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Walking the Line — Creative Research as Critical Activity.

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Abstract | Most acknowledge a lack of specific and unilateral criteria for defining creative research. In some cases, it is defined by the activity itself (i.e. being creative in how research is conducted by the researcher) and in other cases defined by the outcome of the research project (i.e. as a creative artifact.) Creative research in the world of fine art has often been a means by which to examine the impact of cultural and social attitudes as well as practices on the world. In design, creative practices have been incorporated less into the upfront research process, instead relying on more positivistic methods in an attempt to isolate and examine how users interact with design artifacts. But as designers are increasingly interested in addressing systemic and root cause issues, many of the current design research methods show limitations in their ability to forecast and imagine the future at this larger scale. This paper will examine the ways that creative research is increasingly used in design as well as the humanities, social sciences, math and sciences as a means by which to examine the longer-term impact of design and research activity as a speculative, critical and participatory tool.

KEYWORDS DESIGN RESEARCH, CREATIVITY, CRITICAL THINKING, DESIGN THEORY, DESIGN PRACTICE, TEACHING

Introduction

Most designers consider themselves "creative" but often notions of creativity are relinquished to the conceptualization, ideation and production phase of the design cycle. Research is done as a means to help one become creative, but the activity itself is not necessarily considered creative. We are interested in exploring how creativity, specifically the act of creation, can be a means to engage in the research process. We suggest that creativity itself can help designers gain new insights and be more critical of the conclusions that they are drawing in the research phase because the very nature of it forces us to consider alternatives, test assumptions, and evaluate research as a product that is pressed out into the world for others to engage with—as a form of creative research. But there is a little agreement as to what defines creative research, especially in design. This paper provides examples of creative research from multiple disciplines, in the hopes of defining the specific ways creativity might be used to critically engage with information and findings in the design research process

What is Creativity and Creative Research

There are multiple dimensions and interpretations among all disciplines of both the terms creativity and research. In some cases it is looked at as an individual activity—such as Edward De Bono's (1972, 1995) work on lateral thinking. Mihaly Csikszentmihalyi (2015), on the other hand, characterizes it as a much more complex system that expands from individual to field to discipline. Still others look at creativity,

> "as a parallel construct to intelligence, but it differs from intelligence in that it is not restricted to cognitive or intellectual functioning or behavior. Instead, it is concerned with a complex mix of motivational conditions, personality factors, environmental conditions, chance factors, and even products" (Feldhusen and Goh, 1995, p. 231-232).

In all of these definitions, that act or state of being creative reinforces ideas of production that are usually associated with ideation. However, they are also useful in thinking about the construction of research because they encourage an approach that is multi-dimensional, multiscalar and constraints-based.

In a field that relies on novelty and invention, devising strategies for discovery is paramount. Much of the background research used for design practice has relied on more positivistic methods that isolate and examine how users interact with design artifacts, thereby testing what exists, rather than what might be. This is not a universal truth—the emergence of research methodologies like participatory design and design anthropology seek to discover new opportunities for design intervention. While creativity is sometimes used in the design of the research, it is not necessarily central to the methods themselves. Designers acknowledge the value of creative research mostly as a speculative and critical activity. A

mostly as a speculative and critical activity. A well-deserved critique of this method is that often its final resting place is in the museum, or in books, rather than out in the world where the artifacts of design live to be encountered and manipulated. As designers are increasingly interested in addressing systemic and root cause issues, many of the current design research methods show limitations in their ability to forecast and imagine the future at this larger scale. Designers are trained to be creators, to model phenomenon in form, to visualize patterns, and translate the abstract into the concrete. How then, can we use the relevant components of creativity which are propositional in nature—modeling, visualization, the pressing out of something "real" into the world to act as a mediator—to force critical thinking with both designer and participants acts as a primary method for design research? In what ways can this method of research focus design as a way to raise questions in diverse contexts as opposed to design for answers?

Across many disciplines people have used creative methods to engage in research. The following examples can help us see the value of creative research in the following ways:

- Using creative methods as a mechanism of critique and participatory dialogue;

- Using creative methods to engage in data collection, analysis and evaluation, and to facilitate critical discovery.

- Using creativity to look at problems from divergent perspectives.

Creative Research in the Arts and Humanities

While not necessarily defined as such, creative research has a long history in the fine arts beginning in the Renaissance. For example, research for da Vinci was the practical application and deep integration of design knowledge, engineering processes, and the sciences with fine arts.

Along with practical applications, creative research is a mechanism for critique and participatory dialogue. In 1967, Experiments in Art and Technology (E.A.T.) was started by artists Robert Rauschenberg, Robert Whitman, and Bell Labs engineers Billy Klüver and Fred Waldhauer. In a 2000 interview, Billy Kluver stated that "E.A.T. saw itself as a catalyst for stimulating the involvement of industry and technology with the arts" (Kluver, 2000, para 1). Over 2000 artists and 2000 engineers were recruited and paired, the collaborators were encouraged to create works that both investigated and catalyzed dialogue on emerging technology. Artist Lillian Schwartz, was a participant in the 1960s group. She worked with computer graphics innovator Ken Knowlton to develop animation techniques that laid the foundation for Hollywood special effects and the computer games industry.

In a more recent example, artist Joe Davis and Dana Dal Bo partnered with scientists from the University of Kentucky to create the Lucky Mice Project as a means of critique and

dialogue on genetic engineering and the human-animal relationship in the sciences by asking the hyperbolic question, "Can we breed luck?" In their work, Davis and Dal Bo set up the conditions to study the correlations of serendipity and genetics by selectively breeding mice that rolled unique combinations of die (i.e. "snake eyes"). The project aimed to address issues of genetic selection while simultaneously questioning the policies that drive the humane and ethical treatment of animals in scientific experimentation.

Creative Research in the Social Sciences

In the social sciences, Helen Kara argues that expanding methodological boundaries across all of the social sciences are driven by the fact that researchers are tackling more complex questions and traditional research methods are too limiting to adequately handle these complexities. Kara (2017) states that creative research methods allow researchers to accurately reflect the multiplicity of meaning that exist in social spaces, such as arts-based research, research using technology, mix-methods research and transformative research frameworks.

Narrative research—perhaps one of the most widely used forms of creative research—can be defined as using narrative and storytelling as a participatory means by which to collect information (Manney, 2016) or as a methodology for synthesizing, analyzing and ultimately disseminating qualitative data (Crouch and Pearce, 2018) "...which place research participants as collaborators and give rise to emotion and sensory understandings of the self as well as allowing for unexpected experiences and knowledges to emerge." (Bryant, 2015, p.1) This definition is important because it integrates narratives into the information collection phase and gives rise to the potential of unexpected and undirected outcomes.

 W. E. B. Du Bois, a famed African American sociologist, academic and civil rights activist practiced creative research in the late 19th century. He along with his sociology students were engaged by the US government to collect and represent data on newly emancipated slaves in the US. They crafted beautiful hand-drawn and colored visualizations. When the government failed to publish the data portraits, DuBois curated them into an exhibition for the 1900 Paris Exposition—in part to reframe American and European perceptions on race and the lives of African Americans living in the south. The authors, Whitney Battle-Babtiste and Britt Rusert (2018) write that

> "[t]he cross-fertilization of visual art and social sciences here marks an important transition moment in the history of the disciplines while offering alternative visions of how social scientific data might be made more accessible to the populations and people from who such data is collected" (pg.13).

Creative Research in the Sciences

In the sciences creativity and creative research is often used to examine problems from divergent perspectives. In the following example, we can see the importance and value of using alternative forms of knowledge, in this case the embodied knowledge that manifests

itself in a physical model. Hyperbolic geometry, and also known as non-euclidean mathematics is the math that underlines general relativity, and helps explain the shape of the universe, animals such as corals, jellyfish, and plants for example, lettuce and curly kale.

The Institute For Figuring (IFF) was begun by Margaret Wertheim, a science writer, and her sister Christine, an arts professor, to explore the aesthetic dimensions of science, mathematics and engineering through the playful use of materials. The Crochet Hyperbolic Coral reef project uses Diana Taimina's concept of crochet as a means to understand hyperbolic geometry to model a crocheted coral reef, inviting participants to have a hands on playful interaction with the complex math of Hyperbolic geometry. In a 2009 Ted talk, Margaret (2009) argued for the value of creative research,

> "We live in a society that completely tends to valorize symbolic forms of representation, algebraic representations, equations, codes. We live in a society that's obsessed with presenting information in this way, teaching information in this way."

She continues with the proposition that crochet is a form of play that engages abstract theories and makes them concrete.

In a similar way to the craft of crochet, origami, the ancient art of paper folding has helped spark a scientific revolution, propelling a wave of innovation related to how we understand both man-made and natural structures. Origami is informing scientists like David Baker, who studies how amino acids fold in our bodies or the engineers building a satellite telescope's star shade at NASA'S Jet Propulsion Laboratory. (Allington, K., Apsell, P., et al., 2017)

Creative Research in Design

Muriel Cooper was a pioneer in design, particularly early interactive design and as an educator at the Massachusetts Institute of Technology's Visible Language Workshop—today known as MIT Media Lab. Cooper was highly experimental in her use of tools, and technology. She also didn't limit her work efforts to a single format or material—her work spanned from print to software interfaces.

What's relevant for this paper was the absence of a model for Cooper and her students to interact with screen based interfaces. Cooper engaged in the creative process to form critical opinions, collect data and evaluate the new technology. In a 1994 lecture Cooper states,

> "Our goal has been for a very long time to try to examine in the so-called emerging technologies what the new form and content of design, of communication, might be. And to that end for many years we have been building prototype visualization tools that would allow us to do something that seems relatively intuitive in order to say "What if we did this, then what would happen?" but to really visualize this stuff in as tight an iterative loop as we possibly could. So we're looking for the new design principles, umm we're not at all sure what they are...." (Massachusetts Institute of Technology Media Lab, 2018).

Many recognized the value in her creative research process, she became one of the first graphic designers to explore in a rigorous manner the emerging digital landscape and it was through this work that she fully understood the issues and problems inherent in that technology (Abrams, 1994).

Case Studies of Creative Research in Design

Based on the survey on creativity and creative research in the different disciplines outlined in the first section of this paper and related to the three purposes of creative research also mentioned, we suggest that creative research holds the most potential for design research in the following ways:

- As a means to engage in critical discourse about what is "true" and "factual" and to challenge the biases that are informing design decisions;

- To design better data gathering, analysis and evaluation methods that help designers see a problem from multiple perspectives;

- Building trust and openness between participants and researchers in participatory and co-creative methods.

Most importantly, we believe creative research holds myriad possibilities for opening up new paradigms of design research, challenging the biases that are inherent in any design approach—from the context of the project, to the way we conduct our research, to the solutions that we ultimately propose —and engage people (i.e. users) in both creative and critical research methodologies.

Design research and design research methodologies are still very much in their infancy. Over the past 30 years, discourse surrounding methodologies have been trying to decide if design research is a science, a liberal art, or a new domain in and of itself (Cross, Poggenpohl, Buchanan & Margolin). With roots in engineering, computer science, and manufacturing, the historical perspective of the designer has been to aim for objectivity, using research to "collect data" in order to make informed, and unbiased decisions. But, increasingly designers are recognizing the act of interpretation as key to the design research process, and that biases are inherent in any process that is propositional. The use of abductive reasoning, core to the design process involves judgement, and that judgement is closely tied to research, experience and habitus—or the way we view ourselves in the world, and as part of a field of study. (Cross, Crouch and Pearce) Paramount to decolonizing the activity of design is to situate the act of interpretation at the center of design research and dislodge the notion of the designer as an objective actor. We think creative research is a good opportunity to reframe this, as it positions the designer at the center of the interpretive process,

confronting them with qualitative analysis and decision-making as a core part of the research process. As Crouch and Pearce quote the french philosopher Jacque Bourdieu on the value of creativity—it is an 'acquired system of generative schemes' and

> "[t]hinking of creative practice in design as a dynamic relationship between the habitus and field empowers the researcher because it locates design thinking in the context of a dialectical engagement between ideas and the material world, positioning design in a continuously changing social environment" (Bourdieu, 1997, p. 95)

Creative research as a critical activity is based on the idea that through the creative process —one that involves making decisions in the very act of productivity—creativity can help designers challenge their own research findings and give a means by which to test the assumptions and conclusions they are drawing. Embedded in the act of creation are the qualities of framing, orientation, organization and scale, which all contribute to the activity of synthesis, analysis and evaluation. In addition, the process of creativity requires translation from one form to another, which necessarily involves encoding, summarizing and including certain pieces of information while excluding others (Author, 2015).

Case Study: Creating visualizations that illuminate gaps in research and knowledge

In "Groupthink: The Brainstorming Myth", social scientist Charlan Namath argues that "debate and criticism do not inhibit ideas but, rather, stimulate them relative to every other condition...because it encourages us to engage more fully with the work of others and to reassess our viewpoints" (Lehrer, 2012, para.10). Creative Research—and in particular visualization as a means by which to engage in the examination of a phenomena, can be particularly effective in prompting this critical discourse because the visualization acts as a sort of "truth" that can be contested. In visualizing causal relationships, visualizations can also foreground the relationship between cause and effect; as a movement it can visualize the collective consciousness through pattern-creation; and in both structuralism and post-structuralism it can emphasize the myriad network and connections that inform the interpretation of an problem—potentially bringing in more diversity and depth of understanding to similar or related sets of information.

In a graduate seminar at NC State entitled DIY cartography, students created a series of maps that looked at the history of urban development in Raleigh, NC with the aim of better understanding the myriad complexities of how a small southern US city had grown over the last 150 years. In using maps to engage in research, this class used creative research in its most basic form—as a mediator to disseminate and explain research findings. Invisible social issues such as segregation, civil rights, and discrimination are also formally manifested in the map, thereby becoming "real".

In the class, maps were used as a critical tool to raise questions about what the gaps were in the existing narrative of urban development in the city, but also in the student's own

research. In one example, a student used the map to examine the role that public schools played in the city of Raleigh's development. Do schools crop up as a result of housing development or is there a concerted effort to develop both simultaneously? Of particular concern was the disparity between neighborhoods where housing value and income was low, and the access those students had to quality public education. Through the creation of the map, the student looked broadly at such data as land value and the proximity to schools (Figure 01). Additional information such as the "score" the school had was included to overlay a more qualitative angle to the research. Finally, the student included a series of case studies that highlighted two houses in close proximity to each other, and where the children in each attended school. These case studies added yet another layer of qualitative examination by visualizing the incredible difference in distance of travel between the two. The lower income student had to travel 3 times the distance as the higher income student. Students then created additional visualizations that looked at the "network" of information that contributed to their findings (Figure 02). Their final visualizations were more experiential —specifically about a site that was pivotal to their research. This final visual was meant to test their findings "on the ground" (Figure 03). For the student conducting the research, the map itself became a powerfully persuasive tool. It also encouraged the student as well as the whole class to think through the implications of this disparity, and what is "fair." Of primary concern through these maps was to illuminate gaps in knowledge, to use the map as a creative tool to force synthesis of information and as a critical tool to discuss correlation and causation of observed patterns and phenomena.
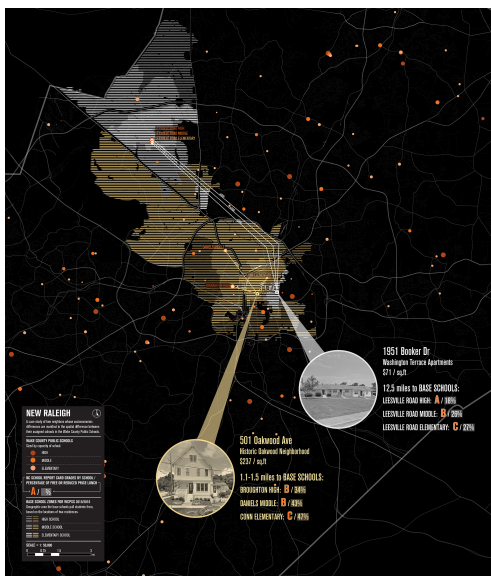

Figure 01: Geospatial Map: Education and Housing

Figure 02: History of Education Access

Figure 03: Oberlin Village and the History of African American Education

Using creative engagement in participatory design and co-creation: Building trust and critique through games and play

Participatory research has roots in anthropology in the sense that often the researcher is a participant-observer—simultaneously observing the culture or condition they are studying while also recording and interpreting their observations about its "peculiarities"(Geertz). It often implements a co-creative approach by asking participants to actively engage in finding the answers to design problems. Participatory methods are inherently creative in the sense that both the designer and the user are making something together.

Creativity within the participatory process could help raise new and novel questions—and potentially set up conditions for entirely new problems to emerge because of the open-ended nature of the creative process. In addition to engaging in a mutually creative experience, the creative process can help engage in a more critical examination of the problem definition. Could creative methods be used to augment or re-define the problem at the end stages of the design process? How might the tools that we are generating as a part of the research process be rethought as more inherently discursive tools? In traditional definitions of creative research, the idea of the research instrument as a mediator between the researcher and subject is not a new one, but possibly one that we can look at again in terms of how to negotiate meaning in novel and unique ways. Especially if we look at the purpose of the interaction as a reciprocal tool for this negotiation.

One of the challenges with participatory research is in building the trust necessary between audience and researcher, and between users themselves. In her Book, *Reality is Broken*, Jane McGonigal argues that one of the main values of gameplay is the trust that is built between the players—trust that is built as a result of mutual expectations of "following the rules" of the game. McGonigal also argues that games encourage us to take risks because the stakes are contained within the space of the game itself. How can we take advantage of the liberation of the game, and use creative research to build that trust to take risks and engage in meaningful critique as part of a participatory design process?

In a research project examining collaboration in online environments, ideas of gameplay were implemented to help participants build trust and spark conversation throughout the design process. As the study was focused on design collaboration, all of the participants were designers. Each time the group met, there was a different goal for what was to be produced with the end results living in the written journal, *Margin*. The research was also set up for both synchronous and asynchronous work. One of the first tasks was a writing exercise similar to the "telephone" game that children play. In that game, an initial statement is made. In this case, the first participant was given a passage from Shakespeare's *Merchant of Venice*—which they created a response to (Figure 04). Some participants translated line for line, others created a more original piece that responded to the ideas presented in the excerpt. Participants were also tasked with collecting and generating images that would complement the writing. The images were put into a shared repository for all to draw from and ultimately turned into a series of visual essays (Figures 05-07). Ultimately, this charrette
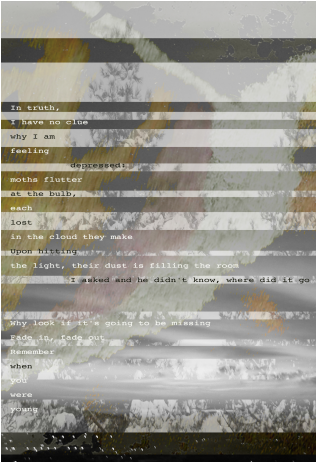
provoked important conversations about the nature of collaboration, especially as it related to scale, authorship and outcome. The project was meant to engage participants in deeper conversations about collaboration, and in many ways it was successful in breaking apart a collaborative process for closer examination. But more so as a creative exercise it helped participants gain a measure of trust with each other, and facilitate conversation. Through the activity of creation, it also gave specific testament to the way that collaboration was happening—as a proof of concept. And because of the constraints imposed on the participants, it forced a measure of risk-taking and liberation in the process.

Figure 04: Writing "telephone"

The artifacts generated from creative research are powerful tools that have a multiplicity of purpose. They capture and illuminate the intricacies of a problem, they help synthesize research gathered, recognize gaps in individual or group knowledge and help users form critical opinions on the inquiry.

Figure 05: Visual Essay by Author

Figure 06: Visual Essay by Erin White.

Figure 07: Visual Essay by Rebecca Tegtmeyer

Conclusion

Looking at examples from the humanities, social sciences, math and science, we start to see the value of using creativity in myriad ways throughout the research phase. We are not suggesting that creative research should be a substitute for other methods, nor that creative research should be the only type of research designers engage with. Rather, we are suggesting it as a critical part of a mixed methods approach that encourages designers to challenge their assumptions, seek new perspectives and engage in critical dialogue with participants and with their own ideas. The figure below is a preliminary visualization of the way that creativity and criticality intersect, and the reciprocal relationship between the two. The act of creativity, and the thinking that is involved, is directly linked to critical thinking through analysis and selection. Critical thinking is enhanced by creative thinking through the need to remain open-minded, while simultaneously rationally examining what is in front of you.

In her book, *Creativity from Constraints*, Patricia Stokes (2016) argues that, "Successful solutions are reliable, not surprising; predictable, not novel; already accepted, not creative" (p. xi). As the problems that we engage with become more complex, messier, more "wicked" it's increasingly critical to move beyond historical ideas of what is successful—and challenge our deeply-held assumptions about how to engage in design and research. Using creative methods to encourage a more open-ended approach to design research might be a critical first step in fundamentally rethinking the approach we take in this regard.
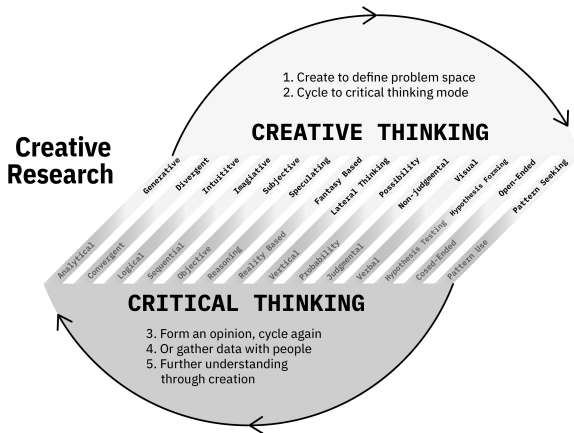
**Creative
Research**

1. Create to define problem space
2. Cycle to critical thinking mode

CREATIVE THINKING

Generative · Divergent · Intuitive · Imaginative · Subjective · Speculating · Fantasy Based · Lateral Thinking · Possibility · Non-judgmental · Visual · Hypothesis Forming · Open-Ended · Pattern Seeking

Analytical · Convergent · Logical · Sequential · Objective · Reasoning · Reality Based · Vertical · Possibility · Judgmental · Verbal · Hypothesis Testing · Close-Ended · Pattern Use

CRITICAL THINKING

3. Form an opinion, cycle again
4. Or gather data with people
5. Further understanding
   through creation

*Figure 08: A model
for critical and
creative research in
design*

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