Designing Design Education

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The world is looking to improve educational systems to respond to changing needs of the future. Design education provides hands on, place based project learning that learns from direct connections and interactions with the world. Design connects horizontally with diverse fields of information. Design creates critical awareness of our built and natural worlds.

This paper presents design of informal design education opportunities created in conjunction through workshops with children and teachers over a ten-year period. It offers insights and concludes with access to free online activities created by the educational collaboration, NEXT.cc, that support creativity in place based design practices with teachers and students in remote classrooms.

KEY WORDS

Design; Imagination; Creativity; Environmental Design; Design Thinking; Design Research; Design Learning; Design Process; Design Making; 21st Century Teaching and Learning; Place Based Project Learning; Global Learning; Eco Literacy; Digital Fluency

EVERYONE IS A DESIGNER

While it took Daniel Pink writing in *A Whole New Mind* to offer us '*designerly*' ways of thinking everyone actually "is" a designer. [1] People focus their thinking to satisfy their wants and needs. They seek information necessary to activate change. They weigh options. They make decisions based on what they know and what they have learned. They attempt to implement change. If their change is not as predicted or not as successful as it could be, they re evaluate their actions, revise changes, and attempt to create change again. This is experiential learning and it is what design brings. Designing design education sets up informal opportunities for design projects to occur during the school day, week and year. Design education moves the learning from the teacher or the text, to the community of the classroom and the context of the world.

Design is a creative process that develops critical thinking -seeking and selecting necessary information to organize and test ideas. Materializing ideas is the mode of creating change. Constructing ideas demands social engagement. Purposeful thought and action forms the basis for human achievement found in all subject disciplines.

It is the nature of design to redesign. In the twenty first century, education is in critical need of being designed in countries all over the world. In a universe that changes faster than the mind can comprehend, education needs to redesign delivery and content to best prepare children to be adaptable and creative local and global citizens. It is imperative to introduce design as human nature to nurture imagination, raise motivation and relevancy, and blur learning with work, play and fun. 21st Century education asks for new literacies (eco literacy and digital fluency) and changed definitions of progress to create better relationships between the built environment and the natural worlds. Design is the socially engaged liberal arts education of the 21st century.

Figure 1 NEXT.cc 2013 c New Relationships Between the Built and Natural Worlds

Photo Credit: LKeane

Figure 2 "The world is finite, but imagination is infinite."

DESIGN IMAGINATION AND LIFE LONG LEARNERS

Sir Ken Robinson calls" creativity imagination at work"[2]. Creativity is a 21st century necessity for students to discover connections between themselves, their talent and their ability to contribute to the world. Design education nurtures creativity by exposing children to ways of working that cross traditional subjects. Design develops abilities and intentions, encourages communication and social interaction, critically selects and retains meaningful memories. As we learn more about building attention, developing memory and raising motivation to learn, we find that hands on experiences raise our aptitude. Born to Learn (http://www.born-to-learn.org/) is one of many websites that connect the neuroscience of learning for developing life long learners [3]. We have a 24/7 capacity to learn life long. K12 educations forms this foundation.

DESIGN LEARNING

Learning involves the whole person; it is not only a measure of specifics from K12 school activities but also development of relationships to larger social communities – becoming a full participant, a member, a kind of person. It implies coming to terms with the world and one's place in it. Organized learning only partly – and often incidentally – implies becoming able to be involved in new activities, to perform new tasks and functions, to master new understandings. Activities, tasks, functions, and understandings do not exist in isolation; they are part of broader systems of relations in which they have meaning. K12 directed in school experience needs to be connected to informal learning, or learning that occurs on an ongoing basis outside of school. [4] Informal education is unorganized, unsystematic and even unintentional, yet accounts for the great bulk of any person's total lifetime person.[5]

Figure 3 NEXT.cc Hand and Mouse Skills

The interest in and basis for informal learning creates our direct connection to life long learning. Lifelong learning can be defined as the lifelong process by which every individual acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment – at home, at work, at play: from the example and attitude of families and friends; from travel, reading newspapers and books; or by listening to the radio or viewing films or television.

Informal learning involves evaluation, reflection and development of critical thinking and problem solving in real life. It also often happens without realization that learning is occurring.

Thirdly, while a large portion of informal learning is happenstance, much more is individually selected learning than during organized instruction. Selected learning is self-initiated and motivational. Self-motivated learning is purposeful. It connects with us emotionally and creates memory. Learning that is pleasurable is rewarding.

DESIGN AND ART EDUCATION

A National Governor's Association 2012 Report promotes the importance of design linking art with science with the environment for cultural sustainability. **New Engines of Growth: Five Roles for Arts, Design and Culture** presents the importance of art and creativity education in K12

to deliver a better prepared workforce, catalyze community revitalization, launch cultural districts and cultivate creative hubs. [6] Designing design education to deliver informal design thinking, research and making opportunities nurtures imagination across broad bands of population.

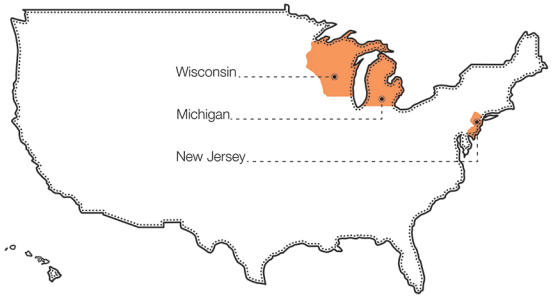

Figure 4 NEXT.cc 2012 c Map of States w/Art & Design Standards

New learning tools and skills remake the context between consumer, creator and producer. 86% of US voters believe that encouraging children to be creative and develop their imagination is necessary to maintain a creative edge and ensure that the US does not fall behind other countries. [7] Teaching art linked with science, engineering and math, creativity is linked with research and design can become a powerful vehicle.

Canada and the United Kingdom have been mandating K-12 design education since 1995. Three U.S. states (MI, WI, NJ) currently have art and design standards, though the NAEA published correlation between Art Standards and new Common Core State Standards that evolve critical thinking, awareness of diverse approaches, etc.

Declared basically non-existent in the United States [8] teaching of design changes STEM (Science + Technology+ Engineering + Math) learning to STEAM (Science + Technology + Engineering + Environment + Art + (Design + Environment) +Math). Children learn from and celebrate multiple cultural associations. Art experiences help children develop unique perspectives and assist children in visualizing and materializing ideas. [9]

Art is the current place based project learning experience in most schools. Design connects with art with purposeful studies of human use connecting art making to social justice roles. Design combines science and art and mediates diverse information across natural and artificial systems. It offers processes that open complex interactions and morally charged decision making in relationships with each other, with the built world and the world we encounter. Design facilitates relationships between the physical and social environment; the advent of sustainable design practices proposes solutions to social problems, provides conscientious living strategies and creates local and global ecological perspectives.

Figure 5 NEXT.cc STEM to STEAM 2013

DESIGN EDUCATION AND THE IMPORTANCE OF THE ENVIRONMENT

Earth's evolution reveals that nature has 13 billion years of trial and error, experimentation and evaluation, risk and success in creating the world. As nature learns from diverse approaches, so too does the K-12 education system need to learn from other educational models and environmental practices. David Orr, in Earth In Mind, On Human Prospect and Education, writes that all education is environmental education. [10] Janine Benyus asks for a "Biomimic revolution" to learn from nature [11]. Biomimetic research discovers what works in the natural world and perhaps even more importantly, what lasts. The North American Association of Environmental Education established Environmental Education Learning Standards in 2007 [12] connecting 21st century critical thinking skills with awareness and understanding of interactions between people and nature. Delivered through place based design activities these standards address awareness, knowledge, attitudes and environmental ethic, citizen action skills, and citizen action experiences and connect development of the individual with understandings about human ecology and the ecology of living systems. Architects and designers work in careers that nature and people in place making. These 4 processes brought into K12 teaching and learning can connect teachers and students to their schools and school communities in new ways.

Strand 1: Questioning, Analysis and Interpretation Skills;

Strand 2: Knowledge of Environmental

Processes and Systems; Strand 3: Skills for Understanding and Addressing Environmental Issues including the earth, living systems, humans and their societies and interactions between humans and the environment.

Strand 4: Personal and Civic Responsibility.

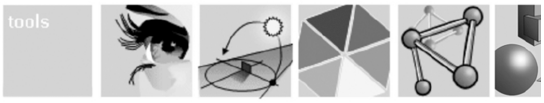

Figure 6 NEXT.cc Tools c 2013

DESIGN TOOLS

Children introduced to design practices at an earlier age are empowered to use them, college bound or not, to make better choices about the built environment and their interactions with it. Design introduces tools that scientists, artists, designers, architects, and environmentalists use to learn about the world, engage the world and interact with the world. Children read, write, paint, make, photograph, videotape and record the world around them. They become active explorers of using all of their senses and challenging themselves to learn. They collect and evaluate observations and findings.

DESIGN LANGUAGES

Languages introduce vocabulary and sets of ideas. Languages are sets of ideas that look at taxonomies of relationships inspiring wonder of the built and natural world. Knowing names of things allows for exchange of meaning and communication. Knowing that things exist in systems connects ideas horizontally. Design introduces ideas about systems that are natural, social, economic and cultural. Offering activities that connect scales of investigation expand awareness and understanding of networks.

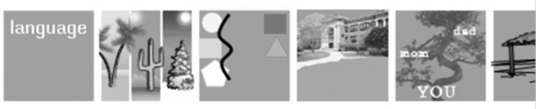

Figure 7 NEXT.cc Language c 2013

DESIGN DISCOVERY

Discovery journeys look at how economy, culture, climate change, and technology shape sustainable design responses. Discover transdisciplinary interconnected thinking between earth, air, water, well being and design of the every day.

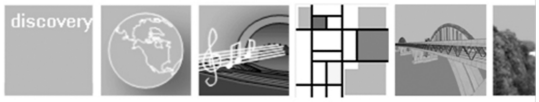

Figure 8 NEXT.cc Discovery c 2013

Figure 8 NEXT.cc Design Journeys c 2013

DESIGN OPPORTUNITIES

Design opportunities allow students to explore their intentions. They use their senses, learn and build with light, understand matter and materials, seek out nature patterns, look at architecture in response to weather, build an emergency shelter, use color in their classroom, on the stage, in the city. They research their school, school grounds and school communities with new tools and develop new ideas for improving life. They learn to evaluate the energy use of their schools and homes and propose changes. They demonstrate spatial organizations of people, places and environments; discern interdependence of built and natural works in spatial dimensions; and analyze urban structure and predict impact of change. Design opportunities allow students to explore, defining areas of interest, connecting work to the places in which they learn and live.

DESIGN WORKSHOPS FOR CHILDREN

Our research built upon tacit teaching experience teaching design with art, architecture and design students at the undergraduate and graduate levels. We started a Young Architects Club at the University of Wisconsin Milwaukee where inner city youths were bussed to the campus for a Saturday workshop. We drew with them, introduced vocabulary, tested materials and explored modeling and building. The energy and enthusiasm in the room was palpable. At the end of the day the students were bussed back and we lost contact with them, wondering if they would forget their interest in working in the built environment. We began to introduce built environment education in elementary, middle and high school career days in our local public school district. Quick subject introduction followed by hands on activities spurred curiosity, interest, and excitement about project based learning (outside

of the art room). Most students had never been exposed to design fields that engage the public realms. We discovered through the work of Meredith Davis, Design As A Catalyst for Learning [13], that "design education was basically non existent in the US." This National Endowment for the Humanities research project discovered that K12 educators were not trained to

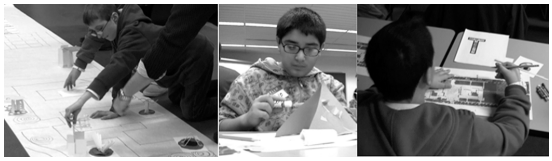

Figure 9 NEXT.cc Green School Workshop

introduce design as a investigative research tool critical to human ecology. Rather, design, if it was introduced, was as a simple 'noun' raising questions of "what does something look like?" or "how does something function?" rather than the key 21st century critical question of "how does it relate?"

In 2002 sixteen 'journeys' with multiple activities were designed with college art and design students to translate college design projects into K12 projects. Our group collaborated with K12 administrators and teachers, architects and designers initiating design projects for middle school students. Printed initially in booklet form, these original 'journeys' were tested in Racine, Wisconsin inner city schools. One week later teachers called and said, "do you have more journeys?"

The NEXT.cc Project was initiated to create access to design processes for teachers and students. NEXT.cc continues as an expanded collaborative effort of principals, teachers, architects, artists and college art, art education, design and architecture students (MIT, Harvard, NYIT, CCAC, Parsons, SAIC, UWM) . NEXT.cc introduces what design is, what design does, and why design is important. It offers activities across nine scales- nano, pattern, object, space, architecture, neighborhood, urban, region, and world. NEXT.cc's journeys integrate virtual field trips, museums, institutions and contemporary practices connecting the classroom with the world. NEXT.cc reaches young people, their teachers and their families with meaningful learning experiences that create positive influence on lives. Founded as an educational non-profit in 2007, NEXT.cc actively researches and creates transdisciplinary journeys that engage local ideas with global practices. Participants move from the computer into the community and learn about themselves, their neighbors, and their friends as they engage history and culture of place and explore sustainable design possibilities.

NEXT.cc is partnered with Ace Mentors, Burnham 100, Chicago Public Schools After School Matters, Detroit Public Schools, Earth Day Network, LaCrosse Design Institute, National Environmental Education Foundation, Industrial Design Society of America, National Environmental Education Foundation,US Green Charter Schools, The RISD, STEM to STEAM Project, The School of the Art Institute of Chicago, Smithsonian, Cooper Hewitt National Design Museum, Harvard Career Links Project, FutureLab's InfoCow, UIA's Architecture and Children Program, and the University of Wisconsin Milwaukee. NEXT.cc is being informally accessed in 100 countries and 50 states.

DESIGNING TEACHER PROFESSIONAL WORKSHOPS

Since 2007, we delivered over sixty teacher and student workshops in Midwest. NEXT.cc place based project learning has been shared with over 5000 teachers and 25,000 students. We learned with the teachers the need to introduce digital tools in non-intimidating ways. We learned to connect design journeys and activities to required Learning Standards. We created ways to work on short introductory projects, outside projects and longer term projects specific to school communities. We connected teachers with trans disciplinary approaches to traditional teaching. NEXT.cc's links to virtual field trips, museums and contemporary practices was welcomed with a great deal of excitement and enthusiasm.

Figure 10 Green Building Green Cities Workshop Art Institute of Chicago NEXT.cc 2011c

Figure 11 Design As Nature Workshops NEXT.cc 2011c

Teachers reported starting environmental clubs, proposing green roofs and urban agriculture beds for their schools and connecting art making with other teachers' teaching. Teachers were captivated by the ecological and educational transforming mission to reach all learner types with project based learning. With teacher input we expanded science, math and engineering journeys. We learned how to captivate attention of teachers, get them excited about new ways of teaching, share access to free tools and new understandings underlying activities. We began to give workshops to art and science teachers, school administrators and environmental education consultants.

Thanks very much for an awesome workshop! You inspired me to collaborate to start a new architecture curriculum for this year including the whole school of nearly 1600 4th and 5th graders. **Craig Hammett (NEXT.cc Communication)**

With each different group the sequence of journeys 'toggled' was tuned to their interests. During this process we learned that systems thinking is a maturing process and that teachers needed support to connect journeys. With our webmasters we modified the current website to include the ability to sort journeys via scale, subject or combinations. This gently suggests that no work that we do is ever done in isolation but is connected to smaller and larger scales of influence.

We also learned that a short introduction to this way of teaching only reached the most agile and technically motivated teachers. We needed longer sessions to build confidence with the teachers. We extended workshops from 1 hour, to half day, whole day and multiple day consultations. Like college design education, maturation of the 'designing mind' takes practice and exposure over time to challenges. We have found that the most evaluating their progress and student work at the successful relationship with teacher professional development is working with teachers prior to the school year, checking up with them via Skype midterm; reviewing their work mid year and end of the academic year and valuating their progress and student work at the end of the year. We learned that even project based trained instructors need introductory design research, thinking and making experiences.

Our first level of success was with teachers who would replicate the exercises shared with them in workshops. They were excited to have access to NEXT.cc's interplay of journeys, activities and linked resources. Eager to try the short and long activities with their students and to share their outcomes, they reported that children were happy to explore the on line tools and take their own journeys. They also noted that the informal learning format allowed children to self select and develop ideas for more projects.

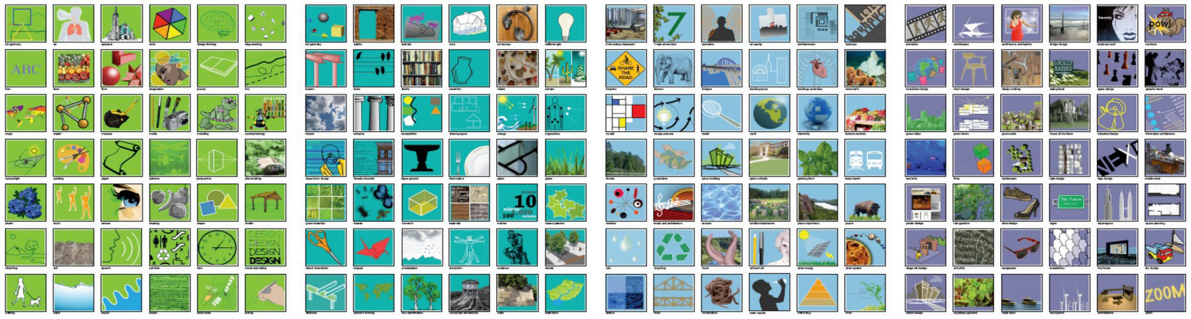

Figure 13 NEXT.cc Eco Web of Tools Languages Discovery and Design Journeys Journeys 2103 c

I just wanted to let you know that after 2 or 3 years of being on your list of pilot teachers, I am finally using the site in my classroom. My kids LOVE it. They are 12-14 yrs. old and are finding so many great journeys to go on. We are using it as a way to teach independent projects in a more guided way before they leap off in designing their own journeys. I have never seen a group of 7th and 8th grade students so engaged for an hour working independently on their computers... wow.
Victoria Rydberg, RIVER CROSSING 7-8, Teacher of the Year 2009, WI DPI Environmental Education

We found the most success with schools whose administrators were behind a shift in learning and would work to have teachers collaborate.

Design thinking has taught us and our students new skills that traditional schools do not focus on. As a teacher I am more focused on the design process (are they brainstorming? are they coming up with solutions? how will you defend their answers? what are they going to build/mold/design?) as compared to many teachers who are focused on content deliverables (do they know which battles were key in the Civil War? Do they understand photosynthesis?). Students themselves are able to think for themselves and think OUTSIDE THE BOX! We started our school with many students thinking that display/trifold boards and key notes were "projects," but now they are coming up with much more innovative ideas such as writing a diary as if a girl from the holocaust, designing an all green home, - everything from blue prints, to samples of materials, to an actual model, an i phone application, a story about different animals for preschoolers, etc. They are realizing that they can use their talents and embed them into their education. **(NEXT.cc Communication)**
Ashley Hiser, LaCrosse Design Institute, LaCrosse, WI

The ultimate goal of access to design education is to empower teachers and students with new tools and new ways of teaching, learning and making to find their own place based opportunities. Design education experience supports the designer in each of us and makes us more critical of consummation without intention. Teachers are charged with delivering standards based education, but accessing design thinking opens the door for concerns and causes to be developed as projects. As teachers move from authoritative deliverers of knowledge and become guides and facilitators, more responsibility is naturally placed on the student for his or her own success. Students are charged with learning and having the opportunity to have ideas about what to learn about raises motivation and enhances learning opportunities. This 'ownership' factor is crucial for personalizing learning and empowering students to want to find their voice and place in the world.

NEXT.cc *is a brilliant concept encouraging our students to be active in their communities as architects and educators. It introduces environmental issues and inspires design and education as ethical practices.*
Sean S. Miller Director of Education
Earth Day Network

Design is our future. Let us design k12 design activities that will support imagination and nurture wonder of the built and natural world in new relationships.

I find ***NEXT.cc*** *to be a powerful, intuitive and disarmingly engaging learning platform for students. We have deployed* ***NEXT.cc*** *at SUPAR, and it has been a great vehicle for supporting student directed exploration and discovery.* ***NEXT.cc*** *supports our pedagogical objectives very well. The modular nature of the* ***NEXT.cc*** *platform allows for the scaffolding of knowledge building, thus rewarding students by promoting their increased level of content competency while encouraging them by giving them opportunities to demonstrate their increased capacity to apply what they know. That said,* ***NEXT.cc*** *is a robust learning platform that could be applied in various education settings where creativity, global thinking and student-center learning is valued.* ***(NEXT.cc Communication)***
Dr. Kirk E. Harris, Faculty, UWM School of Architecture and Urban Planning & Founder, School for Urban

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