How Design Education Can Use Generative Play to Innovate for Social Change: *A Case Study on the Design of South African Children's Health Education Toolkits*

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There's been a paradigm shift in design from focusing on aesthetic worth to focusing more on the interplay of form and function to assume social responsibility and to pursue social change through innovation. As a result, the discipline needs models for how to educate responsible designers who see design not only as a commercial enterprise but more importantly as a catalyst for social change, and are able to innovate visual technologies that address social problems that are wicked by nature, and are far more complex and interdisciplinary than merely problem-solving how to aestheticize a client's content. This paper introduces such a model called generative play that integrates psychology, game theory, and economics with design. Specifically, generative play takes root at the intersection of activity theory, generative research, flow, play, and generative justice. It offers an interdisciplinary methodology that addresses wicked problems in health through social innovation and instills cognizance of social responsibility in design students. In a case study of the wicked problem of children's health education in South Africa, 40 fourth-year design students used generative play; and, through an analysis of their logbook entries and design outcomes, we found that generative play does engender cognizance of social responsibility and pleasure and does facilitate social innovation.

Keywords – Socially Responsible Design, Social Innovation, Design Education, Play, Health Design

Relevance to Design Practice – Designers who use their knowledge and resources to innovate for social change will confront health problems that are wicked and interdisciplinary. This paper proffers generative play, a model that integrates psychology, game theory, and economics with design for use, particularly when innovating for the wicked problem of children's health education.

Why Design Education Needs Models for Teaching Social Innovation

There is a school-of-thought in the broad discipline of design known as socially responsible design that advocates for the use of design resources to address problems in society. And even though socially responsible design has gained prominence in recent years (see Melles, de Vere, & Misic, 2011; Tromp, Hekkert, & Verbeek, 2011), it should be noted that the 1970s mark a turning point in the discourse with the publication of Papanek and Fuller's (1972) seminal book, *Design for the Real World*. Papanek and Fuller's book aligns with the emergence of participatory design in Scandinavia at that time but is widely regarded as being a critique of consumer culture and an advocate of the need for designers to be more responsible in their design practice (Clarke, 2013).

Similarly, Manzini (2015), a seminal design theorist affiliated with the Politecnico di Milano in Italy, argues that design for social innovation is "not a new discipline; it is simply one of the ways in which contemporary socially responsible design is appearing" (p. 55). That is, the values and processes of socially responsible design manifest presently in social innovation, or, as Manzini expresses it, socially responsible design manifests itself in "new products, services, and models that simultaneously meet social needs and create new social relationships or collaborations"

(p.11). We argue that social innovation is a result of socially responsible design; it "emerges from the creative recombination of existing assets" (p.11) provided by socially responsible design initiatives. For instance, carpooling is considered a social innovation because it relies on the existing asset of the automobile and provides an alternative to citizens driving individual cars; it also facilitates collaboration among citizens. The example of carpooling underscores Manzini's definition of social innovation that emphasizes a link between innovation and change, and more significantly, the fact that social innovation is grounded in the everyday lived experiences of people. The carpooling example also highlights Manzini's (2014; 2015) stance on social innovation regarding behavior change, that is, new ways of considering production and consumption. Another example that brings light to what Manzini means by social innovation is his

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example of a community garden. Designed to be managed by the people it serves, a community garden creates an opportunity for collaboration among the same people who experience an improvement in the social fabric of their community; and, the fruits of their labor return to them through healthy, nutritional sustenance. What becomes evident with these examples is that with social innovation there is an increased emphasis on the creation of a social design culture (Julier, 2014), one that favors designerly ways of knowing and doing (Cross, 2006) in order for all people to "design and redesign their existence" (Manzini, 2015, p.1), thus putting the power into people's hands, particularly those who are underserved and, thereby, effecting social justice.

Indeed, social innovation is the new buzzword and a phenomenon, underpinning many discussions where the word innovation denotes social change. Today, social innovation traverses many disciplinary conversations. The most popular lens from which it is considered and promoted is, arguably, business; where strategy, enterprise, and entrepreneurship represent some of the key business areas for social innovation research. Within a business context, social innovation is inextricably linked to a novel product that drives consumption. For instance, Toyota's Prius is an example of a car company taking an existing design—the car—and redesigning it to be more sustainable in order to appeal to more car buyers' 'eco-sensibilities' and, hopefully, lead to more car sales. Driving a Toyota Prius contributes to improving the environment and increasing financial profits for Toyota. However, social innovation can do more for society as a whole.

Evolving in reach from the traditionally rational and left-brained disciplines, social innovation has gained prominence within a widening intellectual domain that includes design thinking. As social innovation extends in disciplinary scope to

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encompass right-brain thinking, there needs to be a shift from the existing "value-added" (Whiteley, 1993, p.79) adages of form and function (i.e., form follows function and function follows form) towards the idea that form *and* function follow content. That is, "art and utility" (Moloth, 2005, p.57)—how a design is aestheticized and how it is used—should depend on a socially-responsible message, with the designer leading the development of the content. Designers are no longer called upon at the end of the design process but now sit at the front end of innovation. This allows them to be content creators too. Designers who socially innovate today have more control over form, function, and content. Within the context of social innovation, this new responsibility of authorship effects more control over the nature of the designed outcome as well; and the content that social innovation designers grapple with creatively is more wicked in nature and, therefore, warrants complexity in its articulation.

Social innovators today are designing for wicked problems; that is, macro problems that are ill-defined and comprise an evolving and complex system of interrelated micro problems (Buchanan, 1992; Churchman, 1967; Rittel & Weber, 1973; Rowe, 1991). Due to this complexity, Bennett (2012b) argues that a wicked problem warrants a *wicked solution*, that is, a macro solution comprised of a network of micro solutions. Since wicked problems are complex and tend to apply to many disciplines in scope, a wicked solution may include any combination or all of the following: micro solutions from one discipline (e.g., design) or many disciplines (e.g., design, medicine, and law); a micro solution that is a design system that mediates the involvement of many stakeholders in its successful implementation (Cassim, 2013); and a micro solution informed by multiple disciplinary perspectives in its design and development.

Thus, to address the complexity of wicked problems, the form the design outcome or wicked solution takes needs to be more *multimodal* (Kress, 2010) or inclusive of both tangible objects and intangible experiences. When considering social innovation, the multimodal design outcome, irrespective of the multiple forms that it may take, aims to make life easier and better for people (Frascara, 2002). Thus, the value of the multimodal design outcome moves away from being linked primarily to consumption for financial profit and instead focuses on its value to society and ultimately the greater good.

Accordingly, design education must respond to the emergence of social innovation in the discipline so as to nurture students with the necessary critical and applied skills to approach contemporary wicked problems in appropriate and meaningful ways. Manzini (2015) introduces the idea of design schools as both resources and agents for social change. In this regard he says: "[Design schools] can generate original ideas and interact with local communities to trigger new initiatives or support ongoing ones while adopting a design research approach" (p. 74). This distinction is pertinent to the case study discussed in the next section where the underpinning ethos of the tertiary education project is to cultivate and nurture an understanding of design education's role within the context of social innovation for a wicked problem, with a view towards designing a wicked solution that aims to effect social change.

Socially Innovating for South African Children's Health Education in an Information Design Class at the University of Pretoria, South Africa

Socio-economic inequalities such as poverty still remain a challenge in post-apartheid South Africa and continue to impact the country by contributing to the burden of disease and social health faced by the population. Poor and vulnerable groups are more at risk owing to the lack of resources and poor service delivery in a country still in transition. Despite schools being key sites for service delivery, schools in many areas (most notably those in lower-income areas) suffer from a lack of resources. As such, basic education services, "such as providing textbooks and ensuring school attendance" (de Lange, Mitchell & Stuart, 2011, p.179) do not meet minimum requirements; and schools are therefore often barely functional in this regard.

Furthermore, South Africa is one country that is known to have one of the fastest spreading epidemics of HIV in the world (World Health Organization, 1986). The prevalence of HIV is harrowing and has impacted significantly on the "ratio of the child and aged population (0-14 and 65+)" to "the working age population (15-64)" (National Department of Health [NDoH], 2012, p. 5). What this implies is that children start working at a very young age, families have large numbers of children and many households are child-run. These circumstances are some of the many reasons that a disproportionate number of the population lives below the breadline resulting in poor access to healthcare. The consequences for poor health care are severe in that children and their elders face a great need for social and financial support; the state struggles to provide sufficient basic healthcare services and private healthcare remains financially inaccessible to the masses. The following statistics clearly highlight the inequalities in the access to health services in the country and also substantiate the fact that healthcare in South Africa is a complex problem: "Most of the population, 82.4% (41 million), were dependent on the public health sector and only 17.6% of people belonged to a medical scheme in 2010" (NDoH, 2012, p. 5).

Children's health in South Africa epitomizes a wicked problem; and its' wicked solution likely crosses many disciplinary domains including education, medicine, law, and policy; and, as Nelson and Stolterman (2003) argue, it (specifically health) crosses the domain of design as well. Thus, in May 2015, 40 upper-level, Information Design students at the University of Pretoria, South Africa, embarked on designing wicked solutions to the wicked problem of children's health in South Africa.

The University of Pretoria's vision that information design is a humanistic discipline provided instructors with the intellectual scaffolding to frame the construction and implementation of a learning environment conducive to addressing a wicked problem like children's health in South Africa. The overall pedagogical goal was to foster in students a people-oriented attitude as well as a deep-rooted understanding and mastery of a set of discrete skills in design thinking and making. With this goal in mind, a teaching philosophy, aligned with Freire's (1970) belief that students are active participants and not empty vessels whose task is merely to receive and store information, equipped instructors with a cohesive way of thinking that guided their development of a constructivist learning environment for the information design students. Their teaching philosophy comprised a broad set of imperatives divided into three areas of foci, made easily comprehensible by a metaphorical reference to various perspectives from which designers operate, namely designing with their *head*, designing with their *heart*, and designing with their *hand*. This teaching philosophy is informed by conceptions of experiential learning (Dewey, 1938; Freire, 1970), constructivist learning (Piaget, 1967) that entails active learning by doing, and scaffolding (Bruner, 1975; Vygotsky, 1962) or building on what students already know. The instructors aimed to create a constructivist learning environment to instill in information design students cognizance of social responsibility and to teach them how to innovate socially to address wicked problems. The rationale for situating students within an experiential-constructivist learning environment was to ensure that the students see their instructors' roles as being that of facilitators and mentors instead of teachers who are likely to impose a hierarchy in classrooms or in other learning environments. Secondly, the instructors wanted to encourage design students to better understand their role as facilitators who need to draw on additional content expertise as and when necessary. Thirdly, the instructors aimed to nurture students with the necessary applied design and intellectual skills so that they can promote themselves as professionals and citizens who embody good civic values. The final reason for situating students within a constructive learning environment was to create a meaningful and replicable learning experience that would teach the responsibility of designers emphasized by design theorist Richard Buchanan (1998): to create pleasure that is good, useful, and just. The constructivist learning environment they created is called generative play, an innovation-based system of activity that aims to yield multimodal value that effects social change.

Generative Play:
A Model for Teaching Social Innovation

Within the context of a discussion on the value of activity theory in framing the design of constructivist learning environments, Jonassen and Ronrer-Murphy (1999) adapt Engeström's (1987) model of activity theory to explain design: a subject which involves a designer or team of designers and a community comprised of stakeholders, including members of the target user group, producing an outcome. Their model explains the act of designing as collaborative and goal-oriented, culminating in the production of an object that may be physical or mental. Rules mediate the division of labor and interaction between the subject, community, and tools that produce the object. The Jonassen and Ronrer-Murphy's model of design is particularly useful because it explains design as a mediated activity system depicted in Figure 1 and makes explicit the system's nodes and framework of interaction.
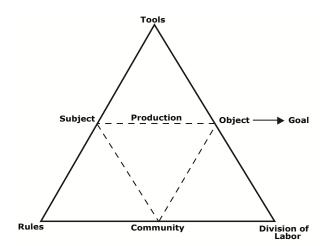
Figure 1. Jonassen and Ronrer-Murphy's (1999) **model of design as an activity system that produces an object that has a goal.**

However, in the Jonassen and Ronrer-Murphy's model of design, the delineation of design outcomes as objects is limiting and outdated. In keeping with the idea that today designers are innovating multimodal outcomes that are less object-oriented and more experientially-based, we extend Jonassen and Ronrer-Murphy's model of design which envisions the production of unimodal objects with goals that benefit primarily corporations to an updated perspective where the activity of design 'innovates' multimodal value that may include a combination of objects and experiences focused on effecting various types of social change. For information designers, social change used to equate to bettering the world through aesthetics; today, however, designing for social change has a more robust meaning in the discipline that includes: quality of experience (including but not limited to aesthetic experience) along with the potential to correct social wrongs; the capacity to catalyze cognitive, behavioral, or environmental change; and the ability to provide economic sustenance. Whereas

the latter used to mean increased consumption for corporate financial profit, today economic sustenance can equate to financial independence (from the client) for the designer and even economic benefits to the end-user. In Figure 2 we depict this new model of design as *generative play.*

Generative play is a system of designing for social innovation that we posit is particularly useful in the contemporary design classroom because it grapples with the challenge of how to nurture students with the necessary critical, research, and applied skills to approach contemporary wicked problems in innovative ways. In generative play, as in a Jonassen and Ronrer-Murphy's model of design, a subject collaborates with a community to design an outcome. However, instead of yielding a unimodal object with a generic goal, generative play generates multimodal value, that is, it generates a combination of tangible and intangible outcomes that aim to yield social change as defined in Figure 2. In generative play, to meet the demands of wicked problems in contemporary society with wicked solutions, the act of designing must broaden to include the designer taking the lead in defining the problem, developing the content, and ideating solutions in collaboration with end-users instead of the traditional model of designers working for a corporate client. Thus, we posit that *innovation* is a more appropriate descriptor of the act of designing in generative play than Jonassen and Ronrer-Murphy's term *production*.

Generative play differs from Jonassen and Ronrer-Murphy's model of design also through its framing of the labor associated with design as a collaborative act. Jonassen and Ronrer-Murphy's use of *division of labor* to describe collaboration is ironic because *division of labor* has a direct reference to Neoclassical economics implying alienation of labor where value redirects to an extractor like a large corporation. This is the polar opposite of the kind of collaborative design approach that generative play aims to facilitate where labor is unalienated and value returns to the actual value generators.
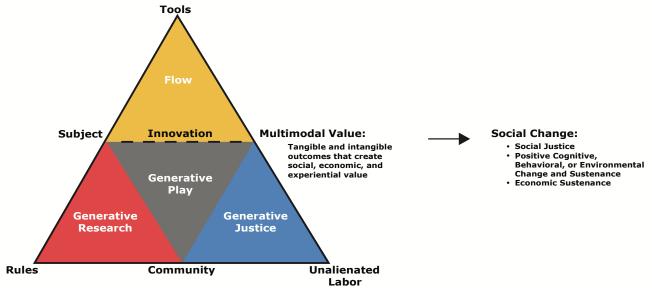

Figure 2. The generative play model of design as an innovation-based system of activity that aims to yield multimodal value effecting social change.

Like Jonassen and Ronrer-Murphy's model of design, generative play is a mediated activity between nodes in a system; and, tools and rules facilitate and guide the interaction between the nodes in the system. However, to facilitate a social change agenda, generative play introduces three new theoretically-grounded concepts (i.e., generative research, flow, and generative justice) where each—like the silent conductor of an orchestra—frames the relationships between nodes in the system towards social change.

Generative Research: Designing Social Value

The days of teaching student designers to be grand masters who aestheticize information in such a way that causes greater consumption leading to increased profits for corporate clients, with little to no regard for social impact, are arguably over. Seminal works—such as Garland (1964); Ortbal, Lange, and Carroll (1996); Poynor (1999); McDonough and Braungart (2002); Heller and Vienne (2003); and Berman (2009)—have inundated the discipline's oeuvre with clarion calls for social responsibility and cognizance of the impact of design outcomes on humanity and the environment. This directive demands an overhaul of the way that we design and teach design, from intuitive-based conceptualization to research-based inquiry that values collaboration with different professional and lay stakeholders, including those most affected by the design outcome, the end-users. Participatory design (Schuler & Namioka, 1993), user-centered graphic design (Frascara, Meurer, B., van Toorn, & Winkler, 1997), inclusive design (Coleman & Lebbon, 1999), co-design (Scrivener, Ball, & Woodcock, 2000), and human-centered design (Buchanan, 2001) contribute formative approaches to user research–like group and individual interviews—that influence the design team's creative decisions and how the design concepts take final form. However, when the outcome of the design is about effecting behavior or cognitive change in the end-user, Bennett (2012a) argues that engendering interaction between the end-user and the design outcome can lead to greater communicative and cultural resonance—an important precursor to behavioral and cognitive changes. Engaging the end-user in active interaction with a design outcome represents a summative form of user research that aligns with what design researcher Elizabeth Sanders (2000) calls *generative research*, that is, the act of supplying the end-user with creative or *generative* tools with which to interact. And empowering the end-user to make substantive contributions to the interpretation process facilitates her gaining more control over the value generated. Thus, within the generative play system, generative research appropriately frames the social interaction between the subject (e.g., the student designers) and the community (e.g., the end-users) along with the interaction between the community and the tangible outcome.

Flow: Designing Experiential Value

In studying how to identify and understand the states of optimal experience, psychologist Mihaly Csikszentmihalyi (1990) theorizes that an optimal experience is a satisfying one that yields a state of consciousness called *flow*. In his findings that extend over two decades, he found that an activity provides optimal experience (flow) when it delineates rules that allow for skill-building; sets up goals; provides feedback; makes control possible; and, facilitates immersive engagement—concentration and involvement—different from everyday experience. This paper posits that flow is a form of experiential value that play can provide in the design classroom. Salen and Zimmerman (2004) define play as a game that has a way of operating (i.e., rules) and a goal; it is a moment when the player acts and the *system* responds with an outcome. Play, then, is an activity much like the one that Csikszentmihalyi describes; and, Brooks and Petersson (2005) shows that play facilitates flow. It is important to note that play has even been used across disciplines to address the wicked problem of health. For instance, in design, Anderiesen, Scherder, Goossens, Visch, and Eggermont (2015) identified various types of play experiences suitable for managing Alzheimer's Disease; and, in psychology, play has proven effective at empowering children to manage their mental health (Axline, 1947; Bratton, Ray, Rhine, & Jones, 2005). There is evidence also that play stimulates learning, in early childhood development (see Bruce, 2004; Frost, Wortham, & Reifel, 2008; Johnson, Christie, Yawkey, & Wardle, 1987; Shaffer, 2006), during primary and secondary education, as well as in early adulthood, and during tertiary education (see Sheldon, 2012). Within the generative play system, flow appropriately frames the experiential interaction between the subject, tools, and community along with the interaction between the community and the tangible outcome.

Generative Justice: Designing Economic Value

Heskett (2009) initiates an important conversation of how design creates economic value, analyzing the canons of economic theory and how each explains what constitutes economic value. Heskett argues that design has the potential to reach new frontiers by creating social value that improves the end-user's quality of life; and, social value occurs when the end-user finds value in the design outcome. Thus, social innovation represents a next frontier for the creation of economic value through design.

Social innovation for some designers might manifest itself in abiding by existing professional organizations' codes of conduct on social responsibility while designing for businesses and non-profits. However, in generative play, the student designer takes social responsibility to another level, abandoning the client-based, business model of design, and thereby adopting a *designer as author* (Rock, 1996) identity that entails identifying the social problem to address, deriving appropriate content, and innovating multimodal value from that content. Value, in generative play, aims to effect social change that includes improving the quality-of-life of end-users and providing the student designer with a pathway to financial survival.

In generative play, labor refers to unalienated versus alienated labor; and, innovated value can mean intellectual, behavioral, or economic gain that brings about social change. When some of the value returns to the system that generated it, particularly to the subject and the community, then *generative*

justice (Eglash, 2014) prevails. Generative justice is a form of social justice that refers to the rights of laborers (i.e., value generators), to create their own conditions of production (or innovation in the case of generative play). Generative justice also refers to the rights of communities of value generation to nurture self-sustaining paths for its circulation. In other words, generative justice, as depicted in Figure 3 is the universal right to generate unalienated value and directly participate in its benefits.

In contrast to Jonassen and Ronrer-Murphy's model that produces a unimodal object, generative play *innovates value* through unalienated labor (shared by different stakeholders in a collaborative manner) to attain the goal of social change. Within the generative play system in Figure 2, generative justice frames the pecuniary interaction between the community and the outcome and between the subject and the outcome both in relation to unalienated labor and the flow of value.

The Role of Design Thinking in Applying Generative Play

While design may traditionally be known as an expertise that can make things look aesthetically pleasing to motivate consumption, today Brown (2009) argues that due in part to the economic shift in developing countries from manufacturing to service delivery, design has a new social role. Design has become a sought-after expertise for the development of non-object outcomes including improved service experiences and even ways of communicating and collaborating. As a way of thinking (Cross, 2011; Lawson, 2006; McKim, 1972; Simon, 1969) design has arguably become the method of choice for social innovation. One reason for design thinking's desirability in addressing social needs in particular may be due to its value as "a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos" (Brown, 2008, p.86). For instance, Brown references IDEO's work with health care provider Kaiser Permanente to teach its employees (nurses) design thinking so that they (the service providers) can innovate new services and service delivery options that better meet the patients' needs or improve the patients' experiences. IDEO's work with Kaiser Permanente is precisely what Buchanan (1998) argued should be the designer's task, to design for the individual's needs within his or her immediate context.

While various approaches to design thinking exist (See, for instance, Back & Gremett, 2011; Brown, 2008, 2009; IDEO, 2013; Liedtka & Ogilvie, 2011; Simon, 1969; Stanford dschool, n.d.), in the case of generative play, we posit the integration of playing with Cassim's (2013) non-sequential, design thinking process of *formulating, representing, moving, evaluating, and reflecting*—an approach substantiated by Lawson (2006), Cross (2006), and Nelson and Stolterman (2003). In generative play, the innovation process, as depicted in Figure 4, moves linearly through formulating, playing, representing, moving, evaluating, and reflecting but offers flexibility to move back and forth non-sequentially. Formulating entails finding and understanding the design problem. When representing, the student design team gives form to their solution ideas with multiple representations and alternatives. Whereas, moving describes the process of dialoguing with representations to generate the most viable solution—*moving* closer towards the design outcome through negotiations and critical reflection. In evaluating, the student design team makes design decisions that enable it to move forward. Thus, although the processes of moving and evaluating are listed separately, they tend to be interdependent. When Norman (1988) describes design as the "successive application of constraints until only a unique product is left" (p. 158), he is essentially describing the simultaneity of moving and evaluating, and vice versa. One of the most important phases in generative play is reflecting, where the student design team looks and thinks about their design and their design decisions. The student design team innovates a design outcome from generative play that aims to effect social change. With generative play, social innovation emerges from circuitous activity or dynamic interaction between nodes within the system, including collaboration between the subject and community; and, when carried out successfully, innovation generates multimodal value that has the potential to yield social change, and, if so, contributes to the problem's wicked solution.
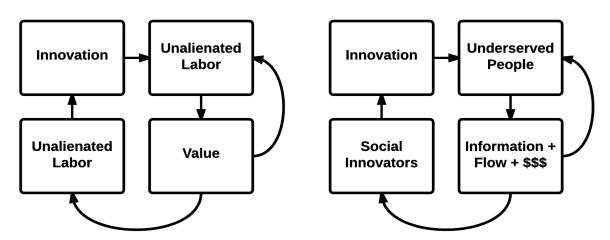

Figure 3. The flow of value in a form of generative justice (Eglash, 2014) **applied on the left to design for social innovation, while on the right the activity of designing generates value that returns to both the underserved people and the social innovators.**
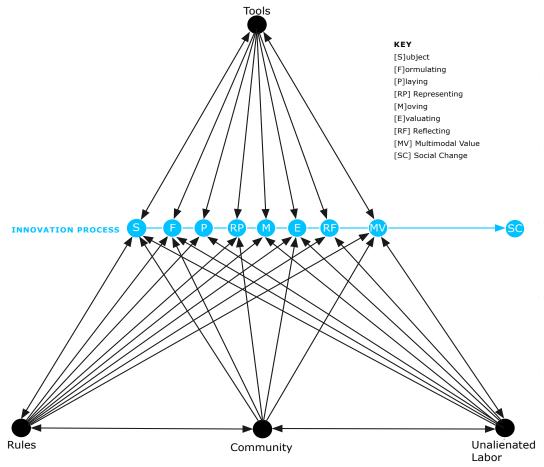
Figure 4. The social innovation process in generative play, represented by the cyan color, moves linearly through formulating, playing, representing, moving, evaluating, and reflecting with flexibility to move back and forth non-sequentially.

Procedure

Prior to the start of generative play, the instructors gave the students a design brief that provided an overview of the problem, learning outcomes, and guidelines detailing specific objectives that align with the tenets of social innovation: To inspire students to realize the communicative power of information design and its potential to make a difference in the world; to cultivate in them an awareness of broader socio-cultural and health education issues, as well as the challenges faced in environments that they may not necessarily be familiar with; to develop their ability to collaborate with different stakeholders including other designers, disciplinary professionals, and end-users; to imbue in them an understanding of design problems as wicked or complex, and to develop multifaceted and design outcomes that are socially responsible and sustainable; to foster in them an understanding of design as an iterative process, requiring multiple and evolving stages of research and prototyping; to critically consider production costs; to impart research, strategic thinking, critical thinking, and applied skills; and to improve reflexive skills in objectively analyzing and evaluating their work including ideas, outcomes, and processes.

The brief also provided constraints meant to facilitate creativity among students and provide initial cues for *framing innovation* (Dorst, 2015) for the problem at hand. One requirement

was for students to thoroughly document their design process and findings in a logbook. They were required to include written reflections on their process and experiences throughout the project. The pedagogic rationale for requiring the use of a logbook was to make the student designers more receptive and mindful about their own growth and learning. Students were also required to familiarize themselves with one of a given list of health sub-themes (i.e., nutrition, hygiene, disease awareness and prevention, and social health) and iteratively design, in a collaborative and user-centered manner, an overall identity and look-and-feel for their group's toolkit—keeping in mind that it needed to be appropriate to the context/users, inclusive of their input, feasible, and, ultimately, sustainable in form and content.

At the start of generative play, the forty students self-organized into 13 groups (12 groups of 3 students and 1 group of 4 students); and, over a three-week period (that included three weekends) they shared in the responsibilities of designing the toolkits, starting with focusing in on the part of the wicked problem of children's health that interested them. The first week focused primarily on formulating and representing (and even making small moves), with time from the onset to play among themselves as part of the process. Then, play therapists facilitated a half-day workshop with the students to introduce (or rather re-introduce) them to play.

The playing phase of generative play included five forms of play. After a short slide presentation of each type of play by the play therapists, students were allocated some time to play games and activities that subscribed to the respective type of play. As students played, the play therapists met with each group to engage the students in dialogue about what they were experiencing, as shown in Figure 5.

Figure 5. As students experimented with play in small groups, a play therapist (on the left) **met with each group to engage the students in verbal reflection on what they were experiencing.**

The five forms of play–mastery play, dramatized play, free play, creative play, and biblio play–were chosen because they are developmentally appropriate forms of play for children. Mastery play facilitates and nurtures mastery of a specific subject or activity like digging a hole or pouring water from one vessel into another, as depicted in Figure 6, or even trying to put a puzzle together. Mastery games tend to focus on hand and eye coordination and necessitate team work, requiring students to practice communication skills to play the game.

Figure 6. A group of students collaborating in mastery play, taking turns pouring water from one vessel into another.

Dramatized play makes use of lived-out or role-playing techniques to explore real or prospective personal, social, or domestic scenarios (e.g., playing shop). Props provided in this form of play included masks, finger puppets, toy animals in a sand pit, a water station with creatures inside it and other dress up accessories. Figure 7 shows different student groups engaged in dramatized play.

Figure 7. Three groups of students engaged in the playing phase of generative play where each group is playing a different form of dramatized play. In the first row, one group of students play a dress-up game with accessories. In the second row, another group of students play with masks and role play; and, in the third row, another group of students play with toy sea creatures in a sand (or rice) pit scene.

Free play, as shown in Figure 8, has no external, pre-set goals and favors freedom of choice and imagination (e.g., playing with play dough). During free play, students used their free will to choose from a wide range of items that were brought to the workshop by the play therapists. Similarly in creative play, students can choose to make something of their choice with felt tip pens, colored pencils, cardboard, pipe cleaners, glue and other materials. Creative play encourages the use of existing resources to facilitate creative forms of expression (e.g., making musical instruments from found objects). Thus, many of the materials provided for creative play by the play therapists were intended to be up-cycled and therefore included a large range of items that would typically be thrown away (e.g., toilet tissue rolls and the egg carton shown in Figure 8).

The last type of play involved in generative play is biblio play that includes the use of books and other audio-visual aids (e.g., listening to or reading a book). Figure 9 shows a display of the books provided by the play therapists for biblio play.

Figure 8. On the top, a group of students engages in free play, molding forms out of play dough. On the lower-left, a group of students engages in creative play with up-cycled materials like the egg carton shown in the foreground; and, on the lower-right, one can see the outcome of their efforts.
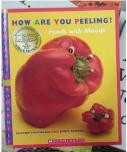

Figure 9. An assortment of books provided by the play therapists for biblio play.

Through experiential immersion with playing during generative play, the student designers were able to gain a better understanding of the principles of the different types of play and, in turn, how they contributed to childhood development and learning. Some games required students to play independently while others necessitated teamwork. To this end, the students were challenged to move out of their own comfort zones and to engage in ways they may not have engaged previously in a tertiary education setting. Playing facilitated an opportunity for them to experience social integration and development first hand with a view towards nurturing similar instances and opportunities in their toolkit activities. In addition, each type of play and game was related to different developmental age groups for children (this

informed the design of the students' toolkits because they had to specify the specific age group they were designing for to ensure the appropriateness of the games for those particular end-users).

While generative play involves playing, when innovating for the wicked problem of children's health education, play is particularly useful because of its benefits to the end-user—children. In general, play has the least potential to harm children (Benham & Slotnick, 2006); it is the most developmentally appropriate medium to use when working with children (Schaefer & Drewes, 2010). Through play, children develop new concepts, acquire new skills, make sense of their world, take responsibility for their actions and increase social skills (Baggerly, 2010; Green & Drewes, 2013). Within the generative play model, the five forms of play were the tools or instruments that the students utilized to facilitate social innovation and change by incorporating them in the design of the tool kits, thereby aiming to make complex health awareness information more accessible to children. By allowing the information design students to explore these five forms of play among themselves, they experienced, first hand, the power of play. Thus, they were empowered to appropriately integrate the forms of play into their tool kit designs in the next phase of the generative play process–moving, evaluating, and reflecting.

During this phase, between the first week and second week, students focused on collaborating with other relevant individuals (including parents, teachers, and administrators), organizations or experts (such as doctors, child psychologists, and teachers) who shed light on the context, content identified, or preliminary educational solutions derived during moving; but, it is important to note that collaboration with users and experts occurred throughout the generative play process on an ad hoc basis. Students collaborated with members of their target user community to come up with a suitable strategic solution that was aligned appropriately with the age group and their choice of topic. They also conducted primary research on their educational topic when feasible that included speaking to health education experts and other relevant professionals as well as children within the target user age groups. They conducted secondary research that included consulting books, magazines, websites, and the like. While students took responsibility for their own research and design process, the educators nurtured their process by arranging for professional stakeholders (i.e., the play therapists) to visit the class and consult with them. Overall, the students received feedback during the design process from their instructors, play therapists, end-users, parents, teachers, and other health professionals from the community in the strategic development of their concepts. With this feedback, during the last week, students returned to formulating or, more pragmatically, executing while also reflecting in their logbooks and then playing, again, under the direction of the play therapists.

There was a strong focus on praxis for the duration of generative play. Praxis comprises action as well as reflection; and this approach allowed for an iterative and critical design process. This philosophical stance resonates with Donald Schön's (1983) ideas of designers being reflective practitioners who engage in dialogue with the situations in which they are placed. Within

the context of this case study on socially innovating for South African children's health, dialogue was central to the project in that students were encouraged to work in a real world context and had to communicate with a wide variety of key stakeholders, including play therapists as well as end-users (i.e., the children, parents, and teachers at respective organizations/schools in the local community).

Results: *Outcomes and Student Feedback*

Upon completion of the course, student design teams demonstrated their ability to socially innovate with generative play in a group presentation of their wicked solution: 13 toolkits aimed at educating South African children of varying ages on health awareness. Each of the toolkits listed in Table 1 consists of a comprehensive set of instructions that aim to engage South African youth and their parents or teachers in a series of educational activities focused on health awareness; and, the use of generative play with the students had a profound impact on their design outcomes as each of their toolkits incorporated playing in its functionality.

Figure 10 through 13 provide photographic documentation of four of the 13 toolkits created that exemplify social innovation in their aim to meet a social need–educating children on health awareness and healthy habits–and to create new social relationships and collaborations between children and their peers, parents, and teachers through play.

Table 1. Toolkits designed by information design students at the University of Pretoria, South Africa.

Name	Type of health education facilitated by play
Hello Life	Teaches hygiene for cancer patients with finger puppets (dramatized play), a storybook (biblio play), and building blocks played like the game Jenga (mastery play)
Germatology	Teaches hygiene by emphasizing awareness of germs with a board and card game (mastery play) and a storybook and informational posters (biblio play)
Rom + Bit	Teaches social health by focusing on the management of technology and screen-time with a storybook (biblio play), a cut-out sunglass activity (dramatized play), and a time management coloring activity (creative play)
Something with Legs	Teaches social health by building self-confidence with a role-playing activity that incorporates hand-puppets and conversation prompts (dramatized play) and a music activity (mastery play) where children form a percussion group with sheet music
Contagion	Teaches awareness of tuberculosis (TB) and rabies with card games (mastery play) and a board game that includes role playing (mastery play and dramatized play) to teach children about how to avoid catching TB and rabies
Play Smart	Teaches nutrition, specifically educating on how nutrient-rich foods fuel the body and the benefits of an active lifestyle with board games (mastery play) and activities that focus on sports and fitness (creative play)
Shine	Teaches personal hygiene and cleanliness with a storybook (biblio play), a coloring book (mastery play), and a bedroom-themed activity with marbles that need to be rolled in a box until they fall out of specific slots–a metaphor for tidying one's room (mastery play)
Great Pursuit	Teaches social health by defining the concept of success with a storybook (biblio play) and a game where a group of children plays with large elements in an open space to reach specific goals and complete a task
Bunch	Teaches social health by focusing on inclusion and tolerance with a storybook (biblio play), a role-playing activity (dramatized play), and a boardgame (mastery play)
It's all about us	Teaches social health by addressing selfishness in children with a card game (mastery play) and free play with a sponge (creative play)
Upbeat	Teaches social health by focusing on understanding and managing attention-deficit hyperactivity disorder (ADHD) with a musical activity (mastery play), an interactive storybook that incorporates performance with storytelling (biblio and dramatized play)
Stitched	Teaches social health by addressing bullying through building tolerance and trust with an activity book (biblio play), a stuffed animal (dramatized play), and a game in which they make connections with other children based on shared interests (mastery play)
Zinjo	Teaches oral hygiene with a storybook (biblio play), a board game (mastery play), and a card game (mastery play)

Figure 10. 'Hello Life' toolkit aims to create awareness of hygiene and infection risks among children between the ages of 6 and 8 who have cancer and their parents. It comprises the following three play activities and each activity focuses on a different aspect of personal hygiene: Germ buster blocks (modeled on Jenga blocks), Germ combat guide (a form of biblio play), and Mr Body's battle buddies (a puppet building kit).

Figure 11. 'Germatology' toolkit aims to create awareness of hygiene and germs amongst children between the ages of 9 and 11 and their teacher. It comprises three phases of play activities—informing, remembering, and relating—a storybook, a board game, a card game and information design posters.

Figure 12. 'Rom + Bit' toolkit aims to create awareness about social health, the need to minimize the use of and reliance on technology, and the importance of a balanced daily schedule for optimal development. It is for children between the ages of 8 and 9 and their parents. It comprises a story book, a time management activity, cut-out shapes for coloring and role play, along with a crossword activity.

Figure 13. 'Something With Legs' toolkit aims to help children to grapple with social health and their self-confidence. It is for children between the ages of 10 and 13 and their teacher. This toolkit comprises four confidence and self-esteem building activities for group play along with an educator's guide with detailed instructions for facilitating play.

The student designers purposefully integrated playing in the functionality of the toolkits that would enable the end-users (i.e., children) to engage in play with their peers, parents, and teachers during interpretation. For instance, with 'Hello Life,' the child plays a building blocks game inspired by the game Jenga, another game modeled after biblio play, and a puppetry activity; it engages children in strategy, social interaction, playing by the rules, literacy, hand-eye coordination, repetition, role playing, and puzzle solving. With 'Germatology,' children play a board game, a card game and a memory game to learn about the presence of germs in their daily life; it engages the child in immersive interaction with stylized and visually appealing illustrations of the different types of germs, visual and verbal literacy, and problem solving activities that involve humor and surprise. With 'Rom + Bit,' the children engage in role play, complete a crossword puzzle,

and learn how to manage their use of technology; it engages and immerses each child in creative problem solving, and craft, fine motor, literacy, cognition, and role playing activities. With 'Something with Legs,' children engage in four games, learn self-worth, and how to have self-confidence within a group context and various daily interactions with adults; it engages children in creative problem solving, social interaction, music, gross motor skills, participation, and imagination.

By using generative play to design toolkits, the students aimed to create visual technologies that would improve the human condition by specifically addressing the wicked problem of children's health education in South Africa. For instance, 'Hello Life' aims to improve the health of children who have cancer by engendering an awareness of hygiene and infection risks. 'Germatology' aims to improve the health of children by

engendering an awareness of hygiene and germs. 'Rom + Bit' aims to improve the health of children by making them aware of their social health, the need to minimize the use of and reliance on technology, and the importance of a balanced daily schedule for optimal childhood development. 'Something with Legs' aims to improve the health of children by helping them to grapple with their social health and self-confidence. In addition to the aforementioned design outcomes, we also collected anecdotal evidence discussed in the next section that provides insight on the effectiveness of generative play at engendering cognizance of social responsibility and pleasure and facilitating social innovation; it also provided insight on the important role of play in generative play.

Student Feedback from Logbooks

The use of generative play to design health education for South African children breaks the stereotypes of play being a mindless time filler and only for kids. As one student wrote:

- *The greatest lesson I learned in this project is that play is a powerful tool, not only for children but for adults too. I felt that with play my imagination was allowed to run free and so were my ideas and concepts. It created a better understanding of…how play aids learning.*

In consultation with the play therapists, during generative play students engaged in self-guided play where they came up with the way each game would operate and what the goal would be for each. The integration of play successfully facilitated an optimal learning experience for the students during generative play. Other students' feedback included:

- *For the first time in a long time we were encouraged to gather information through other methods than the usual desk research and field research via interviews; we conducted research by experiencing the task of playing ourselves.*
- *The power of play is impressive and I also get the impression that we as adults should not forget to play. There is such immense emotional value in play and in working through emotions.*
- *We were given the opportunity to learn…five different forms of playing, by actively experiencing and experimenting with different toys, games, puppets and books. Not only did this provide us with a firsthand experience, but it also encouraged me to push my design solution harder, so that it can be…interactive and fun.*
- *This…project definitely draws from a large well of prior learning and experience. On the most primary level, this brief allowed everyone to look back to their childhood days and revive their inner sense of play.*

The instructors and play therapists nurtured the design students with the creative tools and resources to develop professional design skills accompanied by good civic values. The design students, in turn, engaged the members of their prospective end-user community in the design process in order to reach an appropriate outcome. A few students noted:

- *The project promoted valuable learning experiences in the form of community engagement, and so provided a deeper understanding of social responsibility and awareness.*
- *Reading through hand-written questionnaires, conversing with young minds and playing with the children in their favorite spaces helped us to realize the importance of our job, not only as communicators of information, but designers of a future in which these children will have the opportunity to grow and thrive.*
- *I found a new appreciation for user testing. I feel that the knowledge and insight that one gains from observing a user interact with a piece of design is immensely valuable. It is the best way to test feasibility and practicality. Asking the participant to reflect on the experience delivered information about their firsthand experience.*

The design students' logbook entries also revealed the effectiveness of generative play at instilling cognizance of social responsibility. Generative play has the ability to instill and sustain a social cognizance in designers that favors collaboration, empathy, and responsibility as evidenced by the following anecdote extracted from a student's reflection logbook:

- *Designing for health education was a challenging, but liberating experience. It opened my eyes to see how I, as a designer, can create meaningful designs (based on thorough research) that make a positive difference in people's lives.*

In fact, reflecting on the experience, a number of students felt that they would want to pursue social design and innovation in their professional careers. For instance, they wrote:

- *Through the course of this project I realized that I have an insatiable desire to use design to help people and better people's lives.*
- *This project enriched my awareness of the broader socio-cultural and health education issue of technology. It inspired me and solidified my knowledge that design really does have the power to make a difference in the world.*
- *Above all, this project served as a brilliant introduction to designing for a younger audience and pursuing the greater good through design. This project showed me that I can make a difference in the world by fostering good educational health in children, to promote good social and emotional health in their roads to adulthood.*

When one student says "*Everyone can play but sometimes you just forget how to,*" this implies that generative play provides a common ground within the social innovation process for all participants involved and therefore democratizes both participation and creativity.

Discussion

The results from this study reveal that generative play was an effective approach to teaching social innovation in the design classroom because it facilitated generative research (social value) and generated flow (experiential value) and generative justice

(economic value). Generative play aligns with the collaborative design principle that a designer can no longer work in intellectual isolation when working to tackle complex, ill-resolved or wicked problems which are often social in nature (Poggenpohl & Satō, 2009). Furthermore, the adoption of a generative play approach lent more rigor to the design process and allowed for an increased focus on research. Generative play presented itself as a valuable learning curve to instill respect in students for the people for whom they design. Ultimately, the intention, again, was to educate responsible designers who see design not only as a commercial enterprise but more importantly as a catalyst for social change through innovation; and, when we speak about social change, it's not just about what people say or think but, more importantly, what they do. For instance, a well-designed poster may not always result in value creation if people don't interact or engage with its content—as Bennett (2012a) argues, engendering interaction with images contributes to communicative and cultural resonance. Through the integration of play therapy, generative play aims to make design more engaging and accessible through an aestheticized, meaningful, interactive, play experience. The toolkits in themselves represent *generative tools* (Sanders, 2000). For instance, 'Hello Life' and 'Rom + Bit' engage parents and child in interaction and engagement through play. Whereas, 'Germatology' and 'Something with Legs' engage the teacher and children in interaction and engagement through play. The outcome of this application of generative play shows how social innovation can engage the people they serve in active interaction that has the potential to generate experiential value through flow and address the wicked problem of children's health in South Africa.

The experience of designing with generative play, and particularly the inclusion of an opportunity to engage in play therapy, led to a state of optimal experience for the student designers. In fact, they enjoyed their play experiences so much (as evidenced by their logbook entries) that they were motivated and empowered to integrate play in the toolkits that they designed for children in their target age group. The students' intent was to reciprocate experiential value with the toolkits by designing them to facilitate playful and educational interactions between

children and their peers, teachers, and parents; the underlying assumption was that achieving a state of optimal experience for the end-users would better lead to the kind of social change the student designers envisioned—better health awareness and habits among South African children.

From the perspective of economic value, the design students' unalienated labor generated toolkits that, in turn, aimed to facilitate unalienated labor for an underserved population, South African children, in which multimodal value would be generated and returned back to the underserved population. That is, the children's unalienated labor playing with the toolkits generates health knowledge, a value that returns to them. For instance, 'Hello Life' generates knowledge of how to reduce infections through basic awareness of personal hygiene, a value that is returned to the child after participation in the activity. 'Germatology' generates knowledge of three types of germs— bacteria, viruses, and protozoa–present in daily life, a value that is returned to the child after participation in the activity. 'Rom + Bit' generates knowledge of the negative effects that excessive use of technology can cause and how to manage one's time for optimal cognitive, emotional, and intellectual development, a value that is returned to the child, after participation in the activity. 'Something with Legs' builds self-esteem and self-confidence, a value that is returned to the child, after participation in the activity. By returning value to the children, experiential value was generated and returned to the design students through a strong sense of satisfaction. It is important to note that the toolkits also have the potential to serve as entrepreneurial goods that return monetary value to the design students. Figure 14 shows the flow of unalienated labor value to the end-users (i.e., the children) and the student designers.

Conclusion

The case study in this paper shows that when used in an information design classroom, generative play teaches social innovation in a fun, non-threatening way that advances civic responsibility, engagement, and agency and nurtures the students' cognizance of
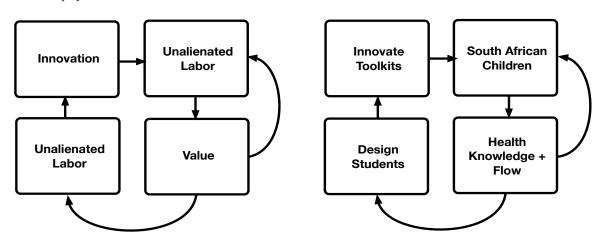

Figure 14. In the design of children's health education toolkits in South Africa with generative play, unalienated labor value (i.e., health knowledge and flow) **flows back to the design students** (the social innovators) **and South African children** (the underserved) **to yield social justice.**

their responsibility to society. Generative play, as a pedagogical approach, facilitates a learning experience that has the potential to effect social change by allowing for the generation of a wicked solution. As a pedagogical approach, generative play aligns well with the responsibility of designers emphasized by design theorist Richard Buchanan (1998): To create pleasure that is good, useful, and just. Each outcome or toolkit aims to engender pleasure and responsibility. The former (pleasure) occurs, for instance, through the aesthetics of the packaging and the flow of the experience interacting with the content and the satisfaction gained by achieving social justice. The latter (responsibility) occurs when the designers use design resources to pursue a social goal like returning unalienated labor value to the children by empowering them with the knowledge they need to take care of their health. And though the design students had a return of value through flow or satisfaction at fulfilling a social goal, generative play reaches its full potential for generative justice when monetary value returns to the social innovators enabling them to make a living using their design knowledge to serve society, for the common good.

It is important to note that by pleasure being good, Buchanan also means sustainable; likewise, Manzini (2015) frames his discussions of social innovation within a sustainability agenda. Generative play contributes to environmental sustainability through formal considerations, like the use of eco-friendly materials. However, it also contributes to sustainability in a broader sense, through functionality and social responsibility. That is, generative play has the potential to create experiences that make children return over and over again to play, an act that reinforces learning and underscores Manzini's ideas of social innovation initiating and nurturing new social dialogues. The toolkits aim to generate social value by fostering new relationships between children and their parents, teachers, and peers that engage them in dialogue about health awareness and good health habits.

The case study in this paper shows how generative play was applied to teaching social innovation specifically in regard to the wicked problem of children's health. However, the applicability of generative play to other wicked problems (in general and specific to health) and social innovation projects requires further testing. Instead, this paper makes a case for how students can be taught to design experiences that facilitate new modes of social innovation through play. The consumption of design through play goes beyond traditional, spectator-based consumption; and, this is where the end user is faced with an experience that is optimal and can have more agency in their behavioral change. One can conclude then that generative play extrapolatively fulfills Wright's (2012) utopian vision of self-determination, that is, of people being in control of their lives rather than having their lives controlled by others.

Acknowledgement

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