness. "Green metaphors" are results of such an awareness and understanding. This study, which aimed to understand ecological awareness and interconnectedness through green metaphors used by students, revealed that student approaches are shallow and need to be improved.

This situation may result from both the lack of reflecting ecological knowledge in the design process (since the methods for this are not well defined and this kind of knowledge is generally accepted as limiting design creativity) and lack of an environmental ethics class in the curriculum. Classes on environmental ethics are needed in the landscape architecture curriculum to provide a deep understanding of the intrinsic value of nonhuman beings and the place of humans as not superior to other beings in nature, to make students question themselves and their professional practices, and to challenge the privileged situation of humans in landscape design practices. Furthermore, the integration of these new insights into design classes is needed, and students must be encouraged to question their approaches in terms of reflecting their responsibilities. Introducing design examples based on green metaphors, discussing the design process in light of the approach that green metaphors guide design, and describing the spatial features that come about as a result of applying green metaphors will help students to understand how to structure metaphorical relations between a design concept and solution and encourage them to use this in their design approaches. Design studio practices and homework based on metaphorical thinking, especially that focused on green metaphors, will promote the students' design experiences. Also, additional field practices about ecological features / processes / relations that include both the design site of environmental design project classes and specific ecological areas will help to teach students how to include ecological cycles and dynamics in their design decisions and how to be sensitive to them.

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