Nature as a Framework for Teaching Design

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Abstract: Design is integrated into every discipline practiced today and is employed in a plethora of interdisciplinary techniques which connect design to every aspect of modern life. This paper provides case studies where nature is used as a framework to teach design at the time when the complexity of the world challenges the ways design was traditionally taught. Looking at the university as a system, the author identifies the opportunities where design education could interact with a larger community and provide tools to meet some challenges of the complex world. This includes: teaching design in the classroom, teaching design outside the classroom by integrating it with other disciplines, and teaching design across the curriculum. Using nature as a model for learning, integrated design can be used as a method of investigation or an inquiry that seeks to create new ideas in any field. After testing different scenarios, the author examines what design educators can learn by looking at the ways students first understand theories, practice design skills and later reflect on their experiences. Outlined below are several experimental courses and projects attempting to use nature as a framework to teach and integrate design at every level of undergraduate coursework.

Keywords: biomimicry; interdisciplinary collaboration; sustainable design; human-centred design; innovation

1 Introduction

In Ontological Designing Anne-Marie Willis states that “design that is something far more pervasive and profound than is generally recognized by designers, cultural theorists, philosophers or lay persons” (Willis, 2015, p. 80). It is also known that the current dire situation with the world’s ecology happened by design and because of design (McDonough & Braungart, 2002, pp. 18-23). In order to combat that situation, we need to “re-learn how to be living beings” (Escobar, 2017). There is no question that our profession demands that design students be prepared to “identify the nature of values and modes of inquiry in various disciplines that contribute to the successful solution of complex design problems” (American Institute for Graphic Arts, 2017, para 17). If we were to hope that future designers will be ready to solve big problems, then we need to find new opportunities to educate students holistically across a wide range of disciplines.

A useful model for teaching and learning, biomimicry, has already been established as a successful method for solving problems, especially in the field of product design and architecture. Some examples of using biomimicry as a methodology are: IDEO’s Nature Cards (IDEO, 2014), Biomimicry Toolbox (Biomimicry Institute, n.d.), Slow Design
Movement, and the use of Parametric and Generative Design in architecture. Designers and architects adopt principles of biomimicry on different levels: from mimicry of the specific organism, to the behavior of organism at the ecosystem level (Zari, 2007, para 24).

According to the Biomimicry Institute, designers need to understand systems in order to come up with true innovation. “Since the world is full of complex systems, taking a systems view can be a very effective means to understand a design challenge at a deeper level” (Biomimicry Institute, n.d.). Taking a systems view is not possible without taking a transdisciplinary approach, yet, educators face obstacles if no structures exist even for cross-disciplinary education at their institution. According to Dr. Gioko Muratovski, design researchers may have challenges “establishing collaboration with other researchers due to lack of knowledge of other disciplines, divergent standards, different methodological approaches, or simply due to negative attitudes and prejudices that are present among the disciplines” (Muratovski, 2014, p. 3).

Because design is a non-linear process it is well positioned to be on the leading edge of human activity. Applying biomimicry methods to education can be a novel way to expand how design is taught in the classroom, outside the classroom, and across curriculum. Although these case studies were not designed to assess the long-term impact of such an approach, observations following the execution of these projects showed an improvement in student engagement and student interest in multidisciplinary classes.

The case studies presented in this paper are an attempt to look at the university as an ecosystem, identify existing structures for cross-disciplinary education, and test new initiatives for integration of design into other disciplines and other disciplines into design.

1.1 Framework 1: Biodiversity

Case Study: Nature in the Classroom - Educational Toy that Works with the Nature of Children’s Behaviour

My guiding principle for this framework was that the need to practice divergent thinking can be illustrated to students by showing examples of multiple solutions that coexist in the natural world. Function is an essential underpinning of biomimicry and is one element that distinguishes biomimetic design from biophilic and biomorphic design” (Biomimicry Institute, n.d.). For the purposes of my framework, the educational toy can be viewed as function of the organism in the context of biomimicry. One of the goals of this project was to show students the need of divergent thinking and generating multiple solutions while staying open-minded to welcome failed experiments in the co-design situation. The need for multiple solutions was easily explained as biological strategies that performed the function. Preparing students for the complex world means fostering critical thinking which is a required component of both creativity and objectivity, or design and science. This methodology was used because the group of students had limited design knowledge but some understanding of the scientific method. The methods I used in this case study are human-centred design and co-design with audience, rapid prototyping and experiments designed to test audience behaviours. Other disciplines integrated are: early childhood education, and STEAM (science, technology, engineering, art, and mathematics).

1.2 Framework 2: Interconnectivity of Nature

Case Study: Design Integrated into Other Disciplines - Faculty Research Initiative

Testing and prototyping ways to establish cross-disciplinary collaborations through faculty research projects, I investigated possible intersections of design with other disciplines at the university where few cross-disciplinary projects existed. Approaching this project as an experiment I identified possible points of connections, first by dipping into other non-design classes and later through design and science collaborations, participatory design, gallery installation, programming, the use of non-classroom spaces and outdoors. I recognize that this work is ongoing but some practices and outcomes are shared in this paper in case others want to implement similar approaches at their universities. The case I am making here is based on the principle of biomimicry that in the complex world, both understanding the problem and proposing an impactful solution cannot be done in isolation, (Biomimicry Institute, n.d.) yet, there are barriers that exist to creating truly interdisciplinary classes. That is why I experimented with alternative ways to collaborate rather than co-teach a class. Methods used for this case study are: participatory design (both facilitated in advertising class taught by communication professor and through installations on campus), cross-disciplinary events such as BioBlitz with design and biology students, access to the biology lab, and collaborations with advanced photography students.
1.3 Framework 3: Nature Cycles of Fast and Slow

Case Study: Design Across Curriculum - Using Design Thinking Methods to Help Non-Design Faculty Visualize Flow of the Activities in the Classroom that Work with Nature of Different Learning Styles

Timing and sequence of classroom elements are difficult. The order of activities, and duration of each, is a critical consideration in engagement. Experimentally, the process of designing the classroom experience can be approached similarly to designing the user experience. John Thackara states that “Multiple tempos—some fast, some slow—can coexist, but they have to be desirable and they have to be designed” (Thackara, 2015, p. 44). This case study shares a process I used to prototype a visual syllabus in order to engage students in their learning. Specifically, designed for non-design faculty, this case-study focuses on the methodology used to prototype the tools for students and teachers to visualize a sequence of activities for time management purposes. This project shows some prototypes of the visual lesson planning. The larger trends of the use of such tools as learning outcomes and assessment in undergraduate education setting was not the focus of this small case study. Methods used in this case study are: human-centred design, visual design, and prototyping.

2 Case Study 1: Educational Toy Project

Nature offers countless examples of evolutionary strategies at work fostering conditions conducive to life. (IDEO, 2014)

What happens if you try to introduce concepts of participatory design and co-creation with the end-user to a group of students for a first time? The biggest challenges I encountered while teaching that class:

- Students resist when asked to keep the project open-ended and want to focus on predetermined outcomes.
- In order to approach design critically, students were required to generate ideas that resemble scenarios or systems to allow co-design by the audience and not a finished product. Many students at this level were not comfortable with this type of approach.
- It is challenging for students at this level to practice divergent thinking and generate a large number of concepts.

Through a series of experiments, rather than a specified design brief, Communication Design students had to work with the nature of children’s behaviour and let go of all pre-existing assumptions and notions about the design process. Tim Brown of IDEO tells us that we should treat design process as “experiments designed for failure” (Brown, n.d., para 1). So instead of assigning a toy project, I asked students to treat it as a science experiment. Using the example of biodiversity as a model, I was hoping to make students recognize and appreciate the diversity of ideas in the classroom, the value of other college disciplines and perspectives, and the value of the failed experiments.

2.1 Project Structure

This was a seven-week project that happened in the middle of the 14-week semester in the second year of Graphic Design undergraduate course curriculum. The studio class met for four hours, once a week. Each class was a mixture of short lectures, discussions and studio work time. On the days of the pre-school visits (three visits over the seven weeks), students worked with a partner to set up their experiments and the group of about fifteen children, ranging in age from four to six, interacted with students’ objects. Students took turns observing and facilitating if needed. Each session typically lasted an hour and a half. Students were also encouraged to observe the overall behaviour of the children when not interacting with their prototypes(s), during the children’s free play time. Students kept journals to reflect on their observations. Later they used these reflections to inform their design decisions. Part of the class was dedicated to group-work where research and observations were shared but each student was responsible for the refined prototype and research documentation. This project was a collaboration between undergraduate design studio classes at Stevenson University School of Design and a local non-profit partner, Irvine Nature Centre, with pre-K school students focused on outdoor classroom learning.

2.2 Project Schedule

Before this project was introduced, students discussed and wrote short responses to the texts and articles about Design Thinking (DT) methodology such as excerpts from Victor Papanek, Tim Brown, and IDEO’s Human Centred Design toolkit (HCD). After the project was introduced, students read a few education primers such as a short chapter from Maria Montessori and articles about teaching science through inquiry. First, students were asked to identify several subject areas to focus their educational aspects of the toy each would be designing. They were encouraged to allow children to learn through inquiry. Examples include: science, math/pre-math, health, cause/effect, etc.
A short workshop was conducted where students created open-ended experiments to observe children’s interactions at pre-K school. Students came up with simple hypotheses on children’s behaviour in a given scenario and created experiments to test their hypothesis. They had to plan and prepare to facilitate the experiments with the children the following week. The point was made to students that this was not a toy design project but an open-ended experiment on children behaviour. For that purpose, I will call all work-in-progress designs and interactions prototypes.

**Week 1:**
- Readings.
- Students wrote a short hypothesis of how children would react and interact with prototypes. Students were asked to think of several ways to get responses from kids on their ideas.
- Students planned and prepared everything needed to facilitate experiments. Students made prototypes from inexpensive and found materials.

**Week 2:**
- Visited the pre-K school and session #1.
- Documented process with a team.
- Analysed the findings and observations in writing. Emphasis was placed on failed experiments.

Only after students were able to test (Figure 1) and reflect on what they observed, did the design process start.

![Figure 1. Initial testing and observation with participating child. (Le, 2017).](image)

**Week 3**
- Based on the behaviour they observed, students generated multiple open-ended concepts for their audience.
- Students developed another round of experiments to test with a goal to narrow down their concepts.

The most challenging part of this stage was keeping students from choosing one solution too soon without practicing divergent thinking. Students struggled to generate multiple design solutions even though this was what was expected from designers, especially in the complex world. As Hugh Dubberly explains, the end state of the project is no longer about completion but adopting or evolving (Dubberly, 2018, para 23). That was where examples of biodiversity as an evolution of ideas and ever-evolving nature of design were helpful. When the project allowed for co-design, my students observed how pre-K children came up with all kinds of their own designs and invented games in front of my students.

**Week 4**
- Visited the pre-K school and session #2.
- Worked in teams and took turns facilitating the testing; one student helped children interact with objects and the partner took notes.
- Analysed the findings and observations in writing.
- Researched more HCD tools to identify what could be useful at which stage of the process.
Week 5
- Refined prototypes of the concept according to observations.
- Developed testing methodology and prepared for the next round of tests.

Week 6
- Facilitated pre-K school session #3.
- Tested with refined prototypes for objects and instructions.
- Analysed the findings and observations in writing.
- Incorporated findings to inform design development.

Week 7
- Students organized the research and presented their process (Figure 2).
- Students refined their prototypes and exhibited them in the public space on campus. Students also presented the process documentation.
- Finished prototypes were refined as a separate exercise for the portfolio but, not as central to the research and the documentation of the process.

Goal
I wanted to test science and physics through interactive design, teaching kids the difference between objects that float and sink.

Hypothesis
The kids will guess if an object will sink or float before putting the object in the water, and they will naturally separate them into two categories.

Research
During a child's early sensory motor stages, introducing science concepts through water play is important. According to [1, page 12], "They explore elements of science such as buoyancy and volume as they experience why some objects sink and others float." Using an experimental tank filled with water, pupils were introduced to more complex science concepts. There are multiple trial and final games that are currently available. An app called "Sink or Float Life" has kids guess if a virtual object will float or not. Also, there is a game called "Float or Sink Super Challenge" that teaches volumes, density, and displacement. The game is for ages 7 and up. A preschool audience. There are younger child guided books such as, "Soozle Street and The Magic School Bus" that teach floating and sinking. Lastly, there are interactive descriptions of float and sink activities.

Bibliography

The goal of this project was to create engaging experiences informed by the behaviour of the child and there were several critical points in this process. The children needed to experience the object with minimal instructions and guidance. In the previous instances of teaching this project, the biggest challenge was to make students comfortable with the unknown. Discovery takes time but projects have deadlines. After re-framing projects as experiments designed to observe the nature of children’s behaviour rather than the design project, students were able to draw their own conclusions, having discovered how children behave in multiple sessions. Students became much more comfortable with presenting unfinished rough prototypes and making changes on the fly. The topics that were difficult for students before, became self-evident. The resulting projects were nothing like the toys that the previous groups of students had designed; they resembled systems that allowed multiple ways of interaction and were open-ended rather than single-function toys. Most of the time their projects took 180-degree turns, not because of the teacher’s critique but because students themselves realized what worked and what did not.

Figure 2. The process documentation by a student at the end of the project (Michelson, 2017).
To make this approach successful, students needed to be exposed to HCD earlier in their education so that they could benefit more from the opportunity of interacting and co-creating with their audience. This project required outside partners that were willing to collaborate with students. The practice of participatory design and co-creation was the most engaging process for students. What would be helpful to do in the future is to have more classes that students could take concurrently where students could frame problems by themselves and use the same DT language across the curriculum.

3 Case Study 2: OVERLOOKED Gallery Installation and Programming - Prototyping Ways to Integrate Design into Other Disciplines

Designers should recognize “interdependent relationships among people, places, things, and activities in a complex system.” (American Institute for Graphic Arts, 2017, para 17)

In recent years we have observed an emergence of multidisciplinary programs and experimental initiatives that have been able to bring designers and scientists together. Many design schools established some sort to interdisciplinary labs and maker spaces where “...collaboration between science, engineering, art and design will provide exciting and innovative ways to address and present complex subjects” (Hopkins Extreme Materials Institute, n.d.). What makes these new initiatives slightly different from other maker spaces is an addition of living materials (Healthy Materials Lab at Parsons School of Design, n.d.) and newly recognized need for engaging in “organic systems ethos” (Dubberly, 2018, para 16) and their even bigger focus on sustainability. Looking at the university as a system to identify opportunities for collaborative lab spaces and projects, I initiated a faculty research project to experiment with already existing techniques of mycelium-based materials. A year-long collaborative project tapped onto the expertise of biology faculty and laboratory services for bio-material experiments and hands-on workshops. Getting access to the lab and greenhouse spaces was critical to this project. While working on multiple components of the project I approached it as an experiment, both literally in the lab and as an experiment on different ways to integrate design into other areas at the university. Using a nature’s framework of symbiotic relationships, installation “OVERLOOKED” engaged students and faculty across such disciplines as photography, biology, digital media, graphic design, and advertising. Generated work was featured in a gallery space and was accompanied by multiple workshops and programmed events ranging from nature walks, sourdough breadmaking, and lichen art exploration. The exhibit itself had many participatory stations where the public was asked to “blend” waste and food in a marble-run game to learn about circular economies, reflect on the overlooked connections by connecting the dots in another participatory station, and look under the microscope at nature’s structures such as polyprop fungus spore surface and imagine how human-made structures could benefit from nature’s engineering. “Mycelium Running” installation shows the process of growing shapes using fungi mycelium and local straw.

Since this was a faculty-run research project and not a class, I had to find a model that would work for design faculty. Integration of design had to be facilitated by scheduling groups of students from different disciplines to explore nature together. One example was a nature walk with students from Biodiversity and Digital Design classes. This was not a co-taught class but a cross-disciplinary event that worked with both classes scheduled together. Biodiversity students conducted a BioBlitz (Wikipedia contributors, 2018, para 1) while design students found objects in nature and used them as patterns for a design exercise. Both groups worked together and later reflected on the role of the species in the ecosystem, both from human and non-human points of view. Dipping into Diversity of Life class to look at SCOBY (Symbiotic Culture of Bacteria and Yeast), sourdough yeast and other kombucha organisms under the microscope, created the opportunity to show a new perspective to students on why fungi are important and worth learning about.

I was able to dip into more classes, by working with advanced photo faculty and students, by first, creating project briefs, offering critiques and later assisting in photoshoots. For the project “Overlooked Species Zoo” photography students worked with speculative scenarios where nature reversed biomimicry rules and borrowed human tools of advertisement and marketing to advance nature’s agenda. This was an opportunity to engage students in critical design. As Anthony Dunne and Fiona Raby mention in the book Speculative Everything, “critical design uses speculative design proposals to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life.” (Dunne & Raby, 2013, p. 34). In this series, students gave organisms the stylization of a magazine advertisement to showcase their important—but often overlooked—role in the environment. Each work juxtaposed an organism with everyday objects in an unexpected way to create a surreal scenario in which nature has borrowed human ideas and environments. The example (Figure 3, left) is a portrait of a burdock plant where seed pods of burdock “pretend” to be Velcro to show their usefulness to humans reversing a most familiar application of the plant as the inspiration for the invention of Velcro by Swiss engineer George de Mestral in 1941. Broadleaf
plantain, which is both a common lawn weed and a medicinal plant used throughout the world, is presented as healing first aid antiseptic bandages (Figure 3, right). 

![Image of plantain and mycelium]

Figure 3. Left: Burdock (Arctium lappa) photo by Volkova & Alesina, 2018. Right: Broadleaf Plantain (Plantago Major) photo by Hadel & Sonntag, 2018.

An informal survey of the biology students and faculty showed that students were inspired to see how biology relates to design and this experience gave students a new perspective. Mycelium hyphae depicted in the exhibition provided a great visual for students to understand their role in plant nutrition and more. In the future we plan to have bio students come up with the biology behind what they were doing (breadmaking, fungi, gluten) and design students to collaborate with their peers to create new scenarios and shapes of fungi to grow.

Reflecting on this experience, I recognize that student engagement was achieved because of design integration and collaborative learning. While it was not a part of the teaching load, visiting colleagues’ classes were an essential step to get these cross-disciplinary initiatives going. Now with more interdisciplinary classes in the works I will be looking for the best practices to overcome several issues that came up:

- It was hard to find classes that could be brought together once or twice in a semester. Scheduling was very difficult.
- If classes were scheduled together, it required more planning and flexibility.
- Dipping into was easier than team-teaching multidisciplinary classes, because roles were more clearly defined and there was no need to develop and approve new classes; but it required extra effort by the educators and students.

Symbolically, the beautiful collaborative processes such as lichen and mycelium found in nature become visible through this project and in turn inspired more symbiotic relationships between faculty from different schools. This dipping into initiatives served as prototypes for future interdisciplinary classes where design can use alternative spaces such as science labs, galleries, outdoors, photo studios, events and more. Starting with one project per semester and being flexible, I hope more design faculty will be interested in finding ways to bring design into other disciplines and other disciplines into design.

4 Case Study 3: Visual Syllabus

The design challenge is not to slow everything down, but to enable situations that support an infinite variety of fast and slow moves - at a rhythm dictated by us, not by the system. (Thackara, 2015, p. 44).

Similarly, to the way that writing is used as a method of learning in the writing across curriculum (WAC) movement (Bazerman et al., 2005, p. 18), teaching design across curriculum (DAC) offers opportunities for students to learn experientially and connect design to real-world problems. Especially useful for non-design students, design can help understand complex concepts, and connect what they learn in one class to other disciplines and everyday life. DAC uses systems thinking and creativity, and provides resources and methodology to address wicked problems in the world, in our profession, and in the classroom.
Still, the biggest contribution of design integration in other disciplines was student engagement, yet it could be met with resistance because introducing hands-on activities to the typical non-studio class has a significant problem: the timing and planning. Palmer Parker in *Courage to Teach*, talks about *opening the space*: “...even before the class begins—in conceptualizing the course of study, selecting materials, framing assignments and experiences, and blocking out the time. If I do not make these decisions in ways consonant with opening space, the space will disappear before the class begins” (Palmer, 1998, p. 133). This looks like a typical design problem and this case study shares the tools for redesigning a class experience that can be approached as a design problem: timing of the activities. Looking at nature as a model where different tempos co-exist, I developed tools to visually plan a course syllabus to allow more flexibility and increase student engagement.

The goal was to create opportunities for students who prefer different learning styles to find a home that allowed them to be creative and experimental, and to explore different modes of thinking. Another goal was to give simple visual tools to teachers to try different scenarios when faced with the need to adjust a class flow depending on the time of day, the number of students, the energy of the group, and other factors. Designing a class is not different from designing any user experience. The timing and sequencing of classroom elements can be difficult. The order of activities, and duration of each, are critical considerations in engaging students. Mapping and diagramming lessons, using colourful Post-its, markers and highlighters is natural for designers; we advocate for being fluid between the analogue and digital technology. Since this is an iterative process, color-coded Post-its allow keeping things fluid.

Here is a breakdown of my approach to syllabus building through a DT lens. Focusing on issues of visualization of components and timing, I went through a series of steps:

- Make a list of formal learning outcomes (LO) and put them in a simple grid.
- Make a list of subjects we will cover and projects I am planning to assign for each LO (Figure 4).

![Figure 4. LOs with subjects and related projects organized in a visual way.](image)

For this visual syllabus, I simplified LO’s language into teacher’s priorities to make it easier to talk to students about why outcomes matter to their education. The teacher’s priorities are for my students to:

- Collaborate.
- Care about the world and practice empathy.
- Have a general understanding of the design process.
- Offer critique and be open to feedback.
- Practice self-directed research.
- Become a visual thinker and a maker.
This is followed by a list of the types of activities I plan to employ in this class:

- Discussions — talks, critiques, presentations.
- Individual students thinking and making — sketches, mock-ups, collages, image making.
- Group activities — brainstorming, games, etc.
- Teacher talking or a video — demo, lecture.
- Computer time — practice software skills, visual research, execute projects and exercises.
- One-on-one time with a teacher.

Color-coding each activity made it easy to take a glimpse at the lesson and visualize the flow. I also somewhat arbitrarily grouped them by the kind of the pacing and interactivity. For example, a lecture and one-on-one interaction is more passive for students, while the individual sketching and journaling is slow, and requires concentration. Discussion and high-energy activity can be fast and more playful. Thinking of the best sequence for a class made me realize that different sections of the same class can have different desired sequences depending on many factors. Looking at examples of three different lessons I visually mocked-up three different sequences (Figure 5). Purple color signifies a lecture, yellow is focused activity and grey is a computer time.

As I populated every week with activities it became evident that having a color-coded tool provided me with feedback that was easy to understand. For example, I can see how I can make my lectures more effective by incorporating activities before, after or even during my lectures. I also can see how some classes are structured in such a way that keeps students in front of computers for too long.

![Figure 5. Quick visual mock-up of 3 different class sequence possibilities.](image)

That realization quickly led to the next exercise about the timing. What if my class could be planned with flexible time sections that could be re-arranged according to the needs of students? From Post-its I moved to Adobe InDesign, where I created a multi-page document with each week represented as a spread. I made a master page template with my LOs and timelines organized in 15-minute intervals. As soon as I populated my weeks with activities from my agenda and mapped each activity to the LOs, a clear pattern began to emerge.

- All of my activities were very heavily organized around the design process and computer time.
- I had not allowed enough time for students to reflect on or discuss things.
- Individual thinking and making became computer time, unless I specifically designed it not to be so.

Below is an example of one week’s agenda mapped and visualized using Adobe InDesign (Figure 6).
Once I mapped the class I had already taught, I started to see patterns and things I needed to change. This tool allowed me to move things around and visually see the problems. Improvements to this prototype could be made as needed. As long as the tool stays flexible it will be improved upon and evolve. Here are few things that I learned:

- When incorporating hands-on and group activities, timing needs to be carefully considered.
- After several semesters of using this tool and by sharing it with colleagues I have gathered information about developing it further. An informal survey shows that this tool could be helpful to new faculty and when developing new classes.
- My assumptions that students would benefit from a visual course schedule were false. Most students did not care to see it visually. Perhaps in the future, this syllabus would need to be introduced several times during the semester when students could be reminded what the LOs of the class are and be more engaged in the learning process.
- It is important to remember that this is a tool, similar to a calendar app and needs to be seen as such. Teachers who use it need to understand that the goal is to be flexible and observe the classroom for how students are engaged.

5 Conclusion

Taking a closer look at every step of the learning process, I observed that dipping into another discipline made students more engaged with the theory and practice of design. When given an opportunity to reflect on their experiences, students mentioned that they not only valued those experiences but understood the wider effect of their design practice. It is difficult to establish the measure of the influence of this approach on the change in students’ design practice over the long-term because during the four-year program at the university, students were exposed to a variety of approaches in different classes.

Applying biomimicry methods to education may not be so different from human’s adaptation of nature’s problem-solving abilities such as Velcro or honeycomb structures. In biology, many structures, materials, behaviours, and other entities are observed, explained and quantified, so in the design field creativity can be explained as the biodiversity or evolution of ideas. One example of this approach is when students found it easier to understand the form-follows-function methodology where the function is presented as a design problem and biological strategies are explored as design solutions. Implementation of biomimicry principles at the level of ecosystem is more complex. Similarly, to the way that writing is used as a method of learning in the writing across curriculum movement, design across curriculum
can be explored as a mode of thinking and a tool for investigation or an inquiry that seeks to create new ideas in any field. If the field of design is “pervasive and profound” (Willis, 2015, p. 80), design education needs to mimic the design perservasiveness.

Looking at the natural world where everything constantly evolves and adapts, designers not only evolve and adapt their practice to human and societal needs, they become the connective tissue between different disciplines. That means that design educators need to look for new ways to expand the way design is taught in the classroom and across curriculum—in this case resembling the way nature works.

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References


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