Visual Knowing: A Case-Study of Gigamapping as a Pedagogical Approach

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Abstract

Design has embedded itself into everyday life through perspectives of professional practice, cultural identity, technological advancement and economic forces. The very nature of design, driven by a need for novelty and change, poses challenges that affect its disciplinary foundations. As a field of study, the future paradigm of design education should rely less on controlled boundaries of theory and practice, but instead explore new modes of inquiry to impact different applications and outcomes. Design plays a central role within the context of rapid change by defining new discourses on design education for creative placemaking and cultural production. Through the introduction of mapping as a research tool, this paper advocates a significant change in the design education agenda to address how future designers can critically initiate new research inquiries pertinent to the creative landscape. This research examines and outlines existing understandings of design that are limited by traditional specializations as well as proposing future directions for design research and pedagogy. Through a discussion of the disciplinary gap in design, its relevant knowledge and cultural considerations, this paper explores gigamapping as a pedagogical approach that generates visual expressions and articulations. The thinking and reflective practice of mapping is presented as an exploratory and conversational tool for interdisciplinary design research and practice. It functions as a creative site to challenge the epistemological foundations of design and develops forms of visual knowing.

Keywords

Design Education, Design Research, Visual Knowing, Design Pedagogy, Gigamapping.

Introduction

Design has built a knowledge base that is theoretically rooted in the nature of creativity, relying heavily on intuition through its specific ways of knowing and doing. Owen (1998) mapped how design creates its own knowledge base and can be applied to the areas of transportation, healthcare, information access, learning, work, urban systems and design processes. The broad application of design and its interdisciplinary intentions lead to new evolutions in the field of design research, further enhancing the value that design brings to its neighboring disciplines. This is an indication of the need for design to move from knowledge using towards knowledge building, allowing practical insights to reach the symbolic dimensions of Human-Centered Design. Design has become less concerned with what it produces — in the form of its outcomes— alternatively moving towards an emphasis on processes and knowledge.

Drawing stands as part of the design process that generates forms of sense-making, exploration and engagement. The act of drawing presents a dialogue between the individual and the sketch (Schon, 1983), allowing design to be explored as an extension of thinking. These expressions act as a necessary activity within the design process to form a language of design.

This paper reviews gigamapping as a part of knowledge creation through a systemic approach for creative practice, producing a form of visual knowing:
1. Design research is discussed as a form of knowing in order to communicate across disciplines.
2. The interdisciplinary challenges of design present a need for collaborative methods and processes in favor of realizing collective design solutions.
3. Gigamapping is introduced as a pedagogical tool to address the interdisciplinary complexities of design.

Gigamapping is discussed as a collective means to reach a common understanding of current issues and generate a form of visual knowing.

Knowing Through Design

Design research produces ways of knowing by means of the forms in which design is studied and how one positions the relationship between theory and practice. According to Jonas (2012), knowledge has different meanings and use when applied in science and design. The tendency to restrict research as a scientific endeavor leads to the mistake of separating theory and practice, which should be joined as part of an interdependent relationship (Glanville, 2015). Cross (1999) outlined the field of design research and its knowledge within the domains of people, processes and products. The characteristics of research in design are categorized as designerly in how knowledge becomes adaptable, reflective and re-usable. Design research relies on researchers who understand the scope of design activities and the implications of the knowledge produced.

Table 1: *Levels of Design Research (Cross, 1999).*

Research in Design	
Design ability as rational problem solving & reflective practice	
Purposive Research	Based on identification of an issue or problem worthy and capable of investigation.
Inquisitive Research	Seeking to acquire new knowledge.
Informed Research	Conducted from an awareness of previous, related research.
Methodical Research	Planned and carried out in a disciplined manner.
Communicable Research	Generating and reporting results which are testable and accessible by others.

It can be seen from Cross' categorization that design research is most valuable when the knowledge it utilizes, questions, interprets and generates is made communicable and transferable across domains of knowing, research disciplines and practices. This suggests that knowledge of design, in the forms of research and practice, is not only specific to design activities but able to build upon existing models to produce new ways of thinking, making and knowing.

1. *Disciplinary Perspectives of Design*

Research in design maps the flow of knowledge from its origins to application, interpretation and implementation. In this way, design transcends traditional models and processes by forming its own domains and contexts for inquiry. Gericke and Blessing (2012) conducted a comparative study of nine design disciplines to analyze process models among the disciplinary boundaries of design. The findings concluded that real design processes require an interdisciplinary approach, suggesting that a reformation of design methodology is necessary for responding to changing perspectives and functions within design. As a broad discipline, design has reached a level of complexity stemming from interactions between various processes to develop new principles, abstractions and solutions. This raises the argument for how design may be in need of a new perspective to redefine, reinvent or restructure its disciplines as broad-based research. Bremner and Rodgers (2013) discuss the fluidity of design and the indeterminacy of professional boundaries as reasons for the current fragmentation of conventional design disciplines affecting the future state of design research, education and practice. New hybrids of design have begun emerging in the forms of artists, engineers, designers and thinkers, reiterating the need for design to continually evolve. The study posits that design cannot be defined as a single discipline but needs to shift and extend beyond its boundaries of multi, inter and trans-disciplinary perspectives.

2. *Towards a Disciplinary Dissolve of Design*

The study produced by Bremner and Rodgers (2013) argues that the historic disciplines of design have been conflicted by the crisis of complexity, in how design has been modified due to issues of professionalism, global finance and the adoption of digital technologies. This implies that design, as a broad discipline, is in need of transformation and should not be confined to the conventions of practice but instead be responsive to external forces of change. The blurring of the disciplines should be positively reinforced as a means for the future possibilities of shared knowledge and skills to produce new forms of thought and action. In this manner, design is culturally situated to challenge threats of uniformity resulting in mass culture/consumption.

Table 2: *Disciplinary Relationships (Bremner & Rodgers, 2013).*

	The Disciplinary Dissolve
Disciplinarity	An understanding of one set of conceptions and one methodological approach.
Multidisciplinarity	An understanding of disciplinary difference with the ability to learn from other surrounding disciplines.
Crossdisciplinarity	An understanding of disciplinary difference with the ability to follow the problem-focus of other disciplines.
Interdisciplinarity	An understanding of at least two disciplinary competencies with one being primary (strengthens the understanding of the primary discipline).
Transdisciplinarity	An understanding of at least two disciplinary competencies where neither is primary (results in emergent perspectives).
Pluridisciplinarity	An understanding of a combination of disciplines already related in design itself.
Metadisciplinarity	An understanding of overcoming disciplinarity with methods to construct overarching frameworks to connect practices and histories to new problems.
Alterdisciplinarity	An understanding of the ability to make connections generating new methods to identify *other* dimensions of design.
Unidisciplinarity	An understanding that purposely blurs distinctions (a flexible mindset to create unexpected ways of working and new projects).

The spread of technology, specialized skills and knowledge presents challenges for properly situating design research and its methods, particularly in the role of education and practice. Poggenpohl (2015) raises questions regarding the interrelated areas of research, theory and practice and how they benefit the development of communities of practice. The argument lies in how design today is increasingly involved in collaborative work, supporting the need for designers to understand other disciplinary approaches. Traditionally, design was taught by practitioners who were able to teach some skills but unable to engage students in design thinking and research. This has led to the misrepresentation and application of research in the design context, uncovering the need to further refine how research informs, underpins and improves practice.

Implementing Research in Design

According to Poggenpohl (2015), research skills should be taught in the same manner as design skills in order for students to understand potential outcomes through various forms of inquiry. One key area that requires attention is in establishing a fine balance between humanities and science (Simon, 1996). Therefore, students should experience the thinking processes of other disciplines to better understand how research leads to the development of knowledge. Such exposure to other disciplines allows for a deeper contrast and appreciation for the designer's own position to tackle other areas of significant human problems. The role of educators is to provide a learning experience leading towards the formation of identity, reiterating the role of design and designers.

Norman and Stappers (2015) question whether current methods of design education address the sociotechnical complexities that are in need of design thinking and Human-Centered Design methods. This leads to the fundamental question of how design is able to contribute to the arena of complex systems and the modifications necessary to design, further emphasizing the importance of systemic approaches to design and design research. The role of design takes into consideration design perspectives in analyzing and identifying the underlying causes to redesign systems.

Table 3: *Role of Design (Norman & Stappers, 2015).*

Ghanging Perspectives of Design	
Design and Other Actors	Designers must build upon the foundations of other approaches to work collaboratively.
Design for Complex Systems	Traditional design methods, developed for simple situations, need to evolve in order to develop new ways of understanding inter-relationships within larger complex systems.
Design and Human Psychology	Design needs to take into account human psychology, human factors principles and Human-Centered Design in order to tackle difficulties, accidents and failure to recover in a timely way.
Design Implementation	Designers tend to focus on the front of the development cycle but must continue through the implementation stage.

In opposition to the complexities of sociotechnical problems affecting the areas of healthcare, transportation, government policy implementation and environmental protection, design is in need of transformation to change design thinking, research, conceptualization, abstraction and implementation. Table 3 orders the changing perspectives that are redefining the role of design, as design activities are confronted with varying degrees of knowledge exchange and transference across its levels of collaboration and interaction. A key area in which these changes need to take shape is in design education, where future designers need to be able to address increasingly complex situations and systems that they may apply design as both strategy and solution.

1. *Educational Approach*
The Master of Arts in Design at LASALLE College of the Arts is a research-led design practice program that addresses the multiple contexts of design posed by everyday complexities.

A pedagogical rubric — as shown below in Table 4— demonstrates the perspectives in which design can be researched through disciplinary, multidisciplinary or interdisciplinary studies.

These three domains define the knowledge base of the MA Design program and demarcate the boundaries for scaling and growing the research capacity of the Faculty's School of Design Communication. Building upon Frayling's (1993) definition of research into, through and for art and design, Table 4 presents the pedagogical rubric that frames the program's philosophy of design research. Research in falls within the disciplinary boundaries of design, where the theoretical perspectives are rooted within design history and practice. The multidisciplinary nature of design, as being informed by neighboring disciplines of practice and other knowledge sources, forms research by design. In consideration of the growing need for interdisciplinary knowledge in design, research through design allows for collaborative experience to build into a new knowledge base for design.

Table 4: *MA Design Pedagogical Rubric.*

Design Research Perspectives		
IN	*DISCIPLINARY*	Foundations are deeply rooted in the discipline of design
BY	*MULTIDISICIPLINARY*	Studies of everyday practices relating to design
THROUGH	*INTERDISCIPLINARY*	Reviews the role of design against the changing patterns and uncertainties of everyday life.

The program's research tracks are structured within four main themes that examine issues of material culture, design futures, urban studies and design citizenry. Graduating projects have identified thematic parallels within the categories of research intentions, measures of value, design implications and categorization (Chon & Abu Bakar, 2018). The research strengths of each graduating cohort inform the creation of knowledge, which is fluidly shared to result in the cross-pollination of ideas. Key areas can be outlined to indicate future directions of design research and the sociocultural impact of designed solutions.

A commonality, linking the different research interests among students, is found in the emphasis on the changing role of design and potential for greater social impact. This shift towards social design moves beyond the functional utility of design in order to focus on the context of users' needs and future interactions through transformative design, contributing to new discourses of design theory and practice. The implications of these changes call for different expressions of design, building upon the use of visual language as a tool to communicate the macro-perspectives, framing its interrelationships.

2. *Gigamapping – A Pilot Study*

In an effort to better understand the crossing, sharing and exchange of knowledge between student researchers, the collective process of gigamapping was introduced to a cohort of 10 students within a Design Lab module in 2019. The physical space of a design studio encourages the forging of ideas through various forms of conversation and creative testing. It was found that individual projects and research streams require a degree of integration to expand the full experience of users. Hekkert et al. (2000) argue that breakthroughs and innovative research should embed a level of co-operation beyond all traditional boundaries to develop designer-driven processes. This results in;

1. Exploring new forms of interaction, constructing the basis of research

2. The discovery of new techniques or methods to support design research.

Visualizing ideas through drawing allows for spaces of possibility to emerge, as intuitive thinking and analytical perceptions are developed, enabling deeper levels of critical thinking (Makela et al., 2014).

The 10 students involved in this research examined topics around intergenerational and multi-sensory play, mindfulness and sustainability, collaborative frameworks and speculative futures.

As these topics were being developed, it was apparent that there were many areas in which students could collaborate in order to examine deeper levels of theory to inform more effective practical applications. Gigamapping is an analogue approach to systems thinking that enables participants to visualize the complexity of design through an analytical, intuitive and reflective process (Sevaldson, 2019).

The process of mapping makes it possible for contexts to be clearly defined in relation to micro and macro environments, shifting concepts into frameworks future actions. Gigamapping provides an ideation technique that facilitates contextual development, maps out the complexities of related systems and macro environments as well as providing a shared understanding of current situations and issues to be further explored by explicating tacit knowledge through visual conceptualizations.

The piloting of this gigamapping process began with an extensive review of information, methods, examples and insights provided on systems-oriented design (Sevaldson, 2013). As design becomes increasingly more complex and relies on greater degrees of collaboration and cooperation, this study was developed to encourage research students to understand the overlaps and interrelatedness of design activities. A set of clear parameters was presented and students were separated into research clusters based on their respective areas of research interest. Taking into consideration the four research themes of the MA Design program, an exploratory approach was taken in order to aid students in defining the disciplinary boundaries of their research projects and clarify the context of their individual practice.

The process comprised the 3 stages of;
1. mapping linkages
2. synthesized mapping
3. the design system.

These stages built upon concept mapping techniques by focusing on the extrapolation of ideas, analyzing the emerging themes and scaling ideas across sectors and systems.

Mapping Linkages
Groups were formed based on similarities or overlaps in research scope. The process began with identifying keywords, drawing linkages and shaping relational themes. Participants were encouraged to start with existing knowledge in order to eliminate all filters of thinking, dig into details, identify potential gaps, use relational descriptions and communicate emerging themes.
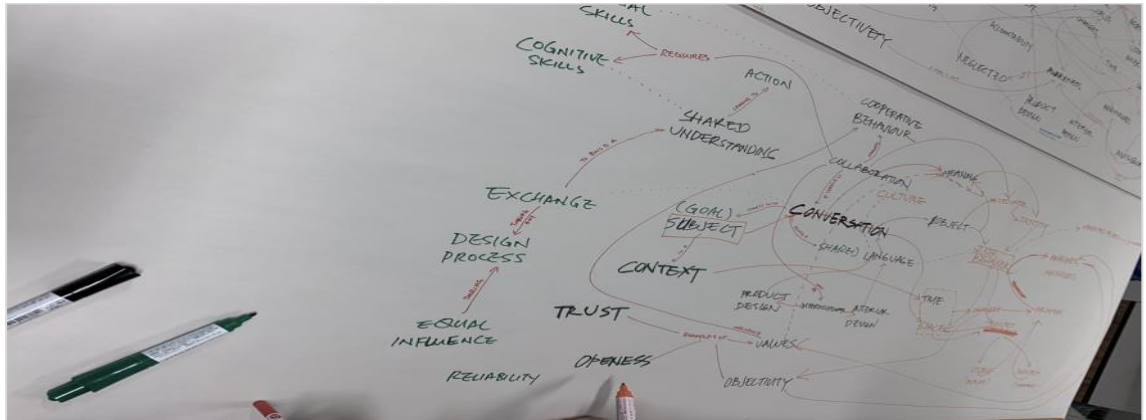

Figure 1: *Part 1; Keywords and Relationships.*

Figure 2: *Mapping Linkages.*

Synthesized Mapping

Through a *sense sharing* session, the 4 groups were combined into 2 larger groups based on similarity of theme. The first group, looking at cultures and communities, selected the *timeline* approach to better understand the chronological sequence of events, develop clear scenarios and propose possible future directions. Group two, focusing on tech and futures, took a more focused approach to zoom into a particular issue, innovate through speculative ideas and interventions and also propose potential directions based on a re-examination of initial pain points.
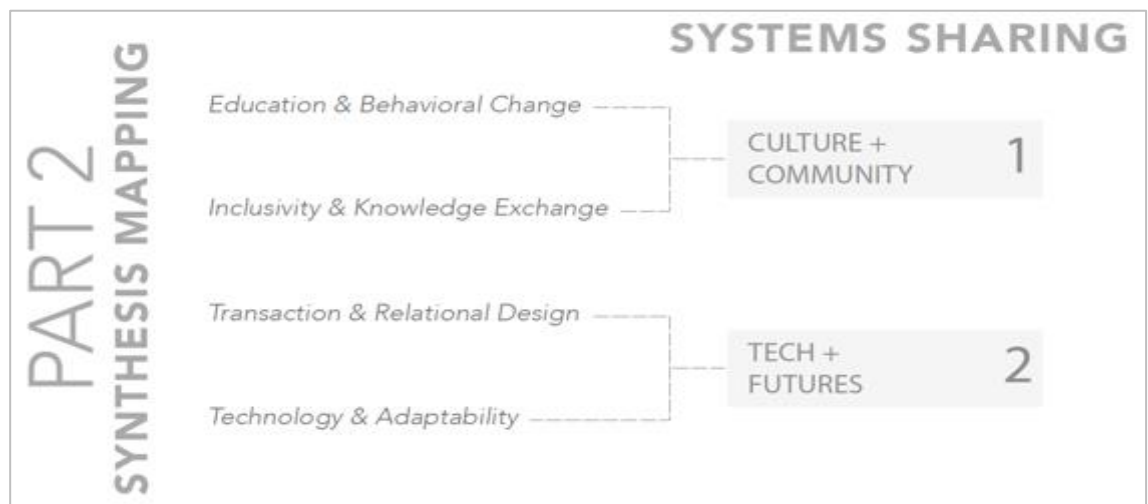

Figure 3: *Part 2; Emergent Themes and Design Approaches.*

Figure 4: *Synthesis Mapping.*

Design System

A *system sharing* session was initiated for the 2 groups to reflect on the different processes of integration before joining the two maps into a final synthesis. As a collective and collaborative practice, this final synthesis allowed all participants to contribute to a larger mapping of future directions. This would further frame their research projects while identifying the overarching themes of the cohort's research areas.
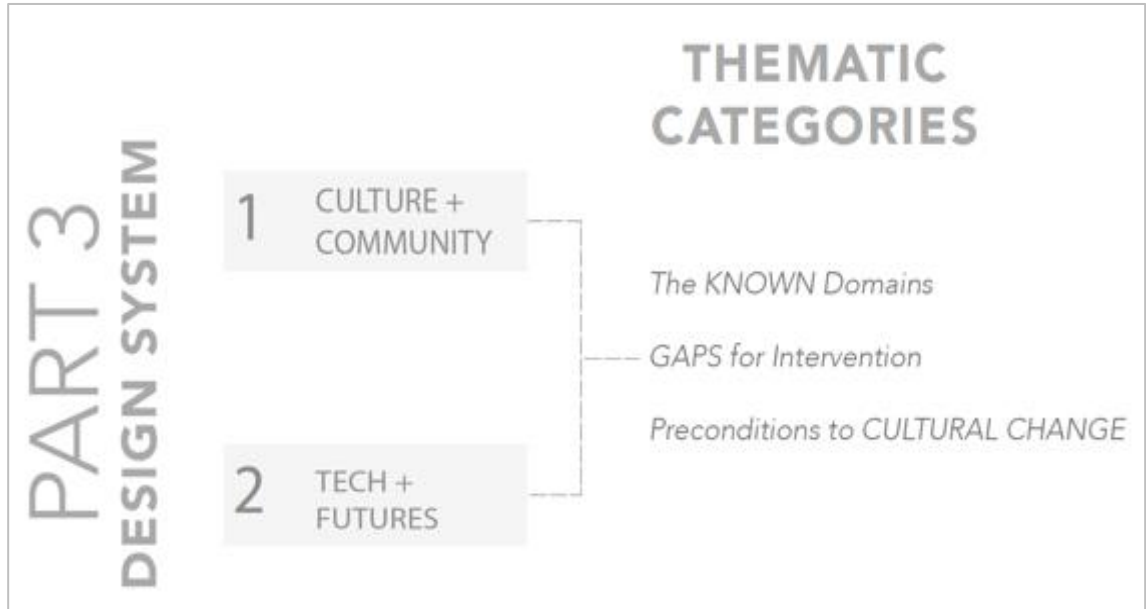

Figure 4: *Part 3; Thematic Parallels and Gaps for Design Intervention.*
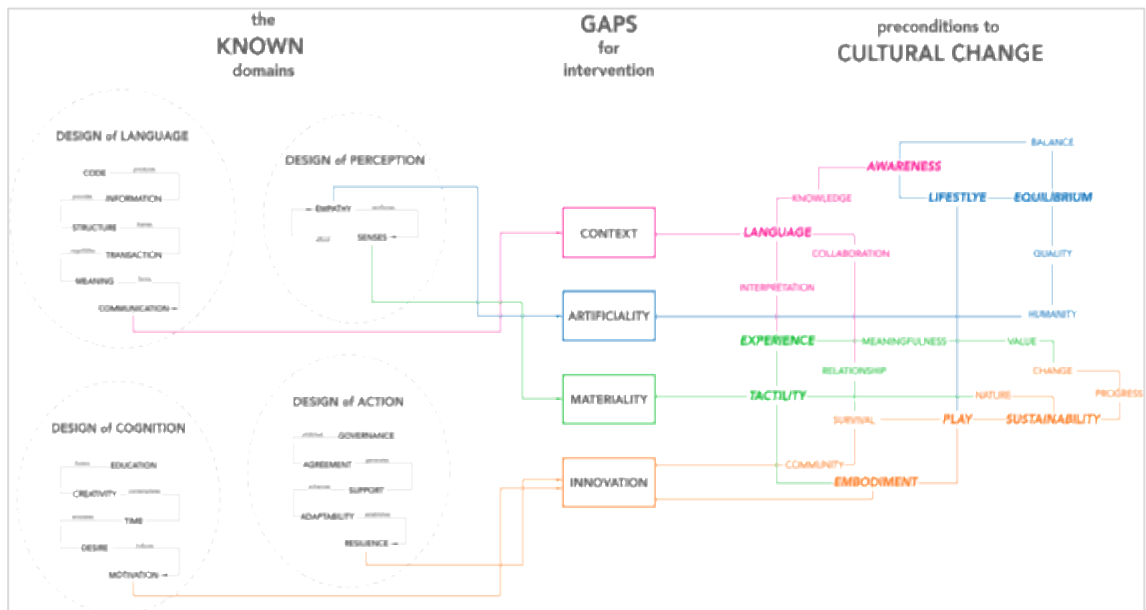

Figure 6: *Categories of Design Research.*

The final synthesis resulted in an incremental identification of thematic categories. These categories are indicative of how a cohort of research students can position their respective research interests against the parameters of;
1. the known domains
2. gaps for intervention
3. preconditions to cultural change.

Designers contribute to future social interactions through propositions, interventions, solutions and future directions. The known domains were organized into the sub-categories of language, perception, cognition and action. The keywords and relational links were transferred from the earlier stages of gigamapping and led to identifying the gaps of intervention — context, artificiality, materiality and innovation. From the gaps of intervention, future actions were identified by areas requiring further exploration through research, framing clear parameters for research derived from the MA Design program.

3. *Exploring the Interdisciplinary Implications of Design*

Gigamapping provides a collaborative application for interdisciplinary researchers to develop collective responses to a complex, systemic issue or problem. Through methods of extrapolation, conceptualization, ideation and analysis, participants contributed to the mapping of systems that frame broader understandings of issues, systemic relationships, identification of main stakeholders and actors as well as the roles of designers.

The assessment of this study began with the intention to facilitate better exchange and communication between a cohort of design research students. Three stages were developed to allow student researchers to experience a collaborative mode of thinking and processing through the visual activity of mapping. Of the 10 students who participated in this study, it was found that their research interests shared an underlying principle to improve on current social issues and relationships through design. Through the tool of mapping, it was confirmed that the context of design research frames all human activity as design interventions can be scaled across micro, meso and macro levels of impact.

Gigamapping, as a methodology, has been instrumental to exploring how a group of interdisciplinary designers can work collaboratively to explore broader research themes, define the systems involved, clarify the role of design and identify future directions. The process of mapping, as a critical and reflective tool, enables design students and researchers to expand upon project scope through a form of visual communication to relate to audiences. Furthermore, the social implications of design are articulated through a focus on users, their perceived needs and potential for scaling impact through design involvement.

As a collaborative and conversational activity, mapping presents a visual articulation of design's impact against broader social and cultural systems. Mapping also provides a space for ideas to develop into an emergent framework of keywords, themes and concepts, outlining the boundaries of future design action. In this manner, drawing gives form and structure to mediate the thinking processes of mapping. These visual representations serve as new forms of expression, whereby the placement and relational links between words generate new narratives to support subsequent design activities.

Conclusion

This paper presents a review of existing discourses on design research, practice and disciplinary divided as the premise for exploring new modes of inquiry, exploration and creative thinking. Design requires its own specific forms of knowledge to establish disciplinary strengths in ways of thinking and acting. This paper supports the need for new ways to expand on systemic thinking, interdisciplinary practice and social impact. A pilot study of gigamapping has been introduced to show how design, as a way of framing and contextualizing, can utilize more collaborative activities to develop a collective understanding of future themes and directions of research. Design is in need of transformation and new educational approaches in order to provide more inclusive and interactive approaches. This objective is well addressed through the framework of gigamapping. As the practice of design requires more collaborative work, a stronger research underpinning can improve upon future practice by properly situating and positioning design issues, contexts and potential solutions.

This paper proposes a gigamapping approach to postgraduate research as a way to identify research themes, clarify the role of design and produce better social impact.

The development of a context-specific design system, comprising known domains, gaps for intervention and preconditions for cultural change builds a framework for categories upon which future designers can further explore and define research areas. Future studies may build on the parameters of the initial study and refine a gigamapping research that focuses on an educational application.

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