LAMPS - 'DESIGNERLY WAYS' FOR SUSTAINABLE DISTRIBUTED ECONOMY

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ABSTRACT

With the growing importance of resonating products with human behaviour, the upcoming field of Design for Sustainability (DfS) is reorienting itself from a 'technical and product-centric focus towards more socio-technical systems' wherein people, their interactions and behaviour play a crucial role. Scholarships in DfS have introduced a multitude of frameworks for sustainability-orienting design such as Methodology for System Design for Sustainability, Circles of Sustainability and LEED. However, during our experience of teaching these methodologies to Design undergraduate students, we observed that the frameworks, often fell short in fostering a "designerly way" of thinking and doing amongst novice designers. They struggled to see open space within these guidelines to explore, experiment and tinker. Hence, we designed a method, LaMPS (Locally available Materials, Practices and Skills), which could be used as a precursor to the more system oriented DfS course and can be introduced to students during their 1st Design Methodology course at the undergraduate level. LaMPS integrates observational studies and material exploration and characterisation using the Material Driven Design method, and translation of the same into products. LaMPS stresses on identification and incorporation of local materials, local skills and local practices, the three keystones of Distributed Economy (DE), in the designed system. Hence it serves as an introduction to the DfS course in the lines of DE.

Key Words: Design for Sustainability, Distributed Economy, Designerly Ways, Design for Sustainability Toolkit

1. INTRODUCTION

Since the emergence of the environmental debate in the 60's, the definitions, role and scope of sustainability, sustainable development (SD) and Design for Sustainability (DfS) have evolved significantly. DfS has strategically moved from approaches such as intervention after process-caused damages and intervention in processes to intervention in products and services and intervention in consumption patterns (C. Vezzoli et al., 2014). The role of a designer in DfS is now to design with holistic life cycle perspectives and with an eye on the socio-cultural dimension. This is in contrast to the earlier focus on mere end-of pipe fixes or product life cycle centred design (Charter & Tischner, 2001; Karlsson & Luttropp, 2006; Rocchi, 2005; Ryan & Fleming, 2004; C. A. Vezzoli & Manzini, 2008). But, with the DfS approaches largely shifting from a 'technical and product-centric focus towards more socio-technical systems' wherein people, their interactions and behaviour play the crucial role (Ceschin & Gaziulusoy, 2016), its methodologies and frameworks have become increasingly complex, involving multitudes of cross-disciplinary actors, stakeholders with varied interests and sustainability-orienting design parameters. Currently we have a diverse set of frameworks from various disciplines, geographies and economies, each customised to its own unique sustainability challenge. This paper presents our experiments with DfS pedagogy with sophomore Design undergraduate students. The research questions for the paper are: (1) How to teach sophomore Design students a Design Methodology wherein Design is looked as a dimension within the context of sustainability(2) How to teach product design by embracing 'local materials, practices and skills' as the starting point?; (3) How to teach DfS in a 'designerly way', ie., to design by dwelling in an immersive mode where engagement, contemplation, aesthetic desires, emotions and inventive thinking take predominance?

1.1. Sustainability and Distributed Economy

As a strategy for sustainable development, Johansson et. al (2005) (Johansson, Kisch, & Mirata, 2005) introduced the concept of Distributed Economies (DE) as an antithetic response to the highly unsustainable large-scale, centralized modes of production. DE proposes that a certain share of production can be conducted locally or regionally in flexible, small-scale production systems which can respond to local market needs better, can reflect the local socio-cultural and environmental milieu better and can be synergistically connected to each other through the flow of non-material assets such as information and know-how, bring in better distribution in socio-economic power and can have higher resilience to uncertainties and unsustainabilities (Johansson et al., 2005; Mirata & Emtairah, 2005; Mirata, Nilsson, & Kuisma, 2005). In the Indian context, we observe that many of our economic activities (handloom industry, craft industry, medium and small scale industries) are closely related to the concept of DE. But, on the Design pedagogy front, we lack in appropriate design methods. (Johansson et al., 2005) With its focus on local modes of production, the DE approach lays out 3 key elements for the design process: local materials, practices and skills. In this paper, we investigate, how designers can design locally rooted product by embracing these 3 elements as the starting point.

1.2. Pedagogy for Design for Sustainability

In implementing sustainability in Design school curricula, there are two approaches (Fletcher & Dewberry, 2002): (1) Sustainability looked upon as one of the criteria in current design activities (sustainability in the design context), and (2) Design looked as a dimension of sustainability framework (design in the sustainability context). In the Design curricula at IIT Guwahati, we have an elective course on System Design for Sustainability (S.DfS) which is offered to both undergraduate and post-graduate students in their final year. The course follows the first approach (Banerjee, Upadhyay, & Punekar, 2019). While conducting this course we identified some drawbacks and need for pedagogic modifications (for in depth analysis, see (Banerjee et al., 2019)). For instance, students looked at sustainability as one of the criteria in their design activities. A better approach would be sustainability as the context for designing. The course was introduced late in their curricula and the students opined that the introduction of the concepts should be in the very first Design Methodology course for better exploration throughout their study period. The existing S.DfS methodologies and frameworks often fell short in elucidating amongst students the "designerly way" to approach sustainability due to the large number of interacting parameters and stakeholders to be considered. The students, being novice designers, used them more 'mechanically' by picking up each parameter, giving them context-appropriate weightage and ideating on them. They missed the opportunity to think in an imaginative and inventive manner. Thus, we saw a need for introducing ways to elucidate amongst students "designerly ways (Cross, 2011)" of thinking, ie., designing by dwelling in an immersive mode where engagement, contemplation, aesthetic desires, emotions and inventive thinking takes predominance over prescribed guidelines. The students' proposed solutions lacked grounded-ness in the context due to a superficial understanding of the field. This issue has been raised by many other researchers who have suggested more in-depth user research to understand the role of socio-cultural factors in users accepting and adopting a sustainable solution or behaviour (example: (Mylan, 2015; Piscicelli, Cooper, & Fisher, 2015)). The course has a system design approach and students found it conceptually difficult to deal with the complexities. Also, covering in a single course the concepts, doing adequate ground research and coming up with design solutions was very difficult and hence we felt the need to restructure the course.

1.3. About the Sophomore Students

The students participating in the course were sophomores in the Design undergraduate program at IIT Guwahati. This was the first course where-in they learned about Design Methodology. Prior to this course, they had gone through courses in Basic Engineering (Mechanical, Electronics, Electrical, Computer Science) and Basic Design (Representation Techniques, Workshop Techniques, Ergonomics). Hence they were equipped with the knowledge and skills for making a product but were not aware of the creative design process. The course was divided into 3 week modules and LaMPS was introduced in the 2nd week of the course as a week-long workshop.

2. DEVELOPING THE PEDAGOGY

Various researchers have worked on identifying the key competences to be developed for Education for Sustainable Development (ESD) (Lozano, Merrill, Sammalisto, Ceulemans, & Lozano, 2017). ESD for DE will need the following competences: (I) Systems thinking (II) Empathy and Change of Perspective (III) Personal involvement and (IV) Tolerance for Ambiguity. We did not introduce the students to "Sustainability" or "System Design" per se as a concept through theoretical lecturing but rather built in the methodology components which will direct them towards these. To foster a wholesome, empathetic systems view (I & II), we divided the LaMPS method into 4 stages: Understand; Observe; Explore; Conceptualise. Figure 1 summarises the Design Methodology presented to the students and the next sub-sections presents the LaMPS methodology.

2.1. LaMPS - Locally available Materials, Practices and Skills

The 3 key elements of DE which bring in sustainability benefits to it are using local materials and manufacturing, practices and skills to produce for local needs. LaMPS guides the students to identify locally available materials. The study of local practices and skills helps in identification of intervention areas and local consumption patterns. It also helps in understanding what manufacturing skills or prosumption behavior the consumers are used to and hence students are able to learn designing by being grounded in the context.

2.2. Stage 1: Understand

Since the course is meant for sophomore Design students, we found it useful to broadly define the intervention area rather than leaving the project completely open-ended by leaving it to the students to identify areas of intervention. We asked the students to go into the local rural communities and study their context and constraints with water (II). This is a high rainfall region with an average of 1,722 mm of annual rainfall and is located on the banks of river Brahmaputra which is one of the major rivers of Asia. It has abundance of water but potable water is a challenge. Excess water due to long periods of flooding and disposing off wastes into the river are some other challenges.

2.3. Stage 2: Observe

The students here begin by understanding the context: a.) Who is the end user b.) What is the problem area and c.) What are the constraints of the system? This becomes the primal definition of the problem space. Although the DfS process revolves chiefly around the tangible, we contemplated on the intangible (practices and skills) in this phase. In order to meet the three key elements of DE, local materials, practices and skills, we made them as the starting points for students to observe. This phase helped us to secure high degree of personal involvement (III) from the students.

2.4. Stage 3: Explore

Here we used Cross's "designerly ways" (Cross, 2011) of knowing, thinking and acting which 'lie in the techniques of the artificial'. Modelling, pattern-formation and synthesis form essential components in this 'culture' of design in which abstract requirements are translated into tangible design solutions. The students were encouraged to experiment, imagine, draw parallels and synthesize in a creative space. The students understood the materials using the open-ended Material Driven Design (MDD) process (Karana, Barati, Rognoli, Der Laan, & Zeeuw, 2015). Its uniqueness lies in its ability to systematically explore both physical and experiential traits of a material. Materials can be experienced at 4 levels: sensorial, interpretive, affective and performative (Giaccardi & Karana, 2015). This phase helped us to introduce students to the ambiguity which is inherent in any design process and slowly they started developing certain degree of tolerance to ambiguity (IV) and gained experience in steering through it during the next phase. Of the 4 steps of MDD, we used only the first step that provides a synthetic space to experimentally explore a material and its possibilities. We gave the students locally available raw materials and wastes. They tinkered with the materials, trying to understand its technical properties and the technical and experiential properties obtained by creating composites. They also conducted a material benchmarking by studying existing literature on the materials.

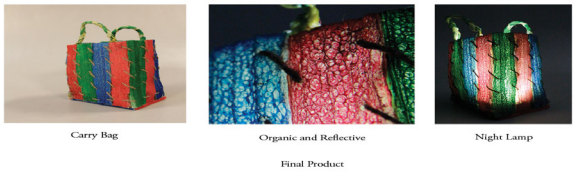
2.5. Stage 4: Conceptualise

Here the designer reflects on the context, picks one material (composite) sample, integrates it with local skills and practices and creates an intervention vision and a product solution, prototypes and tests it with the actual users. This goes on as an iterative process. The key questions in this stage are: (1) What should materials do?; (2) What practices to embed?; (3) What skills can be leveraged?. This phase leveraged systems thinking (I) and empathetic thinking (II).

[Figure 1] Overview of the Design Methodology provided to the students

[Figure 2] A local Restaurant Owner using Cleansy

[Figure 3] Frugal thermos made with insulating materials - saw dust and coffee powder



[Figure 4] Bag cum night lamp made of waste styrofoam and PE bags

3. THE JOURNEY DESCRIBED IN THE STUDENTS WORDS

In this section we present the experience of 3 groups of students. The intervention vision was formulated towards the end of stage 3 and we are indexing the students' learning journeys in the sub-sections below with the vision themes.

3.1. Vision - Cleansy (Aaram se Safai) by Purvish and Vidushi

Cleansy (CLean + Easy), a base of pyramid product, helps in water filtration by making it a fun activity and can promote water hygiene. A quick ethnographic study of the households helped us to understand the problems related to water sanitation and hygiene. The next stage demanded us to not think about the problems and insights gathered previously. A tinkering session was done in the workshop to explore material properties by combining base materials, fiber and binding materials. Initial exploration was random and materials were mixed to see what happens. Then we researched on properties of the materials and ideated to understand what can be mixed. Noting down the insights and keeping it aside helped us not to think about solution and did not hinder the tinkering process. Next we explored the technical and experiential characteristics of the samples to see what peculiar experience can be created out of it. Samples were tested and some of their properties were taken from web. We selected 3 test samples and conducted studies to understand the experience related to those samples. Sample 1 was created by sticking coffee powder on jute to make strands of coffee. Sample 2 was rice grains stuck on jute rope using fevicol. Sample 3 was spiral jute rope burnt using hot gun. 3 sets of interviews for each sample were conducted and participant responses were noted. Participants reported that rubbing rice felt good on palm, coffee had good smell and burnt jute was nostalgic. We also observed how the participants played with the samples given to them. All 3 participants rubbed the rice rope on their palm. This was an interesting observation and helped us create a material experience vision, ie., "Aaram se Safai" (cleanliness with ease). We were curious about how can we map this particular practice into our product which will promote water hygiene in rural areas and encourage its purification by making it a fun activity. We used a framework to map practices into our product. We then utilized the framework provided to us called 'Materials Experience Framework' to create a concept for the product. We mapped the practices, material and people spheres of the collected data to create product vision. We decided to make the process of water purification easy and a relaxing experience through our product Cleansy (from clean+easy). The product designed uses bamboo, rice, glue made with wheat and a cloth bag containing alum, all of which are locally available. We used alum to help in the purification of water. The product can make river water potable. Also anyone interested can make this product at home and use it. Figure 2 shows a local restaurant owner trying our product. To read about our full journey https://goo.gl/2m63YB.

3.2. Vision - Connecting Communities by Ankit

An unstructured interview revealed that people used the water from the river for general purpose while clean drinking water was available from a nearby police station for 1 hour daily and an NGO facilitated drinking water supply in a nearby primary school. Among the materials provided, sawdust, bamboo dust, plastic bottles, jute rope were native to the place I visited and coffee is what I drink every day. Tinkering with the available materials, we combined the materials like sawdust and coffee ground with glue, coir ropes covered with coffee grounds etc. and conducted a technical characterizations of the composites developed. A list of adjectives were given, related to emotions it triggered and meanings they infer. I interviewed 5 people for each of the three sample materials. They were asked very specific questions regarding the type of emotions and meanings these materials could drive. From the field visit, I was able to enlist problems, I became aware of their frugal way of life. The final sample material was composed of materials that connected the communities of the carpenter, rag picker and handicraft workers. The idea was to use

the insulating property of the material along with deceiving look. An affordable thermos, with the essence of coffee. I wanted to drive the idea of water hygiene for newborn babies, they need warm water and storing cold water for the farmers who work under sun. The final product is presented in Figure 3 and read the full journey at: https://goo.gl/r7J5WH.

3.3. Vision - Sasta (low cost) Sundar (beautiful) Tikau (long lasting) Carry Bag by Simran and Suneet

We went onto field visits during the rainy season in the month of September, 2017 to capture the practices performed by the locals of the nearby village of IIT Guwahati. We found one farmer carrying the grass on his head, few laborers carrying sand in a container for the construction of a house and a woman carrying her child on one shoulder and his school bag on another. We also stopped by a house where we saw the women from the village were gathered to have a traditional ceremony. They were singing in harmony to worship the god for prosperity. This visit to the field gave us a new experience of group activities and also the habit of carrying. We chose 5 materials for the tinkering process: Styrofoam(main material), Plastic Carry Bag, Water Bottle, Jute Thread, Rice, Coffee Waste. The first natural thing we tried was to squeeze it hard using the drilling machine table. We got a very foul smell by burning the Styrofoam and the material obtained looked like an ash. We then put the plastic on top of the Styrofoam and used a hot air gun on it at low heat levels. Both the Styrofoam and the plastic melted and plastic acted as color coated layer. Similarly we tried other materials such as coffee wastes and jute threads along with Fevicol as an adhesive. Further we proceeded for the technical testing of the samples developed. Then we tried to develop different products out of it using the attractive organic and reflective characteristics of the sample as shown in figure 4 below. The final product is a carry bag which can also be used as a night lamp. To read our full journey, visit https://goo.gl/ur5YGd.

4. DISCUSSION

The LaMPS method provided a practical guide to the student designers in alternating between divergent observation, experimentation and convergent analysis to design locally-embedded products. The tinkering process placed them considerably outside of their comfort zones where process driven design methods have molded them to think linearly. They sought guidance on ways to initiate the tinkering process and expressed inhibition in experimenting freely with the materials. They were not habituated with the brief suspension from structure and liner thinking and immersive behavior in playfulness and uninhibited imagination. However, on being urged to think in an unrestrained fashion and to anticipate experimental serendipity and incidental revelations, the students gradually started opening up and working in a fluid space. They started experiencing the materials with an eye for new learning and discovery. They creatively thought of new experiments that could be conducted with the material and drawing analogies between objects that they had observed before and the material samples generated. Stepping outside the classroom into the field was especially challenging for the students. But being equipped with the techniques beforehand aided them in smoothly conducting the task. But an in-depth understanding of the practices and their interconnections in the behavioral and social setting, requires a larger time frame and experience. The students expressed that it was a good learning experience for them as they had no prior exposure on how to study 'how users experience something'. However, all the student teams expressed that a 7-day time frame was critically short for them to delve deep into every stage. We also observed that the students tailored the sequence of the steps slightly to suit their needs. The process of ideation, for instance started at different stages for each team. They revisited the field if they felt the need and put varying amount of stress on different stages of the process, indicating that they desired some amount of flexibility in the process. The students came up with innovative and locally grounded solutions and also later extrapolated their learnings to other projects (this batch of students are now in their 4th year of study).

5. FUTURE RESEARCH SCOPE

In Design for DE, local materials, practices and skills are variables that present an array of possibilities for a designer. While LaMPS focuses heavily on material exploration, a structured way in which data on local practices can be analysed and incorporated into different aspects of a product for embedding it in their socio-cultural and behavioural patterns will further enhance it. In future, we will explore how designers can be aided to systematically study different kinds of practices in a community, analyse the data and map them selectively to product idea. Also, LaMPS, as a whole, will be further developed and tested in the context of design for DE for professional designers as well.

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