Creative Capacity Building in Post-Conflict Uganda

By

Kofi A. Taha

B.A. in Political Science
Columbia University

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

February 2011

© 2011 Kofi A. Taha. All Rights Reserved

The author here by grants to MIT the permission to reproduce and
to distribute publicly paper and electronic copies of the thesis
document in whole or in part.

Author

Certified by

Accepted by

Department of Urban Studies and Planning
February 7, 2011

Professor Bishwapriya Sanyal
Department of Urban Studies and Planning
Thesis Supervisor

Professor Joseph Ferreira
Chair, MCP Committee
Department of Urban Studies and Planning
Creative Capacity Building in Post-Conflict Uganda

By

Kofi A. Taha

Submitted to the Department of Urban Studies and Planning on February 7, 2011 in partial fulfillment of the requirements for the degree of Master in City Planning

ABSTRACT

Creative Capacity Building (CCB) is a methodology that emphasizes the ability of people living in poverty to create livelihood technologies, i.e., machines and tools that increase income, improve health and safety, decrease manual labor or significantly save time. By distilling key elements of the design process into a hands-on curriculum that is accessible to any educational level, and relying upon the principles of participatory development and appropriate technology, CCB promotes a democratic framework for the application of technology in development that encourages people to become active creators of technology, not just recipients or users of technology. This thesis describes my personal experiences developing and implementing this new approach with Amy Smith, Director of D-Lab @ MIT, in several post-conflict communities in Northern Uganda. The principle claims of this paper are: 1) by emphasizing local participation and innovation, CCB is software for the hardware of Appropriate Technology 2.0, an updated and strengthened version of the appropriate technology movement that is no longer in favor in development circles; 2) the CCB curriculum is not effective as a stand alone intervention and requires a broader methodology that includes ongoing trainings, resources and venues that develop local capacity; 3) CCB also requires a reinterpretation of the role of the development professional from that of an external, “expert consultant” to a self-reflective participant and facilitator that enhances the abilities of others to transform their own lives and communities 4) the positive impact of every technology intervention, including CCB, is contingent upon successful navigation of the local setting-- in particular the cultural, political, economic, organizational and interpersonal dynamics that affect implementation; and 5) the ethics embedded in CCB have provided me with a framework for a personal theory of practice and a practice of action that prioritizes engagement in short-term poverty elimination strategies over long-term economic or political strategies, and that embraces the vulnerability that is required to bear witness, to reflect, to practice mindfulness in working and interacting with people, and to always maintain hope.

Thesis Supervisor: Bishwapriya Sanyal, Ford International Professor of Urban Development and Planning, Department of Urban Studies and Planning

Thesis Reader: Amy B. Smith, Director of D-Lab and Senior Lecturer, Department of Mechanical Engineering
Acknowledgements

It goes without saying that our perspectives, abilities, and achievements, are far more reflective of the web of relationships that we are a part of than our individual efforts. Nonetheless, I cannot let this moment pass without expressing my profound gratitude to the people who have shaped, helped and inspired both this project and me. Without any sense of hierarchy I would like to first acknowledge Amy Smith, who has provided so much of the vision and substance of this thesis; thank you for the opportunity to work with you, for being so fun to work with (even when it wasn’t fun), for the financial support that made it possible for me to continue, but mostly, for your passion and unshakable values. I am also deeply indebted to the people from many villages who worked with us in Amokolegwai and Acuru; your perseverance in the face of unspeakable odds is the engine of this work.

I am very grateful to Martha Thompson, Gretchen Altschul and Jackie Okanga of UUSC who invited us to this work and, beyond funding, provided wise counsel and a visionary model. Similarly, the leadership and staff of Caritas Gulu-- John Bosco Aludi, David Okello, and Manuela Schweigkofler-- and Caritas Pader Branch-- Michael Ocholi, Mark Bernard Okot, Jennifer Lebangapewanny, Flora Tracy Aye, Denis Obwona, Ben Driver and Michael Okumu-- has been inspirational and has made the implementation of this project possible. And a special thanks to the staff at the Hotel Alikin, our home away from home-- Tony, Stephen, Cesar, Godfrey, Alex and all of the women who tolerated our banging and odd experimentations in the courtyard.

At MIT, I cannot express enough appreciation to my advisor, Bishwapriya Sanyal, whose insightful guidance, patience and consistent encouragement surpassed anything I deserved, or to Dean Kim Vandiver, who stepped in at just the right moment to save me from myself. Similarly, many thanks to Dean Steve Lerman and Dean Blanche Staton; together with Amy, these five educators have not forgotten that the true measure of an institution is not in how many superstars it produces but in how it treats students and helps students succeed even through the rough patches, and for this, I am deeply grateful.

To the entire D-Lab family-- you all are brilliant and inspiring people with whom it is an honor to work; thank you for all of the unflagging support and encouragement. Thanks to Jesse Austin-Breneman for getting excited about this idea and making it the subject of his research; thank you for tackling many of the questions left unanswered in this document. I owe a great debt to Xav Briggs for both intellectual rigor and rigorous support; I was sad to lose an advisor but recognize that a call from the President certainly takes priority. Many thanks to Larry Vale and J. Phillip Thompson, for making it possible for me to come to DUSP; Langley Keyes and Joe Ferreira, for securing multiple chances for me to finish; Sandra Wellford for forgiving my administrative challenges; Judith Tendler for patience and kindness, and for encouraging us all to revel in surprises that burst our preconceived notions; and Harvey Michaels and Terrance Tivnan (Harvard School of Education) for absolutely made it possible for me to graduate.

I would be remiss to not acknowledge some of the foundations: John Aune, Bob Montero, and John Gooden at Fieldston School as well as all of Fieldston Massive; Jerry Watts and Marshall Hyatt at Wesleyan University and all of Wesleyan Massive; Mark
Kesselman, Elnora Johnson, Carolyn Pinedo Turnovsky, Kenya Massey, David Albert, Christia Mercer, Achille Varzi, and Thomas Pogge at Columbia University; John Mohr, Beth Schneider, Melvin Oliver, Cristina Venegas, Gerardo Aldana, Chela Sandoval at UC Santa Barbara. Each of you have made unique contributions to how I see things, how I hear things, and where I am. Thank you.

The inspiration of people's struggles all over the world cannot be exaggerated; they have produced the imagery and music and examples that have kept me company throughout. In the interest of space, I will just thank Yuri Kochiyama, for she possesses the essence of anyone else or any one location I would name-- to the everyday people who have struggled everyday and will continue to struggle everyday, here's to putting our minds, hands and hearts into it.

And family. There is an indescribable sense of comfort, belonging, and purpose when we are with the family we choose. While I never doubted your love and support for an instant, hearing it, feeling it, being constantly reminded of it through this process was truly humbling. So to Betsy MacLean, Eric Miles, Danny Hoch, Clyde Valentín, Maribel Lizardo, Simone White, Julius Joel Ford, Raymi Taylor, Meshell Suñaila Bashir, Amit Sarin, Michael Norman, Eric González, the entire Oakleigh family, Joe Sara, Michelle Gaseau, and Shanti Kleiman, I love you right back. Thank you for the time you gave, for taking care of my little boy when I needed to work, for the kick in the pants, for the ideas, for the loving kindness, for the soothing and relaxation, for the laughter, food and play, for reminding me to breathe, and for the promise of a lifetime of good work and good friendship to come.

To Kaia Stern, this journey would not have been possible without your willingness to move to Massachusetts from California, and in the face of this historic winter, that choice is even more stupendous. Thank you for all of the time, patience, flexibility and understanding you have given as we have done our very best to navigate two hectic lives while raising one beautiful boy. Over the last nine years we have set out to complete a doctorate, an ordination, and a mater's degree. Check.

To Isa, you are the light that has kept me moving forward in the darkest of days. Your love of learning, your excitement about how things work and different technologies (trebuchet!), your joy and playfulness remind me everyday to keep these things at the heart of all I do. Thank you for your understanding while I traveled to do this project, and for being so patient when you wanted to play together. I hope you know that I could not have completed this without you and that I am very grateful for you.

To the bedrock, my dear family, Akwasi Taha, Halima Taha, Rahshiene Taha, Yasin, Kwame Taha & Taha West, Mary & Gerald Gooley, all the Yablonkas, and Umi and Daddy, to whom this thesis is dedicated; you have literally shaped me in every way, stood by through every trial, taught me how and who to be in the world. I hope these pages make you smile and make you proud.
## Contents

Acknowledgments........................................................................................................ 4  
Author’s Note on Language.......................................................................................... 7  
List of Figures and Abbreviations ............................................................................... 7  

1) Introduction ............................................................................................................. 8  
   1.1 Background ........................................................................................................ 10  
   1.2 Purpose .............................................................................................................. 11  
   1.3 Methodology ....................................................................................................... 11  
   1.4 Structure of the Thesis ...................................................................................... 11  

2) Creative Capacity Building as a New Approach .................................................. 12  
   2.1 Towards Appropriate Technology 2.0: a theoretical framework for CCB.... 12  
   2.2 Emergence & Foundations of CCB ................................................................. 15  
      i. D-Lab, IDDS & Northern Uganda ................................................................. 15  
      ii. Liberation, Learning, & Reflective Practice .............................................. 17  
   2.3 CCB in the Context of Historic & Recent Trends in Technology & Development... 20  
      i. Appropriate Technology & Participatory Development ......................... 20  
      ii. Fab Labs, Co-Creation, ICT4D and BoP .................................................. 23  
   2.4 My Expectations & Questions about CCB .................................................... 26  

3) Implementing Creative Capacity Building in Northern Uganda ......................... 28  
   3.1 Fieldwork Background & Logistics ................................................................. 28  
   3.2 Curriculum Implementation & Development in the Field ............................. 31  
      i. The CCB Curriculum .................................................................................... 31  
      ii. Curriculum Development & Reflection .................................................... 34  
   3.3 Participant Responses ...................................................................................... 35  
   3.4 Mechanisms for Ongoing Support .................................................................. 36  
   3.5 Observations Five Months Later ..................................................................... 37  

4) Rethinking CCB and Moving Forward ................................................................. 41  
   4.1 Re-evaluation of Expectations & Questions .................................................. 41  
   4.2 Practical Considerations: Towards a CCB Methodology ............................... 42  
   4.3 Towards Future Work in CCB ....................................................................... 43  
   4.4 Towards My Own Theory of Practice ........................................................... 45  

Bibliography .............................................................................................................. 49  
Appendix 1: The Fourteen Mindfulness Trainings of the Order of Interbeing.......... 52  
Appendix 2: Creative Capacity Building Teaching Notes ......................................... 55
Author’s Note on Language

Throughout this paper I have chosen to use variations on the terms “low-income communities” or “people living in poverty” instead of “the poor,” “poor communities,” or “impoverished” people or communities. The reality is that no semantic debate or wordsmithing will fix the conditions that we—academics, practitioners, community members—seek to eradicate. My intention, however, is to arrive at a level of specificity that also incorporates a deep respect for the ability of people everywhere to overcome the diverse set of conditions that are associated with poverty. Perhaps in a small way, by reiterating that poverty is not an inherent characteristic of the people with whom we work, we can do our work with a touch more respect, with a touch more hopefulness, and, as a result, be a touch more effective. I have similar concerns with the term “developing countries,” which paints a monolithic picture of nations that are immature in every aspect, and “Third World countries,” which is a Cold War throwback that implies an inevitable hierarchy. Instead, I try to be more specific by using the terms “developing economies” or “low-performance economies” in relation to “advanced economies” or “high-performance” economies. The terms “development” and “international development” are used reluctantly, mostly to converse with the profession/industry, but also because I have not yet arrived at more suitable terminology. I appreciate the reader’s indulgence.

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABCD</td>
<td>Asset-Based Community Development</td>
</tr>
<tr>
<td>BNA</td>
<td>Basic Needs Approach</td>
</tr>
<tr>
<td>BOP</td>
<td>Bottom of the Pyramid</td>
</tr>
<tr>
<td>CA</td>
<td>Capabilities Approach</td>
</tr>
<tr>
<td>CAT Center</td>
<td>Community Appropriate Technology Center</td>
</tr>
<tr>
<td>CCB</td>
<td>Creative Capacity Building</td>
</tr>
<tr>
<td>DUSP</td>
<td>Department of Urban Studies and Planning at MIT</td>
</tr>
<tr>
<td>ICT4D</td>
<td>Information and Communication Technologies for Development</td>
</tr>
<tr>
<td>IDDS</td>
<td>International Development Design Summit</td>
</tr>
<tr>
<td>IDG</td>
<td>International Development Group at DUSP</td>
</tr>
<tr>
<td>IDP</td>
<td>Internally Displaced People</td>
</tr>
<tr>
<td>IGA</td>
<td>Income Generating Activity group</td>
</tr>
<tr>
<td>IRDP</td>
<td>Integrated Rural Development Projects</td>
</tr>
<tr>
<td>LRA</td>
<td>Lord’s Resistance Army</td>
</tr>
<tr>
<td>UUSC</td>
<td>Unitarian Universalist Service Committee</td>
</tr>
</tbody>
</table>

List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Issue and Involvement Matrix</td>
<td>14</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Unrealized Opportunity at the Base of the Pyramid</td>
<td>26</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Map of Conflict-Affected Uganda</td>
<td>28</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Creative Capacity Building Curriculum</td>
<td>31</td>
</tr>
<tr>
<td>Figure 5</td>
<td>The Design Cycle (Yubu Tic Kore ki Kore)</td>
<td>32</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Sample Daily Debrief Chart</td>
<td>34</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Bean Counter Evaluation Results &amp; Process</td>
<td>36</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Technologies Created in Amokolegwai West on Display</td>
<td>38</td>
</tr>
<tr>
<td>Figure 9</td>
<td>The Pekoyo IGA of Ademi &amp; their Water Carrier</td>
<td>39</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Towards a Creative Capacity Building Methodology</td>
<td>43</td>
</tr>
</tbody>
</table>
Chapter One: Introduction

1.1 Background

For the last 60 years, economists, policy makers and technologists, acting from afar and decreeing from above, have largely defined the international development field. I chose to return to graduate school after traveling throughout Africa and the Caribbean and seeing first-hand what can only be described as the utter and complete failure of dominant development theory and practice to confront severe poverty. It was clear to me that something was wrong, but I felt that I did not know enough about macroeconomic theory, policy making, or political economy to have an informed analysis. Because I was a community organizer and have what many would consider a social-democratic bent towards achieving social and economic justice, it was natural for me to choose the Department of Urban Studies and Planning (DUSP) at MIT over other programs that seemed institutionally committed to promoting the status quo in development theory and policy making. At DUSP, I expected not only to learn about dominant models, but to also develop critiques and alternatives to these approaches, and to do so within a learning community with long standing commitments to grassroots participation and empowerment.

This really is the place for me, I thought to myself, as I went from a discussion of internal displacement resulting from the Narmada Dam project in India to a GIS mapping project focused on post-Katrina New Orleans, and later had a meeting with several colleagues from my cohort interested in “radical planning.” As a student in the International Development Group (IDG), I enthusiastically enrolled in the subfield’s introductory course in my first semester because, after all, this is why I returned to school—to gain skills that would help me effectively address the extreme poverty I had seen first-hand in Sub-Saharan Africa and the Caribbean. The course was co-led by Alice Amsden, a widely respected development economist and leading figure within IDG. After learning about institutional actors and traditional economic development theory over the last fifty years, we started to explore our own thoughts about how low-income countries could lift their populations out of poverty; we began to grapple with the reality that there are no easy answers in international development.

Except there are, according to Professor Amsden. Jobs, jobs, jobs, she said, after the class had navigated into discussions about incompetent and corrupt leadership and the realities of power in geopolitics. The key to lifting people out of poverty is jobs, and any approach that does not explicitly focus on economic growth that leads to employment is doomed to fail. The most salient reason Africa has failed, Amsden argued, is that it does not have the manufacturing experience of Japan or South Korea or Taiwan, and because “grassroots” organizations, through their protests and unreasonable demands for bottom-up development, have weakened the capacity of governments to implement strong industrial policies. Ignoring the incongruity embedded in casting aside vastly different histories, natural resources, populations and political landscapes to compare small, individual countries to an entire continent, I was most struck by the recommended

---

1 Amsden, 2010
pathway to manufacturing experience: limit domestic democratic expression and accept the economic playing field as defined by multinational corporations and international institutions. "What if that relegates workers to sweatshops?" I asked. Working in a sweatshop is better than not working at all, was the response. The "bitter medicine" of short-term sacrifices in wages or working conditions is good for long-term opportunities created through gains in manufacturing experience.

I was surprised, but not shocked. This explicit justification of pain for people living in poverty has been a common thread throughout the history of development economics; this magic-bullet, one-size-fits-all mentality pervades conventional "wisdom" among development professionals; this type of abolution for colonial and post-colonial political and economic exploitation has been so successful that the legacies of European domination and Cold War politics have been rendered invisible; this willingness of political elites to proceed with certainty at the expense of everyday people is exactly how the Washington Consensus dominated global economic policy for almost three decades before being challenged and discredited. It also is true that Amsden and others, including many grassroots organizations, are correct in viewing employment as absolutely critical to any poverty eradication strategy. The biggest surprise to me was that the human impact of Professor Amsden's prescriptions was fairly uncontested during the class discussion.

On the other end of the spectrum, this class exposed me to the writings of "post-development" thinkers, such as Arturo Escobar, who criticized the entire concept of development as a self-perpetuating project of western domination. A particularly provocative concern is the way development professionals contribute to a discourse of domination that defines the social reality of people living in poverty in such a manner that requires outside intervention and undermines the type of redistribution of power or resources necessary for meaningful transformation. I found myself in complete theoretical agreement with Escobar and others in this school of thought, but was left cold by what seemed to be, first, a monolithic view of all actors in the development space and a fatalistic dismissal of anything that did not, in their view, challenge global power relations or destroy capitalism; second, a failure to acknowledge the validity of what everyday people have to do in the short term to survive; and third, the absence of any practical application of these theories beyond romanticizing grassroots social movements. I was uncomfortable with their logic, no matter how pristine, because it has no theory of action, except for total socialist revolution.

Two positive things came out of this experience. First, I realized that if I intended to pursue international development as a profession, I would need to develop a theory of practice that aligns effective strategies with my own ethical framework. Rather than preaching a normative position from which to dismiss all other strategies, I would simply need to be clear with myself about how I wish to spend my time and energy, and what boundaries of conventional thinking I am unwilling to cross to have a meaningful impact. I decided then and there that my focus would be on strategies that could address the basic and immediate needs of people living in poverty; promoting trickle-down economics at an international scale felt morally wrong to me. Drawing a parallel between the religious afterlife and promises of development through macroeconomic policy, in the words of

---

2 Escobar, 1992, p. 132
Malcolm X, I recognized that I am unwilling to, "look towards reaching the Promised Land by and by when we need some justice here and here, now and now." I needed to look deeper into strategies that shared this sense of urgency.

The second positive outcome was that I recognized that nobody at DUSP currently does field work in Africa and the Caribbean that explores “bottom up” economic development strategies, which is what I am most interested in pursuing. This led me to take the D-Lab: Development course taught by Amy Smith and Bishwapriya Sanyal, which focuses specifically on appropriate technologies that contribute to livelihood opportunities for people earning less that $3 a day. An IAP trip to Ghana with the class eventually turned into fieldwork with Amy in Haiti, Zambia and Uganda. My own search coincided with an evolution that was already underway within the D-Lab program and that, through the International Development Design Summit, was beginning to look more intensely at democratic models for the design and dissemination of livelihood technologies, i.e., machines and tools that increase income, improve health and safety, decrease manual labor or significantly save time. When Amy and I began working together and were confronted with the limited resources in Northern Uganda, we started discussing ways to take these ideas a step further to village-level trainings. What emerged is the Creative Capacity Building (CCB) methodology, which is the primary subject of this paper.

Thus, captured within these pages, beneath a description of the process of developing and piloting portions of CCB, is my search for a personal theory of practice and a practice of action that prioritizes confronting poverty-based suffering in the short-term over long-term economic or political interventions. My intention is not to claim that this framework is for every development professional or that this methodology is a silver bullet that will eradicate poverty. To the contrary, I write this thesis with profound humility and, in the face of perhaps the most complex social issue facing humanity, keen awareness of the self-centeredness in my attempt to feel morally comfortable while living and working in an unjust world.

1.2 Purpose

As the use of technology in international development has shifted from an almost exclusive focus on large-scale infrastructure, manufacturing and agriculture to include small-scale technologies that contribute to livelihood creation for vulnerable populations, the challenges of local applicability and availability of resources have emerged. One approach to addressing these issues is to encourage technology creation by end-users, which inherently meets user requirements within local resource constraints. The purpose of this thesis is to discuss the strengths, weaknesses and possibilities of Creative Capacity Building, which is one strategy for enabling people living in poverty, regardless of prior training or educational level, to produce livelihood technologies.

As this work has unfolded over the last year, a number of practitioners and institutions have inquired about CCB and have wanted to incorporate it into their programs. My hope is that this project, by way of describing its genesis and context, will help to better define the CCB methodology, and that people interested in this approach can consider some of the lessons learned thus far. Embedded within this goal is my intention to reaffirm the importance of appropriate technology as a vital strategy in the fight against poverty and for sustainable development practices. In this moment, when old development
dogmas are being challenged and a plethora of new international institutions and professionals are entering the development field, this is an important discussion to have.

Beyond these aspirations for broader relevance to the development field, perhaps the most important aspect of this project is its role in solidifying my own theory of practice as a development professional. My conclusions are very personal, but it is my hope that the questions I ask myself will be of use to others grappling with similar concerns. In this way, a secondary purpose of this thesis is to encourage other aspiring development professionals by providing an example of a theory of practice that does not accept the inevitability of the “bitter medicine” approach to poverty eradication.

1.3 Methodology

The majority of this thesis is based on fieldwork as a participant observer in the Pader District of Northern Uganda for two weeks in November 2009 and for two weeks in April 2010. My role was to create and facilitate the CCB curriculum with Amy Smith, to try to capture feedback from workshop participants, to make adaptations to the curriculum based on feedback and reflection, and to document any results from the training. Our curriculum development process and pedagogical approach has been captured through teaching notes, an oral survey instrument was used to capture the experiences of 117 workshop participants, a journal was used to record my personal reflections, and photographs and video were used to further document the process. The surveying method we used was developed in the field in an effort to account for varied literacy levels. In preparation for developing the curriculum and framing this thesis, secondary literature in the fields of education, international development, and technology creation were also reviewed. Staff interviews, debriefings with Amy Smith, and personal observations form the basis for my critiques of the CCB methodology and recommendations for further exploration.

1.4 Structure of the Thesis

This introduction is the first chapter of the thesis. Chapter 2 aims to define the theoretical, philosophical and programmatic elements of Creative Capacity Building, to place it within the context of previous movements in education, technology and international development, and to distinguish it from the contemporary strategies of Fab Lab, co-creation, and “bottom of the pyramid” approaches. The evolution of the methodology in D-Lab and my own expectations prior to our fieldwork are also discussed. Chapter 3 describes the implementation of the first CCB workshops in Uganda, the feedback from participants and results observed five months after the trainings. Chapter 4 captures lessons learned and reflections on the strengths and limitations of the CCB methodology. The chapter closes with a summary of how these experiences in the field have influenced my ongoing efforts to create a pragmatic, yet ethical theory of practice.
Chapter Two: Creative Capacity Building as a New Approach

"Technology—no matter how well designed—is only a magnifier of human intent and capacity, not a substitute."³
-- Kentaro Toyama

2.1 Towards Appropriate Technology 2.0: a theoretical framework for CCB

There are a set of principles underlying Creative Capacity Building which are, by implication, an articulation of elements that we feel are vital to the success of most development initiatives. While there are certain global poverty issues that require strategic coordination and intervention by macro-level institutional actors (lowering prices for anti-retroviral drugs or vaccines, for example), this work posits that effective livelihood creation and improvement can be pursued at the community-level in a distributed, deeply democratic manner as well.⁴ CCB actuates our belief that development processes with technology at their center are most likely to succeed when they emphasize self-reliance over dependency, asset mapping instead of deficiency planning, local knowledge and skill-building rather than external expertise, and cross-pollination of ideas over one-way technology transfer. Together, these elements hone in on the transformational potential of valuing, without romanticizing, the creativity and humanity of people living in poverty, the critical ingredients of local motivation and cohesion, and the imperative of addressing the everyday causes and symptoms of poverty.

CCB has at its core a belief in the inherent ability of people to be creative problem solvers and instruments of their own progress. Our point of departure is that while trainers may be able to share ideas, skills and technical knowledge, the expertise and creativity required to design livelihood technologies already exist within communities. Rather than starting with what a community lacks or needs, this approach is grounded in asset-based community development models which value social capital such as time, energy, vision, skill and creativity, and begins development initiatives by drawing on these resources. The goal of CCB is to harness the same knowledge, ingenuity and skill that people use to survive everyday, and to focus these abilities on technology design and creation. Pivotal to the success of this process is the establishment of an atmosphere of mutual learning and mutual respect; the first precept of CCB is to focus on not only what work we do with people but on how we work with people.

Accessing local knowledge requires deconstruction of the traditional development professional in the minds of both CCB participants and trainers. CCB reinterprets the role of the development technologist as a facilitator who enhances the abilities of participants and

³ Toyama, 2010.
⁴ Deep democracy in practice is exemplified by mechanisms, institutions and systems that facilitate broad-based public participation in, and influence over, social, political, and economic decision-making, with the specific objective of creating a just and equitable society that protects the ability of all its members to pursue a life of her/his choosing. Related strongly to the Capabilities Approach (Sen & Nussbaum, 1993) discussed in more detail below, and developed in greater detail in Frame & Khan, 2007.
views meaningful community participation as a necessity to empowerment. Because empowerment is a vastly overused and abused term, it is worth noting that usage herein refers to an ongoing process in which an individual embraces their own ability to affect their reality (power within), is joined by other members of her/his community to identify challenges and work towards solutions (power with), and, finally, when that community gains access to or control of the levers of power through which social, economic and political systems are affected or changed (power to do). Thus, CCB does not aspire to “empower” participating communities because we don’t believe empowerment is something that can be bestowed; rather, CCB postulates that technology creation can be one pathway for an individual to identify or affirm their own abilities, to invite communities to seek solutions together, and to build towards meaningful influence over their lives and livelihoods. Our belief is that CCB can be a useful tool for individuals, communities, and development professionals interested in the empowerment of historically or currently marginalized people.

These notions of assets and empowerment are directly related to our commitment to the sustainability of any initiative with which we are involved. Sustainability in this context involves environmental, economic, socio-cultural and political dimensions, and should be understood as the capacity to endure through time without persistent external support. If a technology, curriculum or other form of engagement remains relevant to the needs of a community but cannot be maintained due to lack of local resources or knowledge or support, then the project can only hope for qualified success at best and, at worst, runs the risk of being a self-indulgent failure. The CCB methodology aspires to sustainability by teaching the technology design process, as opposed to introducing specific technologies, and by offering itself as an instrument through which individuals and communities gain facility with critical assets. Our theory is that when people create and make technologies, they are not only able to repair and maintain them, but the design process is repeatable in perpetuity, whether we are involved or not. Similarly, if technology creation sparks the process of empowerment in an individual or community, that process can become self-generating and independent of any external intervention.

Building upon these principles, CCB intends to work within approaches to poverty eradication that are both integrated (multi-issue) and participatory. These strategies are rooted in the belief that cyclical poverty is as vicious as it is precisely because its negative impacts are interrelated and mutually reinforcing, spanning food security, housing, health care access, water and sanitation, energy options, agricultural production, employment and overall economic opportunity, but that in order for there to be lasting change, communities must lead efforts to address these conditions. Figure 1 illustrates this distinction in strategy by plotting issue focus on the X-axis, ranging from a single-issue approach to an integrated approach, and by plotting decision-making style on the Y-axis, ranging from top-down to participatory decision-making. The graph hopefully makes visual the difference between a single-issue/top-down project like Nets-for-Life, which focuses on malaria and whose leadership determined that distributing mosquito nets is the solution, a project like the Millennium Villages Project, which tackles a range of health, agriculture and income generation issues but also with a set of pre-determined interventions determined by the organization, and a process like Community-Led Total Sanitation, which focuses on the single issue of sanitation, but is very dependent on community participation and decision-making. By teaching a design process that can be applied by participants to any technology
and any issue of their choosing, CCB aims to be both multi-issue and highly participatory. While more challenging to rapidly scale up, we believe efforts that are both integrated and participatory, as opposed to more traditional single-issue/top-down initiatives, are almost always the wisest investment in time and scarce resources.

Figure 1: Issues and Involvement Matrix

Although these theoretical elements are very specific, a willingness to be result-oriented rather than ideological is another very important principle embedded within CCB. In other words, we are thoroughly uninterested in sticking to a particular methodology if another strategy is more appropriate or effective in a given situation; the goal is to end the effects of poverty in real people’s lives, not to be correct or ideologically pure. Thus, CCB may be used, for example, in combination with entirely market-based or charity-based strategies to reach scale, and may find success within public-private partnerships looking at long-term engagement or international partnerships handling emergency relief efforts. Rather than debate the strengths and weaknesses of capitalism ad infinitum, our default is to create space for individuals and communities to determine the most realistic way to produce and disseminate livelihood technologies. Because we lean towards sustainability, we are more likely to advocate for truly affordable loans over grants; because we believe in opportunities for all members of society, we are more likely to promote gender equity over reinforcement of traditional imbalances; because we are interested in livelihoods we are more likely to emphasize entrepreneurship over centralized production; but because we are first and foremost committed to effectiveness, we are more likely to adapt CCB to local
cultural, political, economic, organizational and interpersonal dynamics than claim that what we advocate, promote, or emphasize must be adhered to in a formulaic manner.

Taken together, the principles discussed above—striving to work in a manner that contributes to the empowerment of participants and that is sustainable, integrated, participatory, and results-oriented—form the theoretical framework for how we envision the role of technology in development. Maurice Albertson, a principal architect of the U.S. Peace Corps, discussed some of these concepts as "soft technology." Extending this idea, we propose CCB as software for the hardware of Appropriate Technology 2.0, where the key components of appropriate technology are brought forward and updated. This second generation maintains its commitment to affordable, locally available, maintainable and manufacturable machines and tools that increase income, improve health and safety, decrease manual labor or save time, while more explicitly emphasizing local technology innovation, design and choice that leads to sustainable livelihoods; there remains a commitment to environmental sustainability, but the additional dimensions of economic, socio-cultural and political sustainability are now included; and there is a new understanding of the value of community members participating in the entire design process as designers or co-designers, not just at the beginning or end of the process. Amy Smith summarizes this shift as follows: "If the appropriate technology movement of the 1970’s and 80’s sought to address the question of 'what' technology should be promoted, and participatory development in the 1980’s and 90s asked 'how' to best identify which technology a community wants, CCB asks 'who' creates the technology?" This last question is at the heart of Appropriate Technology 2.0 and Creative Capacity Building.

2.2 Emergence & Foundations of CCB

i. D-Lab, the International Development Design Summit and Northern Uganda

The various elements of CCB have been at work in projects associated with Amy Smith in the last decade. D-Lab is an interdisciplinary program at MIT that is committed to working with people around the world to create and disseminate affordable technologies that contribute to sustainable livelihoods, healthy communities, and more just and equitable societies. The "D" in D-Lab is shorthand for development through dialogue, design and dissemination. In sector-based course offerings, research projects and fieldwork with community partners, students are challenged to use their engineering, science, business and social science training to address issues of poverty. Classes focus on energy, health, information and computer technology, bicycle technology, prosthetics and other mobility devices, school design, and business models that can effectively deliver innovative products for socio-economic development. Experiential learning is central to D-Lab’s pedagogy, with hands-on activities, role-plays and real-world projects providing the foundation for both coursework and fieldwork. The program also emphasizes the importance of working with respect, humility, and optimism in collaboration with community partners. Founded by Amy Smith, D-Lab has grown over the last eight years.

---

5 Albertson and Faulkner, 1986, p.128.
6 Amy Smith, D-Lab class presentation on Creative Capacity Building, Fall 2010.
from one class with 10 students to twelve classes with 300 students conducting research and working in more than twenty countries.7

Beginning in 2007, D-Lab has worked to extend its development philosophy through the International Development Design Summit (IDDS), an annual gathering during which more than sixty people from over twenty countries spend 3-5 weeks developing prototypes for new technologies and social enterprises. Design teams work together to create solutions to pressing problems, regardless of their formal education or employment--villagers, farmers, mechanics, students, teachers, doctors, economists, masons, welders, engineers and artists. This type of collaboration required the creation of a basic design curriculum that would give team members common language and tools for working on their projects. Amy Smith, Benjamin Linder of Olin College of Engineering, Harald Quintus-Bosz of the product design firm Cooper Perkins, and Paul Hudnut of Colorado State University created this curriculum and continue to revise it each year. Teams have generated prototypes ranging from simple, low-cost water treatment systems and medical devices, to agricultural processing equipment and alternative energy technologies. By nurturing invention and innovation, IDDS strives to increase the capacity for creative problem solving in the communities of participants, and to create a global community of interdisciplinary innovators committed to improving the lives of people living in poverty through collaborative technology design.

Both the D-Lab and IDDS curricula are the immediate precursors to what became the CCB curriculum. The catalyst for focusing on village-level technology design trainings was an invitation from the Unitarian Universalist Service Committee (UUSC) to do some technology demonstrations in the post-conflict areas of Northern Uganda. Following a long and brutal war, the Acholi people are just beginning to move back to their homes after more than twenty years of being displaced and living in relief camps. The difference between the burden of work in the camps, where all resources were provided and centralized, and in the village, is vast and difficult to bridge, and UUSC was particularly concerned about how this change would impact the workload of women. D-Lab was asked to demonstrate technologies that would ease this transition as people prepared to return home. Traditionally, as a part of these kinds of demonstrations, we find a local metal worker or carpenter and teach them how to make the technologies we plan to show so there can be a local supply chain if villagers express interest in buying and using the technologies. In this case, there were no fabrication facilities in the transition camps or the dispersed villages people were returning to, so we decided to teach everyone how to make a few of the technologies.

The response to this approach was overwhelmingly positive, and after having many conversations about self-reliance in the context of emergency relief efforts, it occurred to us that an environment that encourages creativity and exploration might lead people to become creators, as opposed to mere users or consumers, of technology. We thought that this shift in perspective could be particularly important in addressing the challenge of post-relief sustainability, and could serve as a mechanism for broader types of community building through collective problem solving. We left feeling as though there was another step to be explored; a step that planted seeds rather than dropped off harvested technologies; a step that enhanced and unleashed the existing

7 D-Lab brochure, accessed 1/10/2011
creative capacity within these communities. Our efforts to work effectively in this new manner led to the idea of Creative Capacity Building as a methodological and philosophical approach to using technology in development. We planned a return trip to the same communities in Uganda, where we would pilot a full design curriculum that would seek to build upon the spark of excitement at creating technologies that we had witnessed.

ii. Liberation, Learning, & Reflective Practice

The foundations of CCB have been articulated in different contexts and fields over the centuries; some trace critical human development goals back to Aristotelian concepts about “human flourishing,” Adam Smith’s “necessities,” Marxist notions of “human freedom,” and Rawls’ “theory of justice.” Mohandas K. Ghandi, however, was among the earliest and most prominent to explicitly expound upon the link between human dignity, distributed production, and addressing the conditions of poverty experienced by the masses. A central component of Ghandi’s strategy for Indian independence was civil disobedience that targeted British control over textiles, salt production, and transportation, and that challenged the idea that modern industrialization is inherently superior to other modes of production. Specifically, Ghandi was convinced that there is a spiritual and human dimension to work that is lost in the factory assembly line, and that every society needed to evaluate for itself how it values these dimensions in the face of modernity. He contended that it is better for more people to have work using less technology than for less people to have work because we use more technology.9

E.F. Schumacher was deeply influenced by Ghandi as well as by what he called, “Buddhist economics,” which led directly to his publication, Small is Beautiful: a study of economics as if people mattered, the seminal work on intermediate technology that inspired the appropriate technology movement in the 1970’s. Leaving the artifacts of appropriate technology aside for a moment, Schumacher offered a radical critique of conventional economics and its preoccupation with maximizing consumption despite great human and environmental cost. As the title/slogan “small is beautiful” implies, he inverts the “bigger is better” and “growth is good” mantra of advanced economies, and was highly critical of attempts to superimpose these values onto developing economies. Schumacher, using a phrase coined by Ghandi, advocated, “production by the masses, not mass production,” not only because of the specific challenges of developing economies but because, “the essence of civilisation is not in a multiplication of wants but in the purification of human character. Character, at the same time, is formed primarily by a man’s work. And work, properly conducted in conditions of human dignity and freedom, blesses those who do it and equally their products.”11

This theme of work and indigenous technology being connected to human dignity and freedom is relevant to Creative Capacity Building because we are essentially making the claim that the process of technology design can have far greater implications than the

---

8 Clark, 2006, p. 6
9 Ghandi, 1956, pp. 15-17
10 Smillie, 2000, p. 87
11 ibid, p. 76
physical artifact that is created or its economic efficiency. Similar to Ghandi and Schumacher, CCB suggests that there is something inherently valuable in asking people to tap into their own creativity to solve their own problems, something beyond metrics or statistics. For them, this intangible is spiritual and linked to freedom; for us, it is rooted in a deep respect for the people with whom we work and a sincere belief in the centrality of their role in the progress of their communities.

Economist Amartya Sen is among those who advanced freedom as a vital component of development. Sen, as did Schumacher, expressed deep skepticism about the value of measuring progress in terms of consumption, which is essentially what statistics like gross national product or per capita income strive to capture. As an alternative, he proposed the Capabilities Approach (CA) as a more accurate and flexible measure of human development, i.e., progress in eliminating poverty should be defined by the wide variety of activities and opportunities that a person is capable of pursuing when they are in a state of well-being and are free from depravity and oppression. Though Sen disagreed with the creation of a definitive list of what these “capabilities and functionings” are, he joined philosopher Martha Nussbaum in her work to create such a list, and supported the efforts of Mahbub ul Haq to use the CA approach to create the Human Development Index for the United Nations Development Programme. The essential relevance here to CCB is Sen’s upgrade of the Basic Needs Approach (BNA) developed by Paul Streeten and others, which incorporated access to food, clothing, shelter, sanitation, healthcare and education as an improvement to mainstream development discourse and its singular focus on macro-level growth that would lead to employment. For Sen, BNA did not fully steer away from tracking consumption of specific commodities and, therefore, did not sufficiently focus on the full range of factors that enhance or inhibit the capacity people have to live full, quality lives.

The challenge of CCB is to effectively actuate these laudable ideas in the form of a curriculum that can be effective in a rural village context. This combination of theory and practice-- what he called praxis-- was the life-long work of Paulo Freire, who outlined his influential analysis of popular education and social transformation in the Pedagogy of the Oppressed. Two very important Freirian concepts are at the heart of the CCB curriculum. First, the idea of a pre-determined, written curriculum is turned on its head in favor of a dialogue-based curriculum that emphasizes mutual respect. By placing respect at the center of learning exchanges, Freire discourages a model in which active “teachers” act upon passive “students” (what he calls the banking system), in favor of a learning community in which people are working with each other. Second, Freire stressed the educational value of people’s lived experiences, and argued that bringing this knowledge into the learning process increases consciousness in a manner that can be transformational. More specifically, he underscored the right of people living in poverty to conduct their own analysis and the necessity for a “pedagogy of hope” created by those who have traditionally been voiceless. This idea is at the center of Asset-Based

12 Sen, 1999, pp. 5-11.
13 Clark, 2006, p. 7
Community Development (ABCD), developed by John Kretzmann and John McKnight, which abandons traditional approaches that use needs, problems, and deficiencies as their point of departure and instead begin the development process by discovering and mobilizing the resources and strengths (assets) found in every community.17

Freire relied heavily upon John Dewey’s work on experiential education and shared his belief in the connection between learning and social transformation. Considered the pioneer of hands-on and project-based learning, Dewey strenuously advocates an interactive educational environment that prepares students to be active learners in the classroom and active participants in society. In 1897 Dewey wrote: “To prepare him for the future life means to give him command of himself; it means to train him so that he will have the full and ready use of all his capacities.”18 While Freire focused specifically on popular and informal educational settings and Dewey wrote mostly about traditional classrooms, Ivan Illich argued for broad-based deinstitutionalization of learning (Deschooling Society, 1970) and more relevant to CCB, in reclamation of the production of knowledge from so-called experts (Tools for Conviviality, 1973). For Illich, the strengths and wisdom of everyday people are intentionally hidden from them through technical and scientific language, the providence of experts. For him, through conscious reclamation, there is an alternative: “Language which is used by a people jointly claiming and asserting each person’s right to share in the shaping of the community becomes, so to speak, a second-order tool to clarify the relationships of a people to engineered instrumentalties.”19 The fingerprints of all three of these thinkers-- Freire, Dewey and Illich-- particularly in terms of experience-based learning and discourse that values diverse sources of knowledge, are evident in the curricula for D-Lab, IDDS and CCB.

The last foundational concept that is important to understand CCB is reflective practice. Donald Schöen, in The Reflective Practitioner (1983), discussed the value of a constant cycle of experience, reflection, learning and practice for professionals, where practice is defined as “artful doing.”20 Through this process, he argues, professionals can escape the trap of “technical rationality,” which bounds practitioner to a rigid structure and static knowledge base. He encourages improvisation (“thinking on one’s feet,” or “reflection in action”), introspection (“reflection on action”), and adaptation (“building new understanding”).21 This framework is central to the DUSP curriculum, where Schöen was a faculty member for three decades, and was part of the daily practice of evolving and implementing the CCB curriculum in Northern Uganda.

While Schöen presented his call for reflective practice as being useful in a range of professions, Robert Chambers takes aim specifically at development professionals in his important work, Whose Reality Counts: putting the first last (1997). Chambers and others pioneered the Rapid Rural Appraisal methodology, which was one of the first major participatory strategies in the international development toolkit. A student of Freire, he is highly critical of outsiders imposing their definitions of development on people living in

17 Kretzmann and McKnight, 1993.
18 Dewey, 1897, p.6.
20 Schöen, 1983, pp. 60-68.
21 ibid, p. 68
poverty, and issues a direct challenge to development workers as a whole to be diligent in recognizing and combating their own biases: “A person who is not poor who pronounces on what matters to those who are poor is in a trap. Self-critical analysis, sensitive rapport, and participatory methods can contribute some valid insight into the values, priorities and preferences of poor people. We can struggle to reconstruct our realities to reflect what poor people indicate to be theirs. But there will always be distortions.”22 By presenting CCB as a tool for people living in poverty to use or discard according to the needs they identify for themselves, and by reflecting daily on the effectiveness of both content and our facilitation, we strive to minimize the effects of this trap.

For accuracy, it should be noted that the above discussion of the literature is presented to locate CCB within a continuum of thought about technology, education and development, but there was very little formal discussion about these theories as we worked through the CCB methodology. D-Lab and IDDS have always functioned based upon Amy Smith’s intuitive and experience-based philosophical approach, which is influenced heavily by Unitarian principles (“the inherent worth and dignity of every person,” “justice, equality and compassion in human relations,” and, “the use of democratic principles in society at large,”23), early exposure to the Swadeshi Movement in India and the teachings of Ghandi (self-sufficiency through the revival of local production and traditional production techniques24), and anti-Apartheid activist Steven Biko (psychological liberation as a pre-condition to progress25). These values harmonized well with my background in community organizing, interest in the Fourteen Mindfulness Trainings of Interbeing (“the present moment,” “awareness of suffering,” “non-attachment to views,” and “right livelihood,”26) and ongoing study of development theory and practice, and so while CCB has, without question, inherited a great deal from the long tradition of social movements, methodological experimentation, and philosophical debate reviewed, it emerged in a very organic manner, through informal conversation, trial-and-error, reflection upon successes and failures, and constant revision before each implementation. This is consistent with theories of planning practice that suggest that professionals more frequently rely on intuition and practical wisdom than on formalized theory.27

2.3 CCB in the Context of Historic and Recent Trends in Technology and Development

i. Development from the West for the Rest

This section is far from a comprehensive review of development practice over the last sixty years; instead, I hope to contextualize Creative Capacity Building within the ebb and flow of conventional wisdom in the field and to compare CCB to some of the approaches that are currently in fashion. I am particularly interested in highlighting the

24 Ghandi, 1956, p. 52
25 Biko, 1986, p. 11
26 The Order of Interbeing, http://www.orderofinterbeing.org/14e.html, retrieved 1/11/11
changing attitudes about the type and role of technology in development because this orientation is what distinguishes CCB the most from both the past and present. Because the role of technology in development theory and practice has not proceeded in a linear chronology, I’ve grouped different strategies in terms of “what”-- the kind of technologies that have been pursued-- and “how”-- the process by which a technology is chosen; our contention is that CCB is among a handful of strategies that view “who”-- technology creation by users-- as another important dimension. These are necessarily broad brushstrokes that miss the complexity of the strategies and the difficulty of the environments within which they operate(d), but as Ian Smillie writes in Mastering the Machine, “it is not difficult to criticize failure. The problem, however, is not the failure; it is the exaggerated donor claims of success, the failure to learn from failure, and the constant re-invention of wheels that will not carry the load they are designed to bear.”

For the majority of the 20th century, development was synonymous with economic growth, and growth meant industrialization. Accordingly, technology was frequently viewed as a panacea and technology transfer from advanced economies to developing economies was the dominant practice. From the end of World War II through the 1960’s, large scale manufacturing was promoted in urban areas so as to optimize the competitive advantage of cheap labor markets in developing economies, and large-scale projects, like dams, roads and railways, consumed a disproportionate amount of development resources. These strategies relied heavily on “trickle-down economics,” which theorizes that overall economic growth will lead to job growth, which in turn, will produce opportunities and other social benefits for the masses of people. The rapid increase in rural-urban migration precipitated by these large-scale, urban-focused technology projects, however, signaled that resources and opportunities were not trickling down fast enough. Still, this theory was promoted by policy makers, economists and engineers in advanced economies and embraced by government officials and industrialists in most developing economies well into the 1970’s; repackaged versions of the same idea continue to crop up to this day.

In rural areas, the role for technology was also mainly at a large scale or was beyond the financial means of most people living in poverty. The Green Revolution in the 1950’s and 60’s ushered in high-tech seeds, fertilizers and agricultural machinery, which mostly benefited agri-businesses and more affluent farmers while smallholders lagged further behind. In addition, while the Green Revolution found some measures of success in Asia and Southeast Asia (excluding long-term environmental costs), it never took off in Africa. Growing inequality and deepening poverty even after hundreds of millions of dollars of expenditures created rumblings about people in rural areas being left behind. In response, the Basic Needs Approach and integrated rural development projects (IRDPs) were introduced in the 1970s, which definitely shifted focus to rural areas but did not change the view of what types of technology are most important. Big technology and infrastructure--rural electrification, roads, water schemes and hospitals-- were also the priority for IRDPs. The integrated approach to a range of issues beyond income affecting people living in

28 Smillie, 2000, p. 45
29 ibid, pp. 36-45
poverty was a needed shift, but limited investment, local cronyism, inefficiency, and donor impatience doomed these projects to failure.\textsuperscript{30}

The stagnation of the global economy in the 1970's, combined with mixed results for these large-scale technology projects, caused both retrenchment and reassessment in advanced economies. On the side of retrenchment, development aid decreased, integrated and community development strategies fell out of favor, and trickle-down economics was reformulated into a global emphasis on trade called structural adjustment. There were many elements of structural adjustment that were unhelpful to the immediate needs of people living in poverty (including mandated reductions in social spending in exchange for long-term loans), but the most relevant to this story about technology is the return of manufacturing as a requisite for trading in the new globalized economy. Big industry in urban areas was back with a vengeance in the 1980's and 90's and, as a result, rural-urban migration continued unabated.

On the side of reassessment, Schumacher's ideas about "intermediate technology" began to really take hold in the 1970's. He noted that, "where high-grade modern equipment is standing idle because of lack of organization, finance, raw material, supplies, transport, marketing facilities and the like, a lot of scarce capital resources-- normally paid from scarce foreign exchange-- are virtually wasted."\textsuperscript{31} If traditional methods are symbolically a $1 technology, and large-scale technology is a $1000 technology, he advocated seeking $100 technologies that would create workplaces with low capital costs, would be small-scale to fit small markets, would be simple so as to not require sophisticated training or organization, and would be non-violent in regard to humans and the environment.\textsuperscript{32} This represented the first major shift in the mainstream development discourse on the question of what type of technology is needed to address the conditions of poverty; a new movement for "appropriate technology" was launched.

While this debate raged on (and to a degree, these positions are still presented as mutually exclusive instead of as potentially complimentary strategies), renewed attention began to be given to the question of how technology choices get made. Going back to the late 1940's and 1950s, community development projects were widespread and designed to be participatory vehicles for community members to seek solutions together. While much of the focus was on economic and political development, community members had a level of input about the type of technologies that a community deemed necessary that simply did not exist when large-scale national infrastructure or manufacturing projects were planned.\textsuperscript{33} These programs died out in the 1960's as donors lost patience with the slow progress inherent in democratic processes, and exploitation by local elites, but the concepts of participatory development made a comeback in the 1980's and 90's in the form of Rapid Rural Appraisal (RRA), also called Participatory Rural Appraisal and Participatory Learning and Action. For RRA and its proponents, process is as important as outcome, and true development requires that people living in poverty are involved in defining problems and identifying and implementing solutions. The great challenge of participatory methods

\textsuperscript{30} ibid, pp. 36-45
\textsuperscript{31} ibid, p. 11
\textsuperscript{32} Schumacher, 1973
\textsuperscript{33} Smillie, 2000, p. 43.
remains that they are difficult to implement rapidly and to take to scale, leaving programs vulnerable to pressure from donors and donor nations eager to show statistical progress.

This quick review of the major themes of technology in development reveals a serious lack of consensus on what works, and a mixed record of lifting people out of poverty, especially if framed in terms of return on investment. Cognizant of the fact that a large portion of this seven decade long debate ignored the specific circumstances of women and smallholder farmers, CCB chose to build upon the foundations of appropriate technology when honing in on what kind of technologies we wished to emphasize. Instead of identifying specific technologies, however, CCB focuses on the principles of appropriate technology: low-cost, produced from available materials, able to be understood, maintained and repaired locally, small-scale, socially and environmentally sustainable (non-violent), and focused on livelihood creation. This emphasis on appropriate technologies does not mean that CCB completely dismisses the dominant economic view that employment is critical to ending poverty but, rather, that livelihood creation is a broader category of work from which people can create value (with or without a wage), and that macroeconomic growth is but one strategy to pursue this goal.

In choosing the process through which technology should be chosen, CCB uses the principles of asset mapping and participatory planning as its second pillar. The appropriate technology movement brought together a mélange of people interested in a variety of things-- some were interested in saving the environment, some were interested in finding a counterculture to consumerism, and some were interested in eliminating poverty. This mixture of motives led to excesses that were unhelpful to people living in poverty, such as a fetishism for the technologies that were oddly reminiscent of the love for big technologies that Schumacher criticized. Engineers and designers were often still far removed from the people and local conditions for which technologies were being created, and machines and tools were still received wisdom from outsiders. CCB strives to correct this tendency by relying upon participants to tap into their own skill sets, to determine which technologies they wish to introduce into their communities, and to be engaged in every aspect of design and creation. It is true that we limit the range of choice based upon the definitions of appropriate technology, but depending on the availability of materials and local knowledge, ‘appropriate’ can include everything from hand tools to information and communication technologies, agricultural processes to energy and water systems. Even in rural areas, given emergent supply chains enabled by improved transportation infrastructure and entrepreneurial networks, the definition of ‘available’ has expanded tremendously to include parts, components and materials that can be obtained in reachable city centers.

If participatory implementations are to be faulted, it may be for being too focused on process outcomes and not enough on technology outcomes. CCB strives to find the right balance between community-led processes and effective technology dissemination. When technology is a focus, participation has also traditionally meant external experts engaging the community in determining needs, possibly getting input on what a technology should do, going away to do the design work, and then returning to the community to get feedback on the design. This is a far superior strategy than designing without community input, but still keeps the skill sets for solving future problems out of the hands of participants. CCB

34 Ibid, p. 94-96
involves the community in the entire design process, from problem framing through prototyping and getting user feedback, thereby augmenting and transferring skills rather than just transferring technologies. It is adding this third dimension of who is creating the technology that we feel is the most exciting, and potentially most useful, element of CCB.

ii. Fab Labs, Co-Creation, ICT4D and BOP

A number of recent projects or strategies have emerged that strive to provide a platform for the talents of people living in poverty. The theory, which CCB also adheres to, is that once unleashed and supported, community-based creativity and ingenuity has the potential to become a transformational force that is sustainable, highly efficient, and far reaching in its impact. While sharing this basic premise, there are some important distinctions between these other approaches and how we envision Creative Capacity Building. This section is intended to draw contrasts for the purpose of defining CCB, not to disparage these other initiatives or ideas.

The first project is the network of Fab Labs launched by Neil Gershenfeld of MIT's Center for Bits and Atoms. This program creates and connects labs with digital prototyping equipment (laser cutters, CNC machines and programming tools) around the world to a network that allows for collaboration. Like CCB, the basic commitment is to distributed innovation and the recognition that, as Gershenfeld writes, "...Fab Labs aren't introducing inventiveness--grass-roots inventors can be found all over the world. What they've lacked is access to modern means for invention."35 The difference is in the applicability of these machines to livelihood technologies in developing economies, and the pre-determined nature of the labs themselves. Each Fab Lab receives a package of machines costing about $50,000, but there is little community involvement in the choice to pursue a Fab Lab, what to put in it, or how else $50,000 might be spent. Fab Labs have a small presence in developing countries, and their effectiveness is restricted by the large disconnect between the high-tech equipment deployed and the products that are needed in communities. By contrast, a CCB workshop would contain tools that are appropriate for their settings and would be adapted to the needs of the community.

Co-creation is the latest iteration of the "collective resource approach" which emerged in the 1970's as an effective mechanism for developing computer applications.36 C.K. Prahalad (with Venkat Ramaswamy) brought co-creation to prominence in his article, "Co-Opting Customer Competence," and later in their book The Future of Competition, arguing that firms can improve their products, brand loyalty, and revenue by engaging customers in the creation of new products.37 Programming networks like Linux and high tech computer firms were the main examples provided to advance the theory, and, in general, co-creation has remained limited to high-end product design for consumers in advanced economies. Nonetheless, the concept of co-creation has started to appear in literature about community-based international development projects and the design of appropriate technologies. The question that must be answered is whether people living in poverty have the resources and skill sets required to meaningfully participate in a co-creative process;

36 Bödker, 1996, pp. 215-236
token participation at the beginning and end of the process diminishes the entire strategy. CCB seeks to contribute to the feasibility of meaningful co-creation by teaching the fundamental processes of technology design so that novice and experienced designers, regardless of differences in education level or backgrounds, can speak a common language.

Perhaps the most rapidly growing use of technology in the field in the last decade has been information and communication technologies for development (ICT4D). The goal of ICT4D is to apply the power of recent technologies—particularly computers, mobile phones and the Internet— to tackle global poverty. The explosion of cell phones in developing economies is used as the quintessential example of a leapfrog technology (after decades of slow land line infrastructure), and a wide range of cell phone applications have been used to advance health care delivery, generate new businesses, and improve markets. Community internet cafes, often referred to as “telecenters” or “community technology centers” were launched throughout high-poverty communities. One Laptop Per Child (OLPC), germinated by Nicholas Negroponte at MIT, set a goal of creating and distributing 3 million $100 laptops that would improve the educational opportunities of children in these communities. Predictably, these technologies have made some gains, but have not been the magic bullet many people had described. Kentaro Toyama, an ICT4D researcher at Microsoft, writes that no matter how widely disseminated new technologies become, “their beneficial contributions are contingent on an absorptive capacity among users that is often missing in the developing world. Technology has positive effects only to the extent that people are willing and able to use it positively...and [when] well-intentioned capability is in scarce supply, technology cannot make up for its deficiency.” The same forces that have weakened other top-down efforts that emphasize technologies more than the people they purport to serve are minimizing the impact of ICT4D projects. In terms of CCB, it is our belief that if users and communities are involved throughout the design process, whether designing a new device for making yam mounds or a new cell phone based application for monitoring newborns, outcomes will always be better and more sustainable.

In his book, The Fortune at the Bottom of the Pyramid, C.K. Prahalad advanced another concept known as the Base of the Pyramid (BoP), which fundamentally seeks to eradicate poverty by convincing for-profit entities to recognize the vast underserved market within the 4 billion people with a per capita income below $1500. Fearful that this amounted to little more than “selling to the poor” in pursuit of “the fortune,” development professionals, NGOs and other stakeholders have been promoting BoP 2.0, which aims to attach participatory processes like, “co-invention, business co-creation and deep dialogue,” to initiatives, and to, “bring corporations into close, personal business partnership with BoP communities.” This change is welcome, and while there are many business schools working to promote effective social entrepreneurship (including innovative programs at Colorado State University, Cornell University and MIT), it is unclear how deeply BoP 2.0 has penetrated the business community. A further examination of this new approach also

38 Toyama, 2010.
40 Prahalad, 2004
41 Simanis and Hart, 2008, p.2
reveals a great deal of emphasis on increasing the capacity of corporations and well-intentioned social entrepreneurs to be successful in an unfamiliar market environment, but far less emphasis on developing the capacity of "BoP communities" to interact within and fully benefit from these new partnerships. Rather than optimizing the environment within which top of the pyramid corporations and social entrepreneurs can sell products to people living in poverty, CCB is interested in preparing the base of the pyramid to develop and sell livelihood technologies to itself.

### 2.4 My Expectations & Questions about CCB

This brief history of how technology has been used in development served as an important backdrop for me as I prepared to travel to Uganda with Amy to pilot the CCB curriculum. I was determined to avoid what seemed to be a recurring theme of arrogance about the superiority of a given method, and yet I was very confident that what we were planning to do would be innovative and effective. I expected that the people we had worked with on our first trip would welcome us warmly and that everyone would be excited to learn how to design technologies. After hearing disparaging comments by aid workers about the Acholi people being lazy after two decades in the relief camps, I think I anticipated a certain level of skepticism from our professional colleagues as we delivered or discussed the curriculum with enthusiasm and hopefulness. I imagine I also expected to "succeed," meaning that we would do something that would make a positive contribution to the process of returning home that was underway for our participants.

In terms of my expectations about the ideas embedded within CCB, I believed in them. I felt confident that intermediate technologies were the best type of technology to serve the needs of the people we would be working with; I felt strongly that they knew far
more than I could ever know about the nature of their work and, therefore, what kinds of technologies they would want; and I believed we would create a space that would invite and enhance people's creativity so they could see themselves designing solutions to problems related to their work or anything else. Mostly, I trusted that working with humility and respect would protect us from making any egregious errors or doing more harm than good, but I was unsure about whether we would be able to get past the trauma that our participants lived through.

In truth, I had far more questions about CCB than expectations. Being fully cognizant of the long history of external interventions, I was feeling very self-conscious and uncomfortable about being an external intervener. And in terms of CCB, I wanted to be able to answer some of the following questions: How do we make this useful to participants even if our ideas about CCB fall flat? What types of exercises can we do that will translate across our cultural and socioeconomic differences? To what degree will we be able to encourage gender equity and ensure balanced participation? Given low-literacy levels, how are we going to measure the effectiveness of the training? What is going to happen after the training and what can we do to support participants? The only thing that I knew for sure was that I was glad I was trying to do this with Amy.
Chapter Three: Implementing Creative Capacity Building in Northern Uganda

3.1 Fieldwork Background & Logistics

Attempting to capture the complex causes and devastating impacts of the two decades-long conflict in Northern Uganda would fill volumes; this section only aims to briefly describe the context in which field testing of the CCB curriculum took place. The war began in 1986 and ended in 2007 (though there is still no formal peace agreement between the rebel group the Lord’s Resistance Army [LRA] and the Ugandan government), leaving 30,000 casualties and horrific civilian abuse and displacement in its wake. An estimated 1.8 million Acholi were forced to live in overcrowded IDP camps that the Ugandan government created in the name of security, but civilians continued to be vulnerable to attack. The LRA, though itself comprised mainly of Acholi, committed atrocities, including abduction, torture, mutilation, rape, and mass killings against its own people, destroying both infrastructure and any sense of safety. An estimated 70,000 people, including 40,000 children, were kidnapped and forced to commit crimes against their own families and homes, further destroying the cultural and familial ties at the center of Acholi culture. 42

The destruction of Acholi communities was exacerbated by years of dependency in the IDP camps that spanned a generation. People could not cultivate food or cash crops because they were not on land that belonged to them and, for the few who had salaried positions prior to the conflict, other job opportunities were scarce. Over 95% of the population was dependent on the government and/or relief agencies for food, water, clothing, shelter, fuel and other services. Population density was as high as 1,700 people

Figure 3: Map of Conflict-Affected Uganda

Source: UN Department of Public Information, Map #3862.1, Sep. 2002

per hectare in many of the 202 IDP camps in Northern Uganda (the population density in England is approximately 3.77 persons per hectare\textsuperscript{43}); the lack of employment opportunities meant that men and women of productive age were mostly idle, leading to unprecedented levels of crime and other illegal activities; the school drop out rate soared in the face of perpetual insecurity and youth unemployment over 90%; alcoholism and domestic abuse rose to epidemic proportions; the rate of violent death was three times higher than in Iraq following the 2003 invasion and 58 children under five were dying every day due to violence or the squalid camp conditions.\textsuperscript{44} In 2004, Jan Egeland, UN Undersecretary General for Humanitarian Affairs and Emergency Relief, described Northern Uganda as, "the world's largest neglected humanitarian emergency."\textsuperscript{45}

By 2007, the LRA had fled to the Democratic Republic of Congo and the Central African Republic (where it continues to terrorize civilians), and the Acholi people began the long process of returning home to their original villages. As an interim step, thousands of families moved into transition villages that were smaller and closer to their home villages than the huge IDP camps. That same year, UUSC began working with partner organization Caritas Internationale to facilitate this going-home process in Pader, considered the district most affected by the war yet the most neglected by relief agencies. UUSC, through the Caritas Gulu branch office in Pader, brought together Mark Bernard Okot, Jennifer Lubangapewanny, and Flora Tracy Aye, a team of Acholi social workers who were also war-survivors, and Jackie Okanga, a Kenyan lawyer with experience in refugee work. In 2008, they began work in two transition villages, Amokolegwai and Acuru, conducting extensive community dialogues in an attempt to understand the barriers to returning home. The team launched a comprehensive program that attended to the material needs of the villagers-- seeds, oxen teams, land-dispute mediation, income-generation and savings groups-- as well as their cultural and spiritual needs-- traditional ceremonies to put the souls of the dead to rest, musical instruments and dance costumes, and psycho-social support groups. UUSC began with a goal of assisting 6,000 people to return home to 14 villages; by the end of 2010, over 12,000 people had returned home and the team had expanded its work to a total of 29 villages.\textsuperscript{46}

The transition villages of Amokolegwai and Acuru, though a tremendous improvement over the IDP camps, present many of challenges that are common wherever traditional rural cultures meet modern concepts of development. Families live in clusters of "ot lum" (traditional round mud brick and grass thatched roof huts) built in forest clearings with no electricity or household sanitation; water sources range from 1-3 kilometers away and the three-stone hearth using firewood is the primary cooking method. Each village has access to the nearest trading town (Pader) via one unpaved road and the dominant modes of transportation are bicycling and walking. There is a primary school in each village, though teacher attendance is a major problem, and overall community literacy is close to fifty percent. Health services are only accessible in Pader; malaria and diarrheal disease are prevalent, accounting for approximately 70% of the community disease burden, though


\textsuperscript{44} Human Rights Watch, 2005, pp.8-10


\textsuperscript{46} http://www.uusc.org/uganda, retrieved January 28, 2011.
there are HIV+ and elderly villagers with a range of more complicated health issues.  

Farming is the principal activity of every able-bodied villager, with most people growing staple crops such as groundnuts (peanuts), sesame, finger millet, sorghum, green beans, cassava and potatoes; cash crops include maize, cotton and oil seeds. Those who hold salaried positions, such as teachers, craftsmen and administrators, still maintain farms. Shea nuts are collected and made into butter for sale on the local market, and hunting and fishing are also important sources of both calories and income. Prior to the conflict, every family owned some livestock, including plough oxen, goats, pigs and poultry; stocks of these animals are slowly being rebuilt. Other sources of income include brewing, stone quarrying, and trading firewood, grass or charcoal during the dry season and wild greens or seasonal fruits during rainy seasons. Each community has agricultural, savings and income generating activity (IGA) groups that pool resources to support community-wide projects, including assistance for the sick, disabled and elderly.  

These IGA groups were the pool from which Caritas staff invited participants for the CCB training we piloted in Amokolegwai and Acuru in October 2009. Because our meetings in April were community-wide, we were concerned about how we would invite some to participate in the training but not others; our community partners solved this problem for us by inviting four members each from sixteen IGAs (though more showed up). A second logistical concern was that we wanted each group to have gender balance, at least one person who could take notes, and one person who understood English; the Caritas staff communicated this in advance, resulting in roughly an equal number of women and men participants, and each group having at least one scribe.  

A third logistical concern was that even in countries where English is an official language, fluency in rural villages is unreliable. In order to remove as many barriers to participation as possible and to be sensitive to issues related to educational levels, we wanted to do the entire workshop with interpretation from English to Luo, the language of the Acholi. Once again, the Caritas staff made this possible by interpreting every word of our oral presentations and translating all of our visual materials. Jennifer Lubangapewanny was our liaison to Amokolegwai and Flora Tracy Aye was our liaison to Acuru; they provided simultaneous interpretation and written translation throughout the trainings. Denis Obwona, who helped develop a nut and seed paste-maker prototype with Amy on our previous trip, also provided some interpretation, instruction and technical support. Jackie Okanga coordinated logistics for the entire team.  

This underscores the critical importance of working with community partners or, as in this case, with an intermediary organization that has gained the trust and respect of the people with whom it works. Caritas earned tremendous goodwill in Acholiland because it was providing aid in the area when other organizations were unable to overcome security concerns, and because the local organizational staff is comprised almost entirely of war survivors. The fact that Caritas introduced us to the community on our first visit and was organizing the trainings on our second trip gave us a level of acceptance that would not have existed if we were working with a different organization. Beyond lending us this credibility, the Caritas Gulu office authorized the Pader Branch to provide all of our  

47 Personal observations and communications with Caritas staff, April 2009.  
48 ibid.
transportation needs for the duration of the workshops, which made operating in the field and gathering materials infinitely more time efficient. In order to help prepare for the simultaneous interpretation, to begin the training process for effective follow-up, and to invite our partners to share in the vision of creative capacity building, we did a presentation to the staff about CCB and the goals of the curriculum before the training.

The curriculum was designed to be 4-5 hours a day for three days, plus a preliminary community meeting that would last about an hour. Training times were arranged between villagers and the Caritas staff; we ran the workshop from 11 AM to 3-4 PM to ensure that farmers tending their fields in the morning and women needing to cook in the late afternoon would be able to participate. This allowed us to achieve greater gender balance and to keep attendance relatively consistent over the course of the three-day training. In Amokolegwai, we had an average of 56 participants on the first day, 52 on the second day, and 54 on the third day; in Acuru we had an average of 64 participants on the first day, 59 on the second day and 61 on the third day. Participation fluctuated most notably because women had other responsibilities, such as children, and would jump in and out throughout the day. At the suggestion of the Caritas staff, we only provided light refreshments during a break each day, as opposed to a full meal.

3.2 Curriculum Implementation & Development in the Field

i. The CCB Curriculum

The curriculum is a focused three-day workshop, designed to highlight the creativity of the participants and to teach the process of iterative design. The principles of the design process are conveyed through a combination of relevant appropriate technologies as examples and a series of hands-on activities that reinforce the concepts presented. Participants practice both creating new technologies and evolving and improving upon existing technologies. On each day, in addition to the more formal design curriculum, participants work on a "mini-capstone" project which allows them to apply the concepts learned during the presentations and to see how the different stages of the process fit together in a single project; the workshop culminates in a showcase of the machines made by participants. Figure 4 shows an outline of the curriculum that we developed for this pilot; a more detailed explanation of the curriculum can be found in Appendix II.

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Design Process</th>
<th>Review</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Greetings</td>
<td>- Example: Charcoal press</td>
<td>- Testing &amp; Getting Feedback</td>
<td></td>
</tr>
<tr>
<td>- Intro to Creative Capacity Building</td>
<td>- Activity: Maize storage</td>
<td>- Example: Simgim paste maker</td>
<td></td>
</tr>
<tr>
<td>- Review schedule</td>
<td>- Concept Selection</td>
<td>- Project: G-nut thresher</td>
<td></td>
</tr>
<tr>
<td>- Things to bring</td>
<td>- Project: G-nut thresher</td>
<td>- Project: G-nut thresher</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4: Creative Capacity Building Curriculum**

<table>
<thead>
<tr>
<th>Idea Generation</th>
<th>Materials &amp; Manufacturing</th>
<th>Detail Design</th>
<th>Prototyping</th>
<th>Project Showcase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Wrap Up &amp; Next Steps</td>
</tr>
</tbody>
</table>
A guiding principle for the exercises and activities we selected for the curriculum was that, in addition to learning new concepts, participants should walk away having made or used some tangible technologies that could be helpful in their daily lives. If people were going to take time away from farming and all of the work they are engaged in to resettle in order to do this training, we wanted to make sure that they benefited even if the idea of Creative Capacity Building fell flat. We delivered the complete curriculum twice, once in Amokolegwai and once Acuru, with the latter receiving slight alterations based on lessons learned during delivery of the former.

The centerpiece of the curriculum is a version of the design cycle that is adapted from the IDDS curriculum. The same principles are covered in most first-year engineering design courses and can be depicted as a circle, a spiral or as a linear process; it also has similar components to the policy design process taught in many planning schools. The essential concept is that good technologies usually go through an iterative process that is easy to understand and replicate; there is nothing in the design process that almost everyone has not done in some way before, either in the course of their work, living their lives, or when they were children. Everybody has asked questions in order to learn more about something; everybody has tried to think of different ways to handle a situation; everyone has made a decision about how they are going to do something; everybody has thought through each step of what they have to do in order to do something; everybody has made something; and everybody has tried to use something to see if they like it. What we are showing people is just a slightly more applied version of these activities with a few more guidelines that might make the end products more effective. Figure 5 below shows the design cycle we used in the workshop, including translation of each step into Luo.

**Figure 5: The Design Cycle (Yubu Tic Kore ki Kore)**

Start Here

Get feedback

Adwogi Ne

Test

Temo Ne

Build

Yubu Ne

Work out details

Neno ne matuti

PROBLEM

Think of ideas

Tamo yoo moo

PEKO

Experiment

Keto

Choose the best idea

Yero yoo ma ber ne

SOLUTION

LACOBE

One project in development is the creation of a manual that goes over each element of the curriculum step-by-step; part of this document is included as the Appendix on page 46. In this section, however, I wish to highlight just a few key points.

- "Maize Storage" is a team building exercise that allows the participants to go through the entire design process that they just learned about for the first time without using a lot of valuable materials and in a fun way. The challenge
given to participants is to support as many ears of maize as possible 15 centimeters off the ground using just two pieces of paper and 30 centimeters of tape. What is great about this challenge is that initially, people look at the paper, then look at the maize, and do not think they can support any maize at all. When, after 20 minutes or so, there are people stacking 15 and 20 ears of maize on their paper structures, competing to see who can support the most, the atmosphere of the training is completely transformed by laughter, excitement, and competitive spirit. We believe that part of this excitement comes from seeing a challenge, believing it is impossible, and then having the experience of overcoming that challenge. It is worth noting that we originally called this a “maize raise” thinking our play on words was clever; it was a group of participants who made the challenge relevant to daily experience by indicating that the challenge was similar to storing maize above ground to keep pests out. In Acuru, where there was no maize, we were able to easily shift to Cassava Storage.

- The “Thinking of Ideas” stage is critical and the first major departure from what people may be used to doing. The key is to think of as many ideas as possible, even seemingly ridiculous ideas, because the goal is to spark insights that might not otherwise emerge. This is especially true when working as a group. Getting people to think of as many ideas as they can, and giving them different tools to do this, e.g., the specific rules of brainstorming or of bissociation, is the essence of this session because the natural tendency is to have one idea and just move forward with it.

- “Choosing the Best Idea” is a tricky part of the curriculum because most tools for this involve writing and using somewhat complicated tools like Pugh Charts. We had success using role plays to demonstrate some of the other steps in the cycle, but even this strategy did not work for this topic. The participants skipped past this stage, seemingly without detriment, but we continue to experiment with a variety of other strategies for this section.

- In the “Testing” section we used the nut and seed pastemaker prototype that we had made in our first visit. Not only was the pastemaker a good choice because it was a rough prototype with plenty of room for improvement, but there was important symbolism in having the participants-- receivers of technology for a generation-- critique the work of the so-called experts, and for them to be so obviously correct about the needed changes. This drove home the point that everyone needs to continue around the design cycle multiple times and that no one has a monopoly on good ideas.

- The “Showcase” may seem like a frivolous addition to the curriculum, but it is truly an important moment when teams line up all of the prototypes they have made and start demonstrating them to each other. Not only is there a lot of fun and laughter, but it is also an opportunity for the community to see what it has accomplished in such a short period of time.
Given the intensity of leading the sessions and the constant preparation during "down time," we found it necessary to develop a fairly structured debrief and reflection process that we could easily complete during or after dinner. We would begin with a check-in about our highs and lows for the day, and then gradually move into more detailed discussions about elements of the curriculum that did or did not work well that day. We developed a chart that we would use to evaluate each session in terms of our preparation, implementation, and achievement of the goals for the session, arriving at a rating for each by consensus. Notes, tips, suggestions for changes and concerns would also be recorded and then lead into discussion about the curriculum for the next day. Particular emphasis was placed on being well prepared, so we would often spend the evenings organizing materials, writing teaching notes, packing for the next day and discussing observations. Since we would have the experience of doing the curriculum in Amokolegwai prior to doing the same planned material in Acuru, adjustments in timing, order or content for the second delivery were common. These debrief sessions were invaluable in terms of both strengthening the material and keeping us in constant dialogue with the feedback, sometimes directly expressed and sometimes observed, from participants. Figure 6 below is a sample debrief chart.

**Figure 6: Sample Daily Debrief Chart**

<table>
<thead>
<tr>
<th>Element</th>
<th>Preparation</th>
<th>Implementation</th>
<th>Goals Achieved</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>✓</td>
<td>✓</td>
<td>?/probably</td>
<td>Being early is good! Nametags &amp; materials early helped &amp; did not cut into time.</td>
</tr>
<tr>
<td>Design Process</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>Need to clarify translation of cycle.</td>
</tr>
<tr>
<td>Charcoal Press</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Having a participant pound was good. Using fines instead of ag waste helps stay focused on the presses instead of the &quot;charcoal distraction.&quot;</td>
</tr>
<tr>
<td>Maize Storage</td>
<td>Ok, could have been better</td>
<td>poor</td>
<td>Probably; seemed to go well despite problems</td>
<td>Lots of people to manage; circle at end was good, before that too spread out.</td>
</tr>
</tbody>
</table>
In addition to these debrief sessions, I maintained a personal diary in which I would comment on the day's training session, possible adjustments to our implementation strategy, and my own "performance." This realization-- that we were essentially performing the material in front of an audience each day-- was an important insight for me, one that both put me in a frame of mind that was conscious of performance (projecting my voice, capturing attention, holding the space, attending to diction, pace and rhythm, emitting positivity and enthusiasm, interacting with people), but also curious about ways to break down the barriers between performer and audience, to avoid performing a script in favor of engaging in true dialogue, and ultimately to have the participants take over the entire process. In the future, in a different venue, I hope to explore this idea further in relation to Augusto Boal's "forum theater method," a technique derived from Freire in which spectators replace actors to find solutions to a problem posed by the actors. 49 In Pader, however, I was more focused on taking notes that would help me do a better job the next day. Below is a sample from my daily entries:

Today was o.k.—not a disaster but not great either. First, it felt great to be 20 minutes early! Granted, we were still doing translations for the posters but it is good to respect people's time. Intro was good, charcoal was good, but people got stuck on the cool factor of charcoal from ag waste and may have lost sight of the design process. During the maize exercise we made the classic mistake of showing an example when people didn't seem like they were following our verbal instructions. Dumb! Of course everybody just did our example. But it turned out OK because we just did it again, this time excluding the single cylinder design and people came up with a lot of cool variations. The rain drove us into the school (always have a backup space!) but that only caused a minor delay (good padding in the schedule helps). Then we did shellers and it went down hill from there. OF COURSE, after making a bunch of shellers perfectly, I blew the one I was making in front of the group as I was trying to teach it. Now I understand and appreciate Julia Child on a whole other level. We also ran out or time...disappointing. Lessons...same ones that keep coming up: test stuff before getting into the field, don't pack schedule, don't stand between people and food...know when to give up trying and to move on...it is all about the people.

Interestingly, this failure with the maize shellers turned into one of the highlights of the training. We left the tools and materials with people over night and when we arrived in the morning, over 50 well-made maize shellers were piled up for us to see. Another lesson: trust people.

49 Boal, 1979
3.3 Participant Responses

Approximately 60% of the training participants were not literate and this presented a challenge in terms of capturing group feedback: oral evaluations would yield mostly polite answers through translation, would not permit anonymity, and would take more time than we had allotted in the schedule. We also wanted there to be room for open-ended responses in whatever language participants felt comfortable using. We broke teams up into groups of four or five, each having at least one person who could write, and settled on a two-part evaluation process: the first set of questions corresponded to a multiple-choice scale with five choices ranging from 'terrible' to 'excellent,' with each rating represented by a familiar agricultural product (three different colored beans, a corn kernel and a peanut); the second set of questions were open-ended and read aloud, with participants telling their group's scribe their responses. The questions using the agricultural scale asked specifically about each module in the curriculum and both how effective and how enjoyable it was. The second set of questions inquired about previous design experience, the quality of the instruction, the usefulness of the training as a whole, the types of technologies people thought would be most useful, whether they would try to make any technologies after the training, and the types of resources and support they felt they needed. Figure 7 shows pictures of the process and results of the Bean Counter Evaluation.

Figure 7: Bean Counter Process & Evaluation Results

![Image of the process and results of the Bean Counter Evaluation.](image_url)
### Question Amokolegwai Acuru

<table>
<thead>
<tr>
<th>Question</th>
<th>Very Good</th>
<th>Good</th>
<th>OK</th>
<th>Bad</th>
<th>Terrible</th>
<th>#</th>
<th>Very Good</th>
<th>Good</th>
<th>OK</th>
<th>Bad</th>
<th>Terrible</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Cycle effective?</td>
<td>30 56%</td>
<td>12 22%</td>
<td>10 18%</td>
<td>2 4%</td>
<td>0</td>
<td>54</td>
<td>33 55%</td>
<td>19 32%</td>
<td>6 10%</td>
<td>2 3%</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Design Cycle fun?</td>
<td>30 54%</td>
<td>10 16%</td>
<td>12 22%</td>
<td>2 4%</td>
<td>1</td>
<td>55</td>
<td>32 54%</td>
<td>18 31%</td>
<td>7 33%</td>
<td>2 3%</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Charcoal Press effective?</td>
<td>18 34%</td>
<td>13 25%</td>
<td>9 17%</td>
<td>4 7%</td>
<td>9</td>
<td>53</td>
<td>26 44%</td>
<td>18 31%</td>
<td>8 14%</td>
<td>5 8%</td>
<td>2</td>
<td>59</td>
</tr>
<tr>
<td>Charcoal Press fun?</td>
<td>28 10% 52%</td>
<td>10 18%</td>
<td>14 26%</td>
<td>1 2%</td>
<td>2</td>
<td>54</td>
<td>28 16% 47%</td>
<td>16 27%</td>
<td>8 13%</td>
<td>6 3%</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>Maize Storage effective?</td>
<td>26 7%</td>
<td>7 14%</td>
<td>9 18%</td>
<td>5 10%</td>
<td>4</td>
<td>51</td>
<td>28 20% 47%</td>
<td>20 33%</td>
<td>6 10%</td>
<td>6 3%</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Maize Storage fun?</td>
<td>20 37%</td>
<td>14 26%</td>
<td>8 15%</td>
<td>8 15%</td>
<td>4</td>
<td>54</td>
<td>30 20% 50%</td>
<td>20 33%</td>
<td>7 11%</td>
<td>2 3%</td>
<td>2</td>
<td>61</td>
</tr>
<tr>
<td>Maize Sheller effective?</td>
<td>33 61%</td>
<td>10 18%</td>
<td>9 17%</td>
<td>2 4%</td>
<td>0</td>
<td>54</td>
<td>46 78%</td>
<td>12 20%</td>
<td>1 2%</td>
<td>0 3%</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Maize Sheller fun?</td>
<td>43 80%</td>
<td>4 11%</td>
<td>6 11%</td>
<td>1 2%</td>
<td>0</td>
<td>54</td>
<td>45 76%</td>
<td>11 19%</td>
<td>2 3%</td>
<td>1 2%</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Pastemaker effective?</td>
<td>30 53%</td>
<td>9 16%</td>
<td>6 11%</td>
<td>6 11%</td>
<td>5</td>
<td>56</td>
<td>34 58%</td>
<td>13 22%</td>
<td>10 17%</td>
<td>2 3%</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Pastemaker fun?</td>
<td>35 59%</td>
<td>4 15%</td>
<td>3 7%</td>
<td>4 12%</td>
<td>15%</td>
<td>60</td>
<td>34 56%</td>
<td>13 20%</td>
<td>10 20%</td>
<td>2 3%</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>G-Nut Sheller effective?</td>
<td>33 56%</td>
<td>14 24%</td>
<td>7 12%</td>
<td>2 4%</td>
<td>3</td>
<td>59</td>
<td>44 73%</td>
<td>7 12%</td>
<td>8 13%</td>
<td>1 2%</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>G-Nut Sheller fun?</td>
<td>43 77%</td>
<td>4 7%</td>
<td>7 12%</td>
<td>0 2%</td>
<td>2</td>
<td>56</td>
<td>41 67%</td>
<td>8 13%</td>
<td>7 11%</td>
<td>4 7%</td>
<td>1</td>
<td>61</td>
</tr>
</tbody>
</table>

### 3.4 Mechanisms for Ongoing Support

From a statistical point of view, we were pleased with the results; in all but three of the activities, 70% or more of the respondents said the activity was good or very good in terms of achieving its objective and in terms of being enjoyable. The three activities that were not over 70% were in the 60% range. The qualitative evaluations, however, revealed the full depth of the situation people were trying to navigate. People overwhelmingly indicated that they enjoyed the training, found it useful, would try to continue to make machines, but in answering the question about support that was needed, the number one answer was seeds. In discussing this with the Caritas staff it became clear that a reason for this request is that Caritas has numerous programs that distribute seed, whether or not the training or program is focused on agriculture. But another important factor is that people were preoccupied with returning home and being able to grow their own food for the first time in two decades. This underscored the reality that whatever technology or intervention is undertaken, people have to be able to take care of basics first. Ignoring the frame of mind of the participants is a recipe for failure.

The next most common answers were tools, materials and more training. This quickly brought into focus for us that, in working tirelessly on the curriculum itself, we had not spent significant time thinking through what the mechanisms for ongoing support would be or how they would work. After further consultation with the Caritas staff, we hastily put three forms of support in place in the closing days of our fieldwork: 1) we donated all of the tools bought for the training to the Caritas Pader Branch to create a tool library, which would allow community members to borrow tools to work on projects; 2) we left a small fund for materials which Caritas
would administer and determine whether issuing grants or maintaining a revolving fund would be best; and 3) we hired Denis Obwona, who is an experienced carpenter and who assisted us throughout the trainings, as a technical advisor that would be available to participants as they developed their projects. With these mechanisms in place, and an overall sense that the trainings were well received, we left Pader tired but very inspired to improve the CCB curriculum. We began to discuss what more effective support mechanisms might look like and how we could extend Creative Capacity Building beyond a two or three day training.

3.5 Observations Five Months Later

**Figure 8: Technologies Created in Amokolegwai West on Display**

Community members in Amokolegwai display the technologies that they have made since the Creative Capacity Building workshop, including (from left to right) a pedal-powered knife-sharpener, a cart, a sugar cane squeezer, pots to be used as part of the pot-in-pot evaporative cooling system, a groundnut-threshing table and two rat traps (on the threshing table).

Leaving Pader was very difficult because in many ways we felt like the work had just begun. While we had great confidence in our community partner and the staff, it was unclear whether the support mechanisms we had hastily put in place would be sufficient, or if there was broader institutional buy-in to the concept of Creative Capacity Building; there was always supportive talk about “appropriate technologies” but we were not certain if the staff, already overwhelmed with the complex and numerous challenges of helping people return home, was committed to the idea of people making their own technologies. We were hoping that one or two groups would make a few technologies. To our surprise, about a month after our return to the U.S. we heard reports that four or five groups had made up to thirteen technologies. We were finally able to return to Uganda in April 2010, and this time visited many participants in their home villages. Figure 8 above displays several of the technologies made by just one group in Amokolegwai West. Discussions with workshop participants revealed several outcomes:
IGAs were working collaboratively to develop technologies to meet their needs and/or to generate income.
Groups sought out resources to learn the skills that they needed to produce the technologies that they wanted to make.
Participants expanded their manufacturing capabilities by making technologies that would enable them to produce more technologies.
Individuals became empowered to produce, repair and adapt things. Women, in particular, expressed that they felt a new facility with tools.
People in the groups viewed technology as a potential vehicle for changing the gender-based workload imbalance between women and men.
In some cases where everyone in an IGA did not participate in the training, participants had difficulty convincing non-participants of the value of making technologies for income generation.

Many of these outcomes are illustrated by the experiences of the Pekoyo IGA group of Ademi. Following the training session, the Pekoyo group decided to build a cart that could be used as a water carrier and for transporting goods to market. They made an initial design out of wood, but had a difficult time making the joints, so they hired a local metal worker to help them make it out of an old bed frame. The women in the group now use the cart on a daily basis to collect water from the boreholes that are 3 km away--the cart can carry eight jerry cans of water, allowing each woman to collect all of her water for the day in a single trip. In addition to this significant time savings, the group rents out the cart for people to carry bricks or to go to market. As of April 2010, they had earned 50,000 shillings from the rentals, which they have used to buy replacement tires for the cart and are saving.

Figure 9: Pekoyo IGA Group with Water Carrier
the rest for future projects. When asked what they want to do for their next project, the group told us that they will make a pedal-powered paste maker for sesame and ground nuts. The men in the group told us that if they had such a machine, they would be able to help with this task, which is traditionally part of a woman's workload.

At this stage, these results can only be described as promising. A longitudinal assessment of the relationship between the training and both people's attitude and their production of technologies is the only way to gain greater clarity. However, my preliminary sense is that a major strength of the CCB curriculum is its emphasis on indigenous knowledge and low-cost-solutions, as well as the foundation it lays for future skill acquisition. While there are several components of the curriculum that need improvement, these are not major areas of weakness; the greatest challenges for CCB will be building mechanisms for sustained engagement after initial trainings, and the ever-present issue of taking it to scale given the time-intensive nature of community-based processes. In terms of possibilities, there are many directions the curriculum can take, including sector-specific modules, advanced trainings, age-appropriate trainings, and units for inclusion in both traditional and informal educational settings. Perhaps the most exciting possibility is the development of Community Appropriate Technology Centers that allow for ongoing trainings as well as a workshop space, tool and service access, technology sales, and technology markets. As we follow-up on developments in Amokolegwai and Acuru, we will also be listening to community members for their guidance on the directions they would like to take Creative Capacity Building.
Chapter Four: Rethinking CCB and Moving Forward

4.1 Re-evaluation of Expectations & Questions

As I reflect upon the expectations and questions I had prior to piloting the CCB curriculum in Uganda, it is clear to me that I was not even aware of the expectations that I had. For example, in coming to the realization that some people simply cannot be trained in a short period of time, I realized that I thought the CCB curriculum was going to rapidly transform everyone exposed to it into a designer. True, I didn’t think everyone would actually become a designer, but I was surprised to be surprised when it became clear that some people just prefer to buy their technologies and have no interest in making them. I was surprised to be surprised that some people just came for the sodas. I was surprised to be surprised that some people just came for the sodas. I was surprised to be surprised that appropriate technologies are but a small slice of hope in the face of absolutely overwhelming odds; somehow being in D-Lab had me in a more optimistic frame of mind about the power of appropriate technology than I usually am. And when the field work was over and I was trying to understand my mixed emotions, some tinged with disappointment, I was reminded of comedian Chris Rock berating fathers who care for their kids wanting credit for doing so; did I somehow expect people to thank me for coming into their community and respecting them and their ideas? You’re supposed to take care of your kids (and treat people with respect), what’s so special about that?!

This kind of unexpected revelation of my own expectation happened with the more serious issue of traditional gender roles. In terms of inclusiveness, I now realize that I expected carving out space for women to feel comfortable in our trainings to be the key hurdle, when in fact, it was unclear to me how many women wanted to use tools or participate in the technology design. While there were many women who enthusiastically participated and embraced the opportunity to learn how to use new tools with confidence, there were some who simply did not want to, and it didn’t appear to be about taboos; some women seemed to be saying that they didn’t want to have to add making technology to their already long list of responsibilities. It was about choice, and it was affected more by individual personality and circumstance than by our efforts to be inclusive. Similarly, in conversations about income generating activities, women in the villages persistently brought up knitting, tailoring, catering and baking. Prior to this fieldwork I was unaware of my biases against this kind of work, meaning my impulse was to push women away from what is considered “women’s work.” Expecting a 3-day CCB to transform centuries of culture was beyond unrealistic, but nonetheless, my tinge of disappointment every time baking was mentioned betrayed me. One of the truly valuable aspects of being committed to a process of self-reflection is that it is difficult to get away with such nonsense for long. I learned that if I strive to be a facilitator and not an expert, then I need to be receptive to the full range of choices that people might make, including those that rub against my own sensibilities.

In reviewing some of the expectations that I wrote about in Chapter 2, I think the biggest surprise to me was the degree to which I thought that the CCB curriculum would somehow stand on its own as a discrete intervention. I was not even aware of this as being an expectation until it became clear how dependent CCB, like every other intervention, is on follow-up, resource availability, and a flourishing of local capacity. We had not fully
prepared for what would happen if the pilot succeeded, and as a result, we were left improvising in the field. Being responsive to people and following their lead is certainly part of how we wish to operate, but I think it is also true that I had not fully grasped the power and responsibility that comes with raising people’s expectations. While I could say “amen” as I read about the shortcomings of other development strategies, I was guilty of not reckoning with how we could continue to support the process that we helped set in motion.

In a similar vein, I was surprised by my apparent willingness to suspend the many years of community organizing experience I had, which told me, quite simply, that community organizing is hard work. Endless work. Relentless work. What about CCB or being in Pader made me think differently? When we learned that some IGA groups decided not to make technologies because of leadership issues or because they had a conflict with another group, I was reminded that people are people all over the world; we bicker and jockey for power, and embrace security over risk; we need leadership, we need encouragement, cajoling and support. Community organizers engage these dynamics and strive to inspire community members to their higher, most cooperative selves, all along working the back channels, serving as confidant, mentor and friend to as many sides as want to see progress. I was reminded that absent of this type of force, CCB could be just another thing for people to struggle over and that the sexiness of technology was not enough to render good old-fashioned people to people work obsolete. Thus, the positive impact of every technology intervention, including CCB, is contingent upon successful navigation of the local cultural, political, economic, organizational and interpersonal dynamics that affect implementation.

As from the outset, I was also left with many more questions. In thinking about the IGA groups that successfully made technologies, was the CCB training, or simply the availability of resources, the catalyst for their new initiatives? Did the process of defining a problem and creating a technological solution affect the way participants think of themselves, or of their group’s ability to impact their future? How can we measure the economic benefit of time saved and are there multiplying effects associated with renting out technologies? Does the introduction of small-scale technologies designed and created at the village level really have any affect on the division of labor between men and women? For the IGA groups that chose not to pursue follow-up projects, was it because they lacked materials or tools, or was the CCB training not of interest to them? Is the technology creation process viewed as a distraction from traditional farming and savings projects? What parameters, such as different education levels, different local cultures, or a different geography, affect the efficacy of Creative Capacity Building? Would it be effective in a non-post-conflict environment or with out-of-school youth? For me, this study only scratched a very interesting surface and we have a great deal of work to do to figure out exactly how interesting it is. The only thing I know for sure is that Amy was absolutely the right person with whom to do this work.

4.2 Practical Considerations:

The experience of piloting the CCB curriculum in the field highlighted the clash that often occurs between philosophical commitment and practical reality. A small example is that we conducted pilot workshops with 55-65 participants that would have been much
more effective with 20-25 participants. On the one hand, we were committed to being an open learning environment that served as many people as were interested, but the reality was that we lessened the impact of the training by spreading human and material resources too thin. The larger and more critical challenge for CCB is the question of scaling up this strategy, which is always the difficulty for community-based approaches. As CCB develops, we must create an effective way to disseminate and grown this methodology, whether through extensive training of trainer institutes, partnering with governments or NGO’s, or some innovative social enterprises. Given that we will remain committed to the value of community-led techniques, we must become equally committed to resolving this scale conundrum.

4.3 Towards a CCB Methodology

One of the weakest components of the fieldwork we conducted in October 2009 was the mechanism for ongoing support. While we managed to cobble something together, a good deal of work needs to focus on the development of a more comprehensive methodology of which the CCB curriculum is only a part. If we listen to the participants, from the very first set of evaluations right on through to conversations in our follow-up visit, the need for material support and ongoing training is evident. The challenge is in identifying the type of support that blends well with the larger philosophical foundations of Creative Capacity Building. This methodology would seek to answer questions about how we enter into a new community, how we should expand and adapt the pilot-version of the CCB curriculum, what kind of village-based expertise can be developed to allow for effective follow-up to continue well after trainings, and what type of infrastructure and institutional support in necessary to foster innovation in a given catchment area if the goal is to promote networks of local innovation. Our preliminary take on what this enhanced methodology would look like is as follows:

- An initial meeting in which all community members are invited to identify and discuss the kinds of work they perform regularly, the manual labor that is particularly time-consuming or physically challenging, and the technologies they are interested in having in their communities. This meeting informs the content of the CCB training, and highly interested community members are identified as potential participants. Villagers with technical skills are identified and later interviewed as potential CCB facilitators.

- A multi-day, village-level workshop in which livelihood technologies are demonstrated and the basic principles of design are taught to 15-25 participants, regardless of education level. Participants are exposed to new ideas, made aware of the local accessibility and adaptability of a given technology, and taught how to use/execute a given technology or process. The CCB curriculum also introduces a variety of strategies for creating and making new technologies and then challenges villagers to apply these skills to building and testing a prototype of their own design. This training is a touchstone for all subsequent interactions and is delivered by a lead trainer and at least two village-based facilitators.
• Post-training follow-up in which participants receive mentorship and technical advice specific to the technologies they have decided to create or build. Village-based facilitators provide feedback and suggestions while leaving all of the actual designing or building to participants. Different financing strategies are pursued, including local saving groups, micro-lenders, and government grants.

• Continued support and resources through the creation of physical infrastructure and opportunities to share resources and ideas. Training participants are supported in creating a Community Appropriate Technology Center (CAT Center), which increases access to tools and materials, as well as raises the visibility of appropriate technologies in a village. The CCB trainers that are recruited from the village lead these CAT Centers, providing ongoing mentorship and training, including sector specific trainings. For example, a basic course on circuit design might enable community members to produce their own low-cost solar lights. CCB training modules in the energy, water and sanitation, and health sectors are in development. Training in basic business skills can also become a component of the center.

Figure 10 below captures this preliminary take on improvements and new areas to develop. Many details, including finances, remain to be discussed with community partners and villagers to determine if this is a model that they feel will best serve their needs. Sector-specific curricula for application in the village-setting will need to be developed, preferably with greater input from communities themselves. Hopefully, D-Lab students and community partners in a range of classes will become interested in CCB and begin to help in the development of this new material.

**Figure 10: Towards a Creative Capacity Building Methodology**
Effectively measuring the impact of the CCB methodology is another important area for us to develop. While it is easy to count kilos of food delivered, number of houses built, or dollars committed, it is far more difficult to pinpoint the outcomes resulting from interventions attempting to get at intangibles like creativity or empowerment. Useful metrics are critical to improving service delivery or programming, to communicating best practices, and to quantifying value for donors or investors. One important dimension of future work in CCB will be the development of useful tools for measuring the impact of both technology creation trainings and livelihood technologies in marginalized communities. Specific evaluation criteria within four main categories is needed:

1. **Technology creation and use**: documentation of the tools, machines and process improvements created by workshop participants.

2. **Behavioral changes**: inquiry into broader social developments catalyzed by the presence of livelihood technologies, e.g., new forms of collective action, increased pursuit of adult education or training opportunities, or adjustments in the division of labor between men and women.

3. **Attitudinal shifts**: exploration of themes such as self-awareness, self-esteem, confidence in oneself or one’s community to affect change.

4. **Economic impact**: calculation of the economic impact of livelihood technologies, including changes in income level and opportunity costs.

Taken together, creation of a more comprehensive methodology and metrics to evaluate this methodology, will lead to level of understanding of the strengths, weaknesses and possibilities of Creative Capacity Building that is very necessary, but is also beyond the scope of this thesis.

**4.4 Towards My Own Theory of Practice**

“The yellowish glow and crackling sounds of the brush fire faded into the background as if it was a part of the beehive of activity that had become our nightly routine. I asked our host if there was anything we could do and Pastor George replied, with a sigh, “No, there is nothing to be done.” We all continued to work, as if nothing was going on just across the road-- ground nut sheller adjustments, water testing results, technology demonstration plans. When I allowed my mind to wander to consider the trees or soil or small life forms that were dying a mere 25 meters away, I quickly shushed myself with a series of doubts about my understanding of the context and culture. Maybe someone wants the fire to burn and who am I to interfere? Perhaps it is the natural order of things and the brush needs to be thinned.”
I am describing this scenario from my first trip with D-Lab to Ghana because it captures different layers of my experience of grappling with development practice over the course of writing this thesis. How do we prioritize one community over another, or one strategy over another? How do we engage people the right way, what is the most effective kind of intervention, and how do we avoid doing more harm than good? And then there is the omnipresent question of scale. Is a macroeconomic approach the only way to proceed, or is its acceptance of everyday suffering an unjust act? Beyond these conundrums, I have also spent a great deal of time thinking about my individual choices and obligations to my own sense of right and wrong, and how these might harmonize or clash with a grand theory of appropriate development.

As discussed in Chapter 2, this debate has raged for seven decades; it is unlikely to be resolved in these pages. I have noticed, however, something palpably missing in this discourse among both theorists and practitioners: bravery and hope. One of the major values within Creative Capacity Building is how we work with people. Amy often says, "If you are there to help people, you should help people." What she means is that when people are hauling wood, carrying water, weeding, or pushing a heavy load, helping is the right thing to do. It is the human thing to do. This is not an instrumental kind of help that is supposed to help us design better technologies for the given work; ideas may emerge from this experience, but that is not the point. The point is to help your fellow human being because that small action is everything at that moment. In the language of interbeing, this is being mindful, it is being fully present with the person with whom you are working, and it is being present in the work itself. It takes bravery to admit that you wish to help. Bravery is not the same as being fearless; bravery is taking action to care for, protect, or help others in the face of fear and uncertainty. I could see that people in the field have become fearful of caring too much because people die; because people disappoint. We have become fearful of putting ourselves at the mercy of opportunists. We have become fearful of being wrong on a tactical, strategic or ideological level. We have become fearful of jeopardizing our careers. We have begun to consider thinning of the population a necessary part of the order of things. As a result we have lost the human impulse to help and to believe that doing so matters. Believing our actions have meaning defines hope.

Why hope and not optimism? I concur with Cornel West: "You have to draw a distinction between hope and optimism. Vaclav Havel put it well when he said 'optimism' is the belief that things are going to turn out as you would like, as opposed to 'hope,' which is when you are thoroughly convinced something is moral and right and just and therefore you fight regardless of the consequences. In that sense, I'm full of hope but in no way optimistic." Similarly, in answering questions at Harvard University in 1994 about how he viewed his chances of leaving Robben Island, Nelson Mandela said, "I was not optimistic, but I never gave up hope." Perhaps these are distinctions without difference, but the specificity makes sense to me when confronting the overwhelming task as at hand, when engaging in even a cursory glance at human history, or bearing witness to the atrocities we commit against each other on a daily basis. There is no credible evidence to lead us to believe that we will eradicate poverty or create global peace. Optimism seems to me to

ignore this reality; hope seems to me to resolve to push forward in the face of reality because it is the right thing to do.

"Sometimes it takes something or someone to remind us of what we already know we need to do, and after a few brief words, it became clear that Amy and I were going to try to put out the brush fire. It was almost as if there was never another choice. With a couple of buckets of water, a few rags, and a wonder cloth of the type that women all over Africa use to wrap babies and sell goods and catch food and fend off the cold, we waded through tall, dry grass into a circle of fire, and began to beat out the flames that were hungry for more of the land. There, amidst unknown odds under countless stars, in a mixture of heat and smoke, water and earth, work and love for creation, things seemed to make perfect sense. I knew what to do and how to do it. I was grateful to be in the struggle with a like-minded soul. I asked the fire to cooperate, and it did. 'The edges don't look that big,' said Amy."

If planning culture is, as Bishwapriya Sanyal writes, "the collective ethos and dominant attitudes of planners regarding the appropriate role of the state, market forces, and civil society in influencing social outcomes," then I currently exist somewhere outside of planning culture.\textsuperscript{51} The ethics embedded in Creative Capacity Building have provided me with a framework for a personal theory of practice and a practice of action. The distinction I am making here is that a theory of practice informs how I intend to act, while a practice of action is also needed to refine and strengthen my actions. My choice to put my immediate energies into confronting poverty-based suffering in the short-term, rather than pursuing economic policy interventions or paradigm shifts that promise long-term growth or transformation, is not, "the dominant attitude." And my choice to focus on mindful, human interactions, and to proceed with hope is not the dominant attitude.

Thus, I believe the first choice we must make is not which strategy we will pursue but rather how brave we are willing to be and how much hope we are willing to hold in our hearts as we do this work. Next, those of us who are moved to action can evaluate the scale at which we feel comfortable working. Top-down policy interventions have the advantage of scale, and the importance of this should not be diminished. Democratic interventions have the advantage of immediate effectiveness, sustainability and yielding to the needs, analysis, and ideas of the people that policies affect, but acting quickly at scale remains a significant weakness. My choice is to pursue the latter and to continue to grapple with questions of scale, but I believe that bravery and hope can serve as an important bridge between this theoretical divide. When we remain mindful of our own humanity and the humanity of the people who we would like to see living opportunity-filled lives, then perhaps we can commit to finding macroeconomic policies that are truly informed by, even designed by, the people they impact; perhaps, through this lens, we can find ways to use the most powerful development institutions in the world to assist democratic strategies with the challenge of scale and rapid implementation. If development is truly about eliminating

\textsuperscript{51} Sanyal, 2005, p. xxi
poverty, and not about the political and economic interests of foreign powers, then I believe it is through bravery and hope that we can re-define development in this century.

In the course of my fieldwork, I was struck by the complexity of the challenges faced by people with whom we were working; they dwarf any single strategy, let alone my own moral struggles. It was important to bear witness to the children with distended bellies, the amber hair signaling malnutrition, bare feet tracking the human and animal feces that leaves them with constant and life-threatening diarrhea; to look straight into the eyes of teens with death tattooed on their expressions, knowing that the hands they used to shake my own were forced to kill their parents with machetes, or to rape their sisters or grandmothers; to watch the "elders" who are about my age but looking 65, no teeth-- no strength, drunk at 10am on little ketchup packet sized vodka pouches-- marketing to the "bottom of the pyramid.' It was important to be outside of the halls of MIT and back in the world of suffering that so-called sound economic theories have helped create. These are the truths that must inform my theory of practice and practice of action. These are the truths that call for bravery and audacious hope. I stand firmly by the theories that define Creative Capacity Building, but I must never become so far removed from the stench of a pit latrine that I believe a plastic bag buried in the ground is the equivalent of a toilet.52

"After the last flame suffocated, only tiny embers spotted the earth. It seemed like the ground had become a mirror and was reflecting the stars. And there was a profound silence. A pause that silently acknowledged that what had transpired was good. It was more than the usual satisfaction one gets after a hard day of physical labor is done-- yes, there was sweat, exhaustion and a completed task, but this felt more like the type of harmony we sense when a mother can hand her child a clean glass of water. A part of me wished to stay in that space forever, but it was time to move on. Amy and I waded again through the tall grass, this time with complete darkness behind us, and then we stepped up onto the road. That is when we saw another brush fire blazing off to our left."

Surely this is yet another tale of development. There is no end to the struggle, but that reality does not diminish or negate each small victory. Every person counts, every effort counts, we can only do what we can do, but that is what we must do. If we come upon something that can be scaled to billions, that will be wonderful, but our quest for that magic must not blind us to the small actions and tools just in front of us, be they rags or buckets of water. The edges are a fine place to start. Mostly, if we are sincere in our desire to serve others and to work for the common good, then we must act together with whomever we are with. We must cast aside fear, indifference, or resignation, and have hope that we will make a meaningful difference. If, as Cornel West says, “love is what justice looks like in public,” then we must infuse our words and deeds with love as we pursue justice.53

52 No joke, see the PeePoo Bag website (www.peepoople.com) and its claim that "2.6 billion people just got sanitation."

Bibliography


Sanyal, Bishwapriya, ed. *Comparative Planning Cultures*, New York: Routledge, 2005


Appendix I: The Fourteen Mindfulness Trainings of the Order of Interbeing

The First Mindfulness Training: Openness

Aware of the suffering created by fanaticism and intolerance, I am determined not to be idolatrous about or bound to any doctrine, theory or ideology, even Buddhist ones. Buddhist teachings are guiding means to help me learn to look deeply and to develop my understanding and compassion. They are not doctrines to fight, kill or die for.

The Second Mindfulness Training: Non-attachment to Views

Aware of suffering created by attachment to views and wrong perceptions, I am determined to avoid being narrow-minded and bound to present views. I will learn and practise non-attachment from views in order to be open to others' insights and experiences. I am aware that the knowledge I presently possess is not changeless, absolute truth. Truth is found in life and I will observe life within and around me in every moment, ready to learn throughout my life.

The Third Mindfulness Training: Freedom of Thought

Aware of the suffering brought about when I impose my views on others, I am committed not to force others, even my children, by any means whatsoever - such as authority, threat, money, propaganda or indoctrination - to adopt my views. I will respect the right of others to be different and to choose what to believe and how to decide. I will, however, help others renounce fanaticism and narrowness through compassionate dialogue.

The Fourth Mindfulness Training: Awareness of Suffering

Aware that looking deeply at the nature of suffering can help me develop compassion and find ways out of suffering, I am determined not to avoid or close my eyes before suffering. I am committed to finding ways, including personal contact, images and sounds, to be with those who suffer, so I can understand their situation deeply and help them transform their suffering into compassion, peace and joy.

The Fifth Mindfulness Training: Simple, Healthy Living

Aware that true happiness is rooted in peace, solidity, freedom and compassion, and not in wealth or fame, I am determined not to take as the aim of my life fame, profit, wealth or sensual pleasure, nor to accumulate wealth while millions are hungry and dying. I am committed to living simply and sharing my time, energy and material resources with those in real need. I will practise mindful consuming, not using alcohol, drugs or any other products that bring toxins into my own and the collective body and consciousness.
The Sixth Mindfulness Training: Dealing with Anger

Aware that anger blocks communication and creates suffering, I am determined to take care of the energy of anger when it arises and to recognise and transform the seeds of anger that lie deep in my consciousness. When anger comes up, I am determined not to do or say anything, but to practise mindful breathing or mindful walking and acknowledge, embrace and look deeply into my anger. I will learn to look with the eyes of compassion on those I think are the cause of my anger.

The Seventh Mindfulness Training: Dwelling Happily in the Present Moment

Aware that life is available only in the present moment and that it is possible to live happily in the here and now, I am committed to training myself to live deeply each moment of daily life. I will try not to lose myself in dispersion or be carried away by regrets about the past, worries about the future, or craving, anger or jealousy in the present. I will practise mindful breathing to come back to what is happening in the present moment. I am determined to learn the art of mindful living by touching the wondrous, refreshing and healing elements that are inside and around me, and by nourishing seeds of joy, peace, love and understanding in myself, thus facilitating the work of transformation and healing in my consciousness.

The Eighth Mindfulness Training: Community and Communication

Aware that lack of communication always brings separation and suffering, I am committed to training myself in the practice of compassionate listening and loving speech. I will learn to listen deeply without judging or reacting and refrain from uttering words that can create discord or cause the community to break. I will make every effort to keep communications open and to reconcile and resolve all conflicts, however small.

The Ninth Mindfulness Training: Truthful and Loving Speech

Aware that words can create suffering or happiness, I am committed to learning to speak truthfully and constructively, using only words that inspire hope and confidence. I am determined not to say untruthful things for the sake of personal interest or to impress people, nor to utter words that might cause division or hatred. I will not spread news that I do not know to be certain nor criticise or condemn things of which I am not sure. I will do my best to speak out about situations of injustice, even when doing so may threaten my safety.

The Tenth Mindfulness Training: Protecting the Sangha

Aware that the essence and aim of a Sangha is the practise of understanding and compassion, I am determined not to use the Buddhist community for personal gain or profit or transform our community into a political instrument. A spiritual community should, however, take a clear stand against oppression and injustice and should strive to change the situation without engaging in partisan conflicts.
The Eleventh Mindfulness Training: Right Livelihood

Aware that great violence and injustice have been done to the environment and society, I am committed not to live with a vocation that is harmful to humans and nature. I will do my best to select a livelihood that helps realize my ideal of understanding and compassion. Aware of global economic, political and social realities, I will behave responsibly as a consumer and as a citizen, not investing in companies that deprive others of their chance to live.

The Twelfth Mindfulness Training: Reverence for Life

Aware that much suffering is caused by war and conflict, I am determined to cultivate non-violence, understanding and compassion in my daily life, to promote peace education, mindful mediation and reconciliation, within families, communities, nations and in the world. I am determined not to kill and not to let others kill. I will diligently practice deep looking with my Sangha to discover better ways to protect life and prevent war.

The Thirteenth Mindfulness Training: Generosity

Aware of the suffering caused by exploitation, social injustice, stealing and oppression, I am committed to cultivating loving kindness and learning ways to work for the well-being of people, animals, plants and minerals. I will practice generosity by sharing my time, energy and material resources with those who are in need. I am determined not to steal and not to possess anything that should belong to others. I will respect the property of others, but will try to prevent others from profiting from human suffering or the suffering of other beings.

The Fourteenth Mindfulness Training: Right Conduct

For lay members: Aware that sexual relations motivated by craving cannot dissipate the feeling of loneliness, but will create more suffering, frustration and isolation, I am determined not to engage in sexual relations without mutual understanding, love and a long-term commitment. In sexual relations, I must be aware of future suffering that may be caused. I know that to preserve the happiness of myself and others, I must respect the rights and commitments of myself and others. I will do everything in my power to protect children from sexual abuse and to protect couples and families from being broken by sexual misconduct. I will treat my body with respect and preserve my vital energies (sexual, breath, spirit) for the realization of my bodhisattva ideal. I will be fully aware of the responsibility for bringing new lives in the world, and will meditate on the world into which we are bringing new beings.
Appendix II: Creative Capacity Building Teaching Notes

Teaching Notes from the Pader CCB Workshops:

October, 2009

Amy Smith, Senior Lecturer in Mechanical Engineering, MIT
Kofi Taha, MCP Candidate in Urban Studies and Planning, MIT

The following notes describe the curriculum that we developed to be used in a focused three-day CCB workshop. The activities were designed to nurture and enhance the creativity of the community members and teach the process of iterative design. We taught the workshop in two different transition camps, once in Wangduku and once in Acuru. Our goal was to teach the participants the design process using relevant appropriate technologies as examples, and a series of hands-on activities to reinforce the concepts presented. The curriculum included exercises that allowed participants to practice both creating new technologies and evolving and improving upon existing technologies. On each day, in addition to the more formal design curriculum, participants were given time to work on a “mini-capstone” project which allowed them to apply the concepts they learned during the presentations and to see how the different stages of the process fit together in a single project. A guiding principle for the exercises and the project was that we wanted participants to walk away having learned about and having made some tangible, useful technologies in addition to the new concepts they learned. Table 1 shows an outline of the curriculum that we developed for this pilot workshop.

Table 1: The CCB Curriculum

<table>
<thead>
<tr>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td><strong>Design Process</strong></td>
<td><strong>Review</strong></td>
<td><strong>Review</strong></td>
</tr>
<tr>
<td>- Greetings</td>
<td>- Example: Charcoal press</td>
<td>- <strong>Concept Selection</strong></td>
<td>- <strong>Testing &amp; Getting Feedback</strong></td>
</tr>
<tr>
<td>- Intro to creative capacity building</td>
<td>- Activity: Cassava storage</td>
<td>- Project: G-nut thresher</td>
<td>- Example: Simsim paste maker</td>
</tr>
<tr>
<td>- Review schedule</td>
<td><strong>Idea Generation</strong></td>
<td><strong>Detail Design</strong></td>
<td>- Project: G-nut thresher</td>
</tr>
<tr>
<td>- Things to bring</td>
<td>- Project: G-nut thresher</td>
<td>- Example: G-Nut sheller</td>
<td><strong>Project Showcase</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Materials &amp; Manufacturing</strong></td>
<td><strong>Evaluation</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Example: Maize sheller</td>
<td><strong>Wrap Up &amp; Next Steps</strong></td>
</tr>
</tbody>
</table>
The workshop ran over three days, but each day was just a 4 - 5 hour session, since most of the participants were farmers and needed to work in their fields in the morning. In addition, the women needed to be home to cook in the late afternoon, so we ran the workshop from 11 in the morning until 3 or 4 in the afternoon. We found that in order for attendance to be consistent throughout the workshop, it was important to understand and accommodate people’s schedule. We provided light refreshments during a break each day.

We believe that the curriculum could be presented in a two-day workshop, if the sessions were longer, though it is probably more effective to have the material spread out over the three days, in terms of participants being able to retain and synthesize all of the material presented and to work on projects on their own, between sessions. We conducted these workshops with 50 - 65 participants, which was a bit overwhelming; we would encourage facilitators to aim for 20 - 30 participants.

**The Details**

The following is a day-by-day, activity-by-activity review of the workshop, including objectives, time allocations, materials and preparation lists. In addition, some of our personal reflections, ongoing considerations and lessons learned are included as teaching notes.

**Day 0: Introduction and Greetings**

**0.1 Introduction and Greetings (20 minutes)**

Goals:

- Explain what the workshop is about and what the time requirements are so that people can make an informed commitment to participate.
- Confirm and review the dates, start and finish times, and arrangements for food during the workshop.
- Confirm that there is an alternate location that could be used in case of rain.
- Ensure that the materials needed from the community are available and will be brought to the workshop when needed, e.g., maize for the maize raise, or groundnuts on the root for the groundnut thresher project.
- Allow time for some of the initial activities, such as in-depth introductions or community ceremonies, to take place without cutting into workshop time.
- Answer questions and address any issues that have arisen regarding the training session.

Materials:

- Nothing required, but you could bring examples of some of the technologies to show as examples.

Things to prepare in advance:

- Make sure all transportation, materials and food arrangements have been made for
the workshop.

- Finalize your curriculum so that you can give an accurate overview.
- Prepare a script or outline of what will be said; a practice run will increase the likelihood that all of the relevant points will be touched upon.
- If the presentation is being given by more than one person, decide how the material will be divided up, so that nothing gets left out.

**Presentation:**

- Thank people for taking time to be there.
- Introduce yourselves (including translators, who play a vital role in the session).
- Describe the goals of the workshop and what you hope people will be able to do after completing it.
- Review the schedule; ask people for best days and times, given their farming and daily responsibilities.
- Ask people about available agricultural materials and tools; ask people to bring what they can.
- Ask people if a rain location has been arranged.
- Explain exactly what will be provided to workshop participants, especially in terms of refreshments, stipend.

**Teaching Notes:**

- This was fairly straightforward, but an important conversation to have. It set the tone of the collaboration and gave us an opportunity to say hello to participants we knew from our previous visit and to introduce ourselves to new people. It also allowed some of the traditional singing and dancing that greets visitors to take place without eating into the workday.
- Making sure people committed to the full three days was important, and our retention percentage was in the high nineties.
- We used this opportunity to make arrangements to go out to one of the farms, so that we could see how groundnuts were harvested and so that we could work with the farmers in their fields. Although this was not required, we highly recommend it as it shows your commitment to working together with people.
- It was also necessary, especially in the context of where we were working, to define expectations around food and compensation; sometimes NGOs provide full meals and pay stipends during trainings, and so we needed to be clear that we were not doing either. We emphasized that we had built an hour break into the schedule for people to go home and eat lunch if that’s what they normally do, and that we would end on time so that people would be able to start preparing dinner. It turned out that many people had come from villages that were far away, and it was not feasible for them to go home for lunch, so we shortened the break time, so that people could go home earlier. In retrospect, the lack of food may have been too much of a distraction and in the future we will consider providing a real meal instead of just sodas and biscuits. We did not receive any feedback that led us to believe that it was necessary to pay people to attend the workshop.
Day 1: The Design Process

1.0 Introduction and Greetings (5 minutes)

Goals:

- Get people inspired and excited to attend the workshop.
- Introduce yourselves to the participants, in case some were not at the previous day’s meeting.
- Give an overview of the workshop.
- Go over the goals of the workshop.
- Give out supplies needed for the workshop.
- Introduce the idea of creative capacity building.

Materials:

- markers to make name tags
- masking tape for name tags
- notebooks for each participant
- pens for each participant
- poster with the day’s schedule of activities (in the appropriate language)

Things to prepare in advance:

- translation of schedule
- a mechanism for giving out the notebooks and pens to participants

Presentation:

- Greetings and welcome
- Nametags (in case there are some people who didn’t already have them as they arrived)
- Introduction to creative capacity building: we believe that if there is to be sustainable development in a community, it is important for people to be creating technologies themselves and to be solving problems themselves, without having to depend on external organizations. There is a lot of power in this approach.
- Hands-on nature of the workshop
- Plan for the day

Teaching Notes:

- We always tried to be sensitive to the fact that some people might have limited abilities to read and write. We did decide to provide pens and notebooks at the beginning in case people wanted to take notes; but overall, the sessions were primarily hands-on activities and notebooks were not generally necessary.
- While we were waiting for people to arrive, one of the community members took
the roll of masking tape and a permanent marker and started making name tags for all the other participants. This worked well, and prevented any awkwardness that may have arisen for people who might not have been able to write as well.

- We had some issues when handing out the pens and notebooks, so it would be good to have a clear plan for how to do so before the start of the workshop. Also, it should be emphasized that it is not necessary to take notes, they are just provided in case people would like to use them. In general, it took quite a bit of time for people to copy things into their notebooks, so we made sure that the day’s posters were up when people arrived, so they could start this while waiting for others to arrive.
- We did not have each person stand up and introduce themselves. It may have nice to do so, but since we had between 50 and 65 participants, and limited time, we opted not to do so. With a smaller group, this could be a good way to get to know the participants a little better, or more quickly, and to get people in an active mode. In the case where people have come from many different communities, you could have them pair up with people they don’t know and then introduce each other.

1.2 The Design Cycle (10 minutes)

Goals:

- Introduce participants to the design process
- Bring out key concepts of the process

Materials:

- design cycle poster

Things to prepare in advance:

- make a poster of the design cycle and get the terms translated into the local language

Presentation:

- Explain the design process
  - The design process is about solving a problem: getting from a problem to a solution. Technology is often a way to get to a solution, and it turns out that there is a process that helps produce better technologies for solving problems. This is the design cycle (see Figure 1 below for the version of the cycle that we used for our workshop).
Figure 1: The Design Cycle (Yubu Tic Kore ki Kore)

- Start with a problem, and collect information to clearly define the problem, and know what solutions already exist.
- Then think of as many ideas as possible for how to solve the problem. Experience shows that it is rarely the first idea that is the best, so it is important to think of as many ideas as you can.
- Then experiment, so that you can see if these are good ideas.
- Then you will chose the best idea, work out the details and build a prototype.
- Test the prototype to see how it performs, you might even get other people to try it so you can get feedback from them.
- And you will find out that it is not perfect, that there are things that can be improved; so you then start through the cycle again, beginning with gathering as much information as you can so that you can identify the problems in your first design...
- Then you will begin again, thinking of more ideas, experimenting and choosing the best idea so you can build a new prototype, test it, and get more feedback.
- And once again, you will find that it is not perfect, that there are new problems so you will go through the cycle again, each time improving the technology.

* Reiterate the key steps:
  - There are three key steps that make this process effective: generating many ideas, evaluating and choosing the best idea, and going through the cycle many times to improve the product.
  - Practicing these three steps is important because we tend to have less experience doing this, most people think of one idea and start building it right away.

* Outline how this fits in with the goals of workshop:
  - In this workshop, we will go through the whole process and then each of the
stages separately, so that you can get experience with the design process and with designing technologies.

- We hope you will use this process to solve the problems that you experience in your lives.
- Ask if there are any questions.
- Transition to the next section

Teaching Notes:

- This was a pretty straightforward session, the biggest challenge was finding a way to mount the poster so that it did not blow around too much in the wind. It is nice to have the sessions outdoors, especially if the participants are people who may not have been in a classroom setting in a very long time; being outside can provide something of a neutral ground for different types of learners. These advantages come with the trade-off of being subject to the natural elements. If rain is a possibility, be certain to arrange for a back-up indoor space that can accommodate different configurations comfortably (small teams working separately, one large group, etc) and can be used for hands-on activities.

Photographs:

1.3 Example: Charcoal Press (20 minutes)

Goals:

- Provide an example of the complete design process
- Show the value of repeating the cycle to improve the design
- Show the beauty of a simple design
- Demonstrate a technology that may be of interest
Materials:

- swing press
- sliding press
- small mini press
- charcoal table (with slot in the middle)
- crushed charcoal mixed with binder
- basin
- cup
- hammer
- pre-made briquettes, if possible one hand-formed briquette, one made by the press

Things to prepare in advance:

- make binder and mix it with crushed charcoal
- check that the “instant” charcoal makes good, strong briquettes so that your demos are good
- be certain to have all parts of all presses

Presentation:

- Introduction:
  - This is an example of the design cycle, and how repeating it leads to better products
- Background:
  - you can use charcoal powder and small pieces of charcoal that are usually waste as a cooking fuel, by mixing them with binder to form briquettes.
  - or you can make charcoal from agricultural waste, and crush it and mix with binder to form briquettes.
- Problem:
  - hand-formed briquettes crumble when burned, which leads to lost energy.
- Gathering information:
  - there are motorized presses available from China, costing about $8,000 and producing thousands of briquettes per day. This is more expensive than most farmers can afford.
- Challenge:
  - to design a small, inexpensive, human-powered device to produce hundreds of briquettes per day.
- Think of ideas/experimentation:
  - we thought of many different mechanisms (levers, screw presses, extrusion, impact), tested them all, and considered our goal. We determined that impact-forming was the most promising technique because it produced high forces to compress the briquette, without using a lot of material to make the machine, which means that it can produce good briquettes at a low cost.
- Work out the details:
we chose the dimensions (2 inches) and the shape (round) and then built our first prototype.

- Show the swing prototype:
  - This produced nice briquettes, it has a nice ejector mechanism, it made 4 or 5 briquettes per minute, and cost about $25 to produce; but there were some problems...
    - it had to be cleaned often
    - it was hard to fill
    - it required two hands for parts of the procedure
  - So we had a redefined problem, and we could go through the cycle again...
  - We wanted a press that was faster to use, which meant that we should make one that was easier to clean and easier to fill.
  - To do this, we observed people using the press, and watched carefully how they used it. We noticed how much time they spent on the different aspects of it using it and tried to redesign the press to minimize the amount of time spent on each task.
  - And we came up with a new design.

- Show the slider prototype:
  - This press has a sliding plate on the bottom, which meant that it was self-cleaning.
  - The chute makes it easier to fill.
  - We designed it so that you don’t have to put the hammer down at all while using the machine, which also made it faster.
  - And indeed, this press was faster: it produces 6 to 8 briquettes per minute
  - But it used a bit more material, and cost about $30 to produce.
  - We took it to the field, and people liked it a lot, they liked the briquettes that it produced, but it was too expensive.
  - So now we had a new problem, and we could go through the cycle again to make a cheaper press.
  - One of the best ways to make things cheaper, is to get rid of material.

- Show the mini press prototype:
  - This press costs only $2 or $3 dollars.
  - It is much, much easier to make.
  - And even though it is so simple, it is the easiest to fill, so it is actually faster than the other two presses—you can make 8 to 10 briquettes per minute.
  - This press was the best one, but we did not think of it the first time, it took several tries to get to this point.

- Summarize and outline the advantages of going through the design cycle several times:
  - We incorporated feedback from the users, and made a product that was better suited to their needs.
  - We ended up with a press that was much, much better than our first idea, even though that one was very good.
- Emphasize the value of simplifying the machine when possible.
Teaching Notes:

- We brought a square mini press and a sheet metal mini press as well, as these are part of the complete story, however it became clear that it was overly complicated to bring them up. So for simplicity's sake, the three presses are sufficient, however, it is still good to bring the others, in case there is a chance to show them in follow up conversations, or if people ask about different shaped briquettes.
- The first time we taught this, we started with an explanation of the full Fuel from the Fields charcoal making process, but then everyone got distracted with the idea of charcoal making (understandably 😃!!) and the focus shifted away from the design of the presses. The second time we did the presentation, we just assumed that people would understand the idea of making briquettes from powder and small pieces of charcoal, which they did. It was much better.
- Be sure to translate the cost of the presses into local currency in advance, so that you can discuss this smoothly, without having to do conversions on the fly.
- The second time we did the presentation, my arm was bothering me and I could not hold the hammer, let alone swing it hard enough to make a briquette. I did not want to have Kofi making them while I explained because, from a gender role perspective, this gave a bad message. Also, there were key things that I wanted to emphasize that a novice user might not bring out, so I didn't want to just choose a volunteer from the audience during the presentation. Fortunately, while we were preparing, an older woman, came by, interested in what we were doing. I showed her the press and how to use it, and when it came time to do the demonstration, we did it as a team, with me filling the press and manipulating the parts, and Aluku pounding the piston. It worked out just great.
- We didn't have time to do this, but it might have been good to have samples of the very rough sketch models for testing screw presses, extrusion, lever presses and impact forming to show the experimentation phase.

Photographs:

The swing press  The slider press  The mini press
1.4 Activity: Maize Raise (60 minutes)

Goals:

- Get the creative juices flowing
- Get the participants to practice working together and break down barriers between team members
- Give participants a hands-on experience with the design cycle, using easily manipulated materials so they can go through the whole process in a short time.
- Show the merits of the process.

Materials:

- paper (~12 sheets per group of four people: 10 of white paper, and two of colored paper, if possible)
- pens (1 per group)
- tape (premeasured into 30 cm pieces, and wrapped around the pens)
- scissors (1 per group) (optional)

Things to prepare in advance:

- divide the group into teams of four, preferably with a good gender/age/literacy balance.
- measure out ~30 cm of tape and wrap it onto the pens.

Presentation:

- Introduction
  - now we will do an activity that will give you a chance to go through the whole design cycle yourselves
- The Challenge:
  - in order to prevent pests from eating your grain, you must store your maize at least 15 cm (or the height of this pen) off the ground. Using only two pieces of paper and 30 cm of tape, support as many ears of maize as possible off the ground.
  - Be sure that everyone understands what the task is, and explain again to clarify if necessary.
- Instructions:
  - recall the design process, it works well to give better products.
  - start by thinking of ideas, you have 10 sheets to practice and experiment with; think of as many different ideas as you can.
  - as a group, you will look at all the different ideas you have come up with, choose the best one, and discuss how you will build it.
  - then we will give you two new pieces of paper (possibly colored paper to differentiate from the practice sheets) and you will build your device.
  - each team will then show their solution to the group and we will discuss what could be improved, and what worked well.
- Give each team ten sheets of white paper with which to start experimenting.
- After about 15 minutes, call the group together and tell them they need to choose their best idea, and then make it out of the two sheets of colored paper (you could then either distribute the paper, or have each group show you their best design and describe it in order to get their paper).
- After about 10 minutes call the teams together to present their designs to the entire group. It works well for this showcase to be in a circle or semi-circle with the presentations happening inside where everyone can see.
- Comment on what was good about the designs, and what were things that could be improved.
- Review the design process and how it was used in this activity.
- Invite participants to take a short break.

**Teaching Notes:**

- The first time we taught this, it was clear that the participants did not understand what the design challenge was (we had not yet thought of the context of storing grain, which was an idea that came from the community members when we were running the activity) so as we were trying to clarify our initial description, we showed a quick example of making a cylinder out of paper, and balancing corn on top of it. We explained that this was just a sample of one idea, but unfortunately everyone latched on to this idea, and after 10 minutes, we had a sea of cylinders! So we told them to go back and to think of as many different ways as possible to raise the maize off the ground, excluding the cylinder. This sparked the type of idea generation we were hoping for and reminded us to never show an example first!
- This activity should not be about using only limited materials when doing the idea generation and experimentation phase, so it’s important to give out the paper at least twice: plenty of paper to experiment with at the beginning, and then, after about 10-15 minutes of working out ideas, the two sheets for the final design.
- We did not have participants go through the cycle again, but there could be merit in giving two more sheets of paper to see if things are improved by repeating the cycle. This would encourage people to identify problems with their own designs, to work out solutions, and to continue around the design cycle again and again.
- We did not have enough maize for everyone to be testing at the same time. While it may not be necessary to have all the groups to test out their prototypes at once, there should be enough maize so that access to testing materials is not a limiting factor.
- In the second community where we worked, the maize crop had failed, so there were no extra ears available. We adapted the exercise to store cassava and yams instead.
- The tape, scissors and pens are not really necessary and could be eliminated, which would simplify the activity and the explanation.
Initially, participants were very much influenced by the example that had been shown to them as we were describing the activity, and nearly everyone just build cylinders and balanced maize on top. We then challenged them to think of other ways to solve the problem.

Working to generate more ideas. The final results.

1.5 Activity: Idea Generation (30 minutes)

Goals:

- Get participants familiar with generating many ideas for solving a problem
- Teach methodologies for generating ideas
- Demonstrate a sample brainstorming session

Materials:
- a hand drill
- a piece of worm-eaten wood and other items with holes in them
- equipment for the brainstorming session role play (these will also be used for the idea generation project, so it is important to have plenty of tools and materials.)
  - scrap wood
  - sheet metal
  - nuts and bolts
  - nails
  - plastic
  - wire mesh
  - other things you find lying around the village
- tool kits
  - hammer
  - pliers
  - hacksaw
  - shears
  - file
  - wood saw
- groundnuts in the shell

Things to prepare in advance:

- a collection of things that have had holes made in them by a variety of means
- rehearse the role play and have a plan for translation
- find materials that can be used for the hands-on experimentation in the brainstorming session.

Presentation:

- Introduction:
  - Once your problem is clearly defined, the next step is to think of many different ideas for the solution.
  - It is very important that you really understand what you want the machine to do before you start, however it is usually not helpful to be focused on only one way for the machine to accomplish the task.
  - Many times, people will just follow up with the very first idea they think of, but experience has shown that you get better solutions if you think of many, many ideas, then choose the best ones. The most innovative ideas are rarely the first ones that you think of.
  - There are methods that can help you think of ideas
    - experimentation
    - think of how solutions to other problems might apply to your problem
    - build off of other ideas
    - be creative
    - associate things that don’t normally go together
• vary your perspective: think of things upside down or inside out
• change your constraints

• Idea generation exercise:
  o what is this? (a drill)
  o what does it do? (make holes)
  o what are other things that can do the same things? (have the group come up with as many ideas as possible)
  o what are other things that this thing can do? (have the group come up with as many ideas as possible).
  o As you can see, you often generate more ideas as a group, so it is good to brainstorm together.

• Do an example of an idea generation session as a role play:
  o We are going to show an example of how you might go about thinking of ideas for your project.
  o idea generating/experimentation session for a groundnut sheller, using simple, available materials for getting new ideas and testing them.

• Now you will have a chance to try doing the same, for a groundnut threshing device.

Teaching Notes:

• For the drill exercise, at first it was hard to get people to think of ideas that were a little off the wall, so we would occasionally ask leading questions or intersperse ideas to keep the group.
• The role play was a little complicated, because we had to have translators, but we made it so that each person in the role play had a translator who was their voice. This worked quite well.
• We tried many different ways of shelling groundnuts, rolling them, pounding them, throwing them, etc. We made sure to have several outlandish ideas as well, to model the method of building off of ideas and not throwing out any ideas in a brainstorming session (evaluation of ideas comes later...)

1.6 Groundnut Thresher: Idea Generation (30 minutes)

Goals:

• To weave a project throughout the workshop so that participants can apply what they learn at each stage of the design process.

Materials:

☐ prototyping materials
Things to prepare in advance:

- groundnuts that are still on the root need to be obtained, they should be freshly harvested, so that the plants have not dried out too much. It is a good idea to have a local supply, in case more are needed throughout the workshop.
- obtain scrap materials for prototyping. It is important to have a wide variety of materials, so that the available materials do not suggest a single solution.

Presentation:

- How do people currently thresh groundnuts? (manually)
- Now, with the design process in mind, break up into your groups, begin to define the problem (what is problematic with the current method).
- With the idea generation exercises in mind, start thinking of as many different ideas as possible for accomplishing the same task.
- You may use some of these scrap materials to inspire your ideas.
- You may wish to experiment with different materials to see which can effectively help remove the nuts.
- You will have time to work on these projects later, so the goal here is not to finish a prototype, but to generate as many different ideas as possible and to start experimenting with some of them so you can evaluate them.

Teaching Notes:

- The hardest part about this activity is to anticipate the type of materials that people will need without suggesting solutions. It is also important to have enough of all the materials, so that some teams don't feel that they weren't able to do what they wanted, because of a lack of materials or tools. We just had a pile of stuff for people to take and use, which has its advantages in terms of creativity, but it might have been better to have given each team at least certain items, so that there was more equitable distribution.
- Another challenge with giving people materials is that they often start building their prototypes immediately, instead of taking each step of the design process sequentially as per the curriculum. One of the things we are reevaluating is the proper stage to give people prototyping materials. Perhaps we should give out a very limited amount of materials for experimentation, just enough for participants to play around with different methods. Or perhaps it is fine for people to move forward and the subsequent slots in the curriculum for project work become opportunities for designers to get user feedback and then improve upon their initial efforts. Experience will probably be the only way to sort this out.
Day 2: Concept Evaluation and Detail Design

2.1 Review (10 minutes)

Goals:

- To review the design cycle and the stages of the process that have already been covered
- To begin the day with praise and encouragement of the previous day's efforts.
- To offer a space for questions and clarification

Materials:

- poster of the day's schedule
- if something particularly exciting was produced by a group the day before, this is a good time to highlight it

Things to prepare in advance:

- Make (and translate) a poster of the day's schedule
- Debrief about the previous day's session and think through any clarifications, observations, or comments that would be appropriate.

Presentation:

- Review the previous day's activities
- Review the key aspects of the design cycle.
  - Yesterday we reviewed the design cycle as a whole, and the idea of repeating it several times in order to get better products.
  - We also started looking at the different phases of the cycle. One of the very important phases is where we think of many different ideas for solving a problem.
  - Today, we will look at ways to choose which is the best idea, and then also go continue through the process of working out the details and building a prototype.
- Any questions or comments?

Teaching Notes:

- Even though the review is very brief, we found that taking a moment to acknowledge people's efforts and to offer words of encouragement set the proper
tone for the entire day.

2.2 Concept Selection (45 minutes)

Goals:

- To provide a methodology for objectively comparing ideas and selecting the best one, or the best aspects of them.
- To apply the concept selection process to the ongoing design project

Materials:

- beans for judging ideas

Things to prepare in advance:

- purchase 5 different kinds of beans/grains
- divide beans so that each group gets a selection
- practice role play

Presentation:

- Now that you’ve thought of many ideas, it is necessary to choose the best one. If you have many good ideas, this can be difficult, so we want to show you a method for doing this.
- First, you need to think about what are the most important requirements for you to meet—some examples include things like cost, safety, throughput, portability...
- Once you have chosen the evaluation criteria, then you will compare all the different designs for each of these criteria. We’ll show you an example with the groundnut sheller project that we generated ideas about before.
- In the role play, be sure to
  - Choose evaluation criteria
    - cost
    - throughput
    - safety
    - quality of product (are the groundnuts broken?)
    - ease of use
  - Start with one of the criteria, and discuss each design, then rate each design using the beans (our bean code was: great = black beans, good = maize kernel, okay = groundnut, bad = beige bean, terrible = green pea). Place the bean next to the representation of each idea, then move on to the next criteria and do the same for all of the criteria.
Choose the best idea by looking at the pile of beans and determining which one has the best ranking.

Before moving ahead, look at the other designs that had “great” beans (black beans, in our case) and see what was great about them, and see if it can be added to the design that you chose.

- With this concept selection process in mind, let’s break up into our groups and start to evaluate the different ideas that you came up with yesterday.
- Talk amongst yourselves about the strengths and weaknesses of the ideas you have come up with. How will you compare them? What are the most important criteria for evaluating the designs?
- After small group discussions, reconvene the group to make a list of the criteria.
- Go back into the design teams, and evaluate the different ideas. Have the teams group similar designs together, so that they are comparing truly different approaches.
- After discussing and rating the designs, look at the pile of beans for each idea choose the one that you think is the best.

Teaching Notes:

- This is the section that needed to be re-worked the most. We tried using a role play, as we did for idea generation, but people did not stick with us. We are not sure if the decision-making rubric was too complicated, if people didn’t like the idea of comparing their ideas, or if they just wanted to go back to building prototypes.
- This process could have benefited from more mentorship, but with 16 teams and a significant language barrier, we were not able to do so effectively. Working with the translators in advance and engaging them could have made this easier.
- It is difficult to overcome traditional gender roles in conversations like these when being honest and critical about someone’s ideas, as critique may stifle further participation.

2.4 Detail Design (~45 minutes)

Goals:

- to show that there are a variety of ways to embody an idea and that this embodiment is often driven by the availability of materials.
- introduce the idea of trade-offs, and how they affect the design.

Materials:

☐ metal groundnut sheller
☐ wooden groundnut sheller
☐ groundnuts in the shell
Things to prepare in advance:

- make sure that shellers are working well
- adjust and calibrate the shellers, if necessary

Presentation:

- once you choose the best idea, you need to work out the details for how to make it real
  - what materials will you use?
  - what size will it be?
  - how will the mechanisms work?
  - how much should it cost?
  - how will it be made?
  - how will it be used?
  - how long must it last?

- The answers to these questions will depend on what materials are available and the user requirements. An example of this can be found in these two machines that shell groundnuts. One of them was made in a metal workshop in Lira, called Lagoon Technical Services. You can see that it is made entirely out of metal, which is a material familiar to the welders and machinists at Lagoon. The other one is mostly wood, because this is the material that is most commonly available and is the material that Denis, who is a carpenter, is most comfortable working with. The mechanisms are almost the same, but the materials and manufacturing processes are very different.

- Let's take a few minutes to use each one, and then point out the features that are the same, and which are different. This will help you understand the types of details that you need to work out. Sometimes, it is necessary to do calculations to know the answer to some of these questions; this is engineering design.

- To start the detail design for your project, we can begin by thinking about what are the best materials for your groundnut thresher design. You may have experimented with the materials we brought, but if you think some other type of material would work as well and it might be cheaper or stronger or easier to work with, then do not limit yourself, please tell us what you need.

- Let's take the next ten to fifteen minutes to think about your thresher design and write up a list of the materials that you will need to build it.

Teaching Notes:

- One thing that we found in all our presentations, is that there is naturally some interest in the technology itself, and at first, we tried to keep people focused on the design process, not the design. But we later realized that it was good to let people explore the technology a little bit, and then go into how it fits into the process and
the things that we wanted them to learn.

- We actually didn't have time to do the last two activities on this list but it seems like a way to bring home the fact that most characteristics are choices made by the designer, and it is often necessary for the participants to feel like they have permission to make these decisions.
- This is the part of the design process that usually needs the closest mentoring, as novice designers in particular may not have the experience necessary to choose the best methods or mechanisms for their projects.

Photographs:

Comparing the details of two different groundnut shellers

2.5 Activity: Maize Sheller (~60 minutes + overnight)

Goals:

- To reinforce the idea that there are different embodiments of the same idea, and that different types of materials can be used to make the same object.
- To give people the opportunity to practice or learn about cutting, bending and fastening metal
- To introduce the idea of making the same device with the same specs again and again (manufacturing) and demonstrating one way of doing that (using a jig).
- To teach people how to make a simple but very valuable technology that will be useful to them (even if the rest of the curriculum is not).

Materials:

☐ sheet metal for shellers
☐ sheller jigs
☐ multiple sets of the following tools: hammer, bull nose pliers, tin snips, file, markers
☐ examples of different types of shellers made from a variety of materials

Things to prepare in advance:

- Depending on the source of the sheet metal, it may be best to cut strips of sheet metal from a large sheet or to find pre-cut strips. In Uganda, we found that there were pre-made louvers, which were the right width and thickness, we just had to pound them flat.
- Sheller display or shellers at different stages in the process.

Presentation:

- As we just discussed, part of working out the details involves determining what types of materials are best to use.
- Considerations will include cost, availability, strength, durability, comfort.
- Here is an example of a maize sheller. (demonstrate the sheller, we sometimes do this as a competition, comparing it to shelling by hand)
- This one is made out of plastic and it is very cheap, and requires injection molding. This one is made out of cast aluminum and requires a foundry. This one is made out of rebar and requires a welding rig. This one is made out of sheet metal and can be made from a simple set of tools. This is the one that we will teach you how to make this one. And last but not least, this one is made from a food can.
- Would people like to learn how to make this sheller? (enthusiastic yes!) A great thing about being able to make the sheller yourself is that you can customize it to fit your own maize.
- These are the things we will need to make this: sheet metal, something to measure with, this jig, which is a tool that helps bend the ridges of the sheller, a hammer, a pair of pliers, and a way to cut the metal.
- The steps to making the sheller are; cut the metal based upon the size of your maize, form the ridges by banging the metal, bend the metal into the right shape, and fasten the ends by crimping, riveting or welding. Some people like to file the sheller after the finish to make sure there are no sharp pieces of metal or rough parts. (show on display or with pre-made examples).
- Now I will demonstrate each of the steps. (do this quickly, refer to the pre-made parts/display to skip over parts, but carefully show the crimping as that is what people will stumble on most)
- Now we will break up into our teams. Each team will get a toolkit that has a hammer, snips, pliers, a ruler, a file, a jig and a piece of metal to help with the crimping. Each member of the team will have their own piece of sheet metal to work with, so everyone can make a sheller.

Teaching Notes:
• It is useful to do the Julia Child thing here; make shellers at various stages before the session, so that you are not on the spot to make a perfect sheller in front of everyone. We made a board display similar to the one Ralph Hotchkiss made while visiting D-Lab last spring.
• It is critical to support people as they move through the process; having multiple people who are familiar with the process and who feel comfortable helping (not doing it for) people when they get stuck is very helpful.
• In general, the men tended to get a hold of the tools and materials first, but everyone did eventually make their sheller. Keeping an eye on this, but also remaining patient, is important.
• We scheduled this as the last activity of the day so that people could finish on their own time if needed. This meant leaving toolkits with people overnight, which was both practical and good for building trust. In both villages, people returned the next day with dozens of completed shellers and all of their tools.

Photographs:

A display board showing how to make maize shellers  Making shellers in Wangduku  Completed shellers the next day

Day 3: Testing and Evaluation

3.1 Review (5 minutes)

Goals:
• To review that design cycle and identify where in the cycle they are with their
projects

- To begin the day with praise and encouragement of the previous day's efforts.
- To set out the schedule for the day's activities
- To offer a space for questions and clarifications

Materials:

- poster of the day's schedule
- if something particularly exciting was produced by a group the day before, this is a good time to highlight it

Things to prepare in advance:

- Make (and translate) a poster of the day's schedule
- Debrief about the previous day's session and think through any clarifications, observations, or comments that would be appropriate.

Presentation:

- Review the design cycle, and discuss briefly what was done so far in the stages of the design process.
  - On the first day we reviewed the design cycle as a whole, and the idea of repeating it several times in order to get better products.
  - On the second day started looking at the different phases of the cycle. One of the very important phases is where we think of many different ideas for solving a problem.
  - Today, we will look show how testing and evaluating a prototype is an important part of improving your design.
- Describe what will be done today, to complete one circuit of the design cycle, and emphasize that the process involves multiple trips around the cycle.
- Ask if there are any questions

3.2 Testing & Getting Feedback (90 minutes)

Goals:

- To reinforce the importance of iterative design
- To introduce pedal-power as a viable approach
- To give participants the opportunity to apply the concept of iterative design
Materials:

- design cycle poster
- sim sim pastemaker
- roasted sim sim and/or groundnuts
- plates for collecting the paste
- cup for scooping the nuts
- prototyping materials
- tool kits

Things to prepare in advance:

- Roast the sim sim and groundnuts (about 30 minutes total)
- Make sure the sim sim pastemaker is in working order
- Assemble prototyping materials for making improvements to the pastemaker
- Assemble materials for making improvements to the threshers

Presentation:

- Explain the importance of testing and getting feedback:
  - Once you finish building your prototype, it’s important to test it so that you can improve upon your design, and get a better product.
  - Sometimes the testing is something that you just do yourself, to see how well the machine is working, and sometimes you should get other people to try the machine and get their input.
  - The more input you can get, the better.
- Introduce the sim sim paste maker prototype:
  - This is a machine that we made the last time we were here.
  - We followed the design cycle—first we heard about the problem from you, that it was hard work to make sim sim paste.
  - Then we gathered information and learned about how to make sim sim paste in the traditional way, which was very inexpensive, but took a long time. We also saw a mechanized machine for making paste, which was faster, but cost about 500,000 shillings and required electricity to operate.
  - We thought that we could make a machine that was faster than making paste by hand, but cost less than 500,000 shillings and didn’t need electricity.
  - We thought of many different ways to do this, and decided to try a pedal-powered machine.
  - We went to Lira to find materials and to build our prototype.
  - We tested it ourselves, and now we want to get your feedback, so that we can improve the machine.
- Have volunteers test the machine and give feedback.
- Compile a list of “complaints” and suggestions for improvement.
- Come up with a new set of problems to solve.
- Invite people to come up and show how they would solve some of the problems.
• Get teams to apply the same process to their groundnut threshers:
  o Now it is time to test your prototypes and get feedback about them.
  o As a group, try out your machines and think of the things that are good about the machine and the things that could be improved.
  o Make a list of the things that you can improve
  o Think of many ideas for how you could make each improvement...
  o Choose the best idea...
  o Then build it...
  o And then you will test it again, and go around the cycle one more time

Teaching Notes:

• We asked for volunteers to come forward and try the sim sim maker, and then to tell us some things that could be improved. Each person got to pedal the machine for about thirty seconds then report on something that they thought could be done better. We tried to limit each user to one suggestion, so that we could get a variety of inputs.
• When we asked people to identify problems, nearly all of the users coupled their feedback with suggested solutions. It was difficult to get them to separate these things.
• The first time we ran this session we had people actually modify the pastemaker. Participants enthusiastically tested the device and then proceeded to make handle bars, reclining seats, sketches and a scale model with new design features. This was wonderful, but we felt that is went too long and we wanted participants to have time to apply the concept of iterative design to their ongoing projects. It was also difficult, because we only had one machine, so it was very crowded. So the second time, we ran this session more as a group discussion, with people testing the machine and then voicing their suggestions, put not actually building the improvements.
• We think it was instructive on a number of levels to use a prototype that we had developed on our previous trip as the focal point of this session. Not only was the pastemaker a good choice because it is a pretty rough prototype with plenty of room for improvement, but there was important symbolism in having the participants--receivers of technology for a generation--critique the work of the so-called experts, and for them to be so obviously correct about the needed changes. This drove home the point that everyone needs to continue around the cycle and that no one has a monopoly on good ideas.
• At the end of our session on the pastemaker, we mentioned some other, similar solutions that have been developed, that incorporated some of their suggestions, such as the mobile maize sheller.
• We did not do it this way, but when they were testing their own devices, it would have been interesting to have the teams pair up, and then use each other's devices and then give each other feedback.
Testing the paste maker to get feedback for improving the design.

Thinking of ideas for how to improve the paste maker.

Making modifications to the paste maker.

Building a model of the paste maker, to show proposed improvements.

Sketching modifications to the paste maker.
3.3 *Project Showcase (40 minutes)*

Goals:

- Celebrate the work that participants have done on their projects
- Provide feedback on how the projects could be improved

Materials:

- plenty of groundnuts on the root

Things to prepare in advance:

- get groundnuts

Presentation:

- Introduction
  - We appreciate all the hard work that you have put into this project, and we are looking forward to seeing your designs.
  - You've had a chance to go through the design cycle once, and we hope that even though the workshop is nearly over, you'll get some ideas for how to improve your devices.
- Presentation of prototypes
- Feedback on prototypes
- Congratulations

Teaching Notes:

- We went to one of the farms in the morning to help harvest the groundnuts that we needed for the showcase. This was great, because it provided the opportunity to get to know some of the participants better and to work side by side with them, doing some of their daily work.
- Giving constructive critical feedback on the prototypes is always a challenge, especially given the time constraints. One method for doing this would be to ask people to think of three things that were good about each device, and three things that could be improved, and then there could be
- The first time we ran the workshop, we declared that we would give a toolkit to the team that came up with the most ideas, and while this was appreciated by the team that received the kit, we don't believe it was necessary in order for the teams to be motivated to work on their project. In addition, it may have some negative side effects, so perhaps it is better not to do so.
- At the end of the presentations, we shared some information about the threshing
table that was developed at the International Development Design Summit that had been held in Ghana the summer before this workshop. We were careful not to present it as a “better” solution, but rather another solution. We wanted to do so because we thought the threshing table could be used for other crops, such as finger millet.

- Although we did not do so at our session, it is probably a good idea to have a discussion about the difference between a prototype and a product, and that there will be more refinement that would be done in order to make a product to sell, rather than a device for one’s own use.

Photographs:

3.3 Evaluation (60 minutes)

Goals:

- To document the effectiveness of each session in achieving its intended goal
- To document how participants enjoyed each session
- To record both quantitative and qualitative responses despite the varying degree of literacy in the group
- To capture suggestions and comments for future improvement of the training session

Materials:

- agricultural markers of five different kinds (we used black beans, maize kernels, groundnuts in skin, brown beans and green peas), about 500 g of each should be plenty (number of beans required = number of participants x number of questions)
- plates or bowls to distribute and collect the agricultural markers (1 per group, plus 3 collection plates)
- response keys (each agricultural marker taped to a piece of paper and shown corresponding to its meaning) (1 per group)
- envelopes and/or plastic bags to store the answers to the questions
- pens and notebooks (participants should have these)

Things to prepare in advance:

- sort the agricultural markers so that each group will receive a pile with enough of each kind of marker that they could theoretically answer all of the questions with the same marker.
- translate the response keys
- prepare both multiple-choice and open-ended questions

Presentation:

- Thank the group for their participation and introduce the evaluation exercise:
  - We want to thank you for all of your efforts over the course of this workshop.
  - It is very important for us to learn whether we did a good job of teaching you the design process and whether you feel like this was a useful training.
  - We would like to ask you a series of questions. Your answers will help us to improve this workshop for other communities.
  - It is very important that you are honest: if you felt something was not good, please tell us.
  - Please don’t feel like telling us how you really feel will not be polite. Telling us how to improve this training is a tremendous help to us.
- Explain the format:
  - There are two kinds of questions.
  - The first set of questions will be asking you to tell us how well each session achieved its goal. Did the way we did the session do an excellent job, a very good job, a neutral job, a poor job or a terrible job of achieving its goal?
  - The way we want you to tell us what you think is to use these grains to tell us what you think. You can think of it like voting.
  - In front of you is a bowl filled with different grains. If you think the session did an excellent job, pick a black bean. If you think the session did a very good job, pick a maize kernel. If you think the session was just okay-- not good and not bad-- then choose a groundnut. If you think the session did a bad job, choose a brown bean. If you think the session did a terrible job, choose a green pea.
  - We will come around with a bowl and you will cast your vote by putting in the grain that you chose.
- Are there any questions?
- Question one:
  - Back on the first day of the training, we did a session showing you the
different charcoal presses.

- Our goal was for you to learn about the design process and to see an example that would help you understand it.
- Think back to that session, how well did the example of the charcoal press do to achieve our goal?
- If you think it did an excellent job of teaching you the design process, select the black bean; if you think it did a very good job, select the maize; if you think it wasn’t good but wasn’t bad, just in the middle, select the groundnut; if you think it was bad, select the brown bean; if you thought it was terrible, select the green pea.
- Now that you have thought about it, select your piece now.

- Has everyone chosen?
- We will come around with a bowl and you can cast your vote into the bowl.

- Question two:
  - Thinking of the same session, did you enjoy it? Simply did you like it?
  - Select the grain.
  - Has everyone chosen?
  - We will come around with a bowl and you can cast your vote into the bowl.

- Question three:
  - On that same day we did a session in which we challenged you to build a structure that would support many pieces of maize using only paper and some tape.
  - Our goal was to get you to go through the steps of the design process to find a good solution.
  - Thinking back on that session, how well did the activity of building the structure out of paper and tape do to achieve our goal?
  - If you think it did an excellent job of teaching you the design process, select the black bean; if you think it did a very good job, select the maize; if you think it wasn’t good but wasn’t bad, just in the middle, select the groundnut; if you think it was bad, select the brown bean; if you thought it was terrible, select the green pea.
  - Now that you have thought about it, select your piece now.

- Question four:
  - Thinking of the same session, did you enjoy it? Simply did you like it?
  - Select the grain.

- Question five:
  - The next thing we did that day was to think about ways to think of lots of ideas.
  - We thought about the drill and other ways we could make holes, and then we did a role play where we acted out the process of thinking lots of ideas to shell groundnuts.
  - Our goal was to get you to understand and practice the idea generation step in the design process.
  - Thinking back to that session, how well did the drill activity and role play do to achieve our goal?
  - Now that you have thought about it, select your piece now.
• Question six:
  o Thinking of the same session, did you enjoy it? Simply did you like it?
  o Select the grain.
• Question seven:
  o On the second day we did a session about different ways to evaluate ideas and choose the best one.
  o Our goal was to get you to understand how to move forward with the best idea before building a prototype.
  o Thinking back on that session, how well did the idea selection session work to achieve our goal?
  o Now that you have thought about it, select your piece now.
  o Has everyone chosen?
  o We will come around with a bowl and you can cast your vote into the bowl.
• Question eight:
  o Thinking of the same session, did you enjoy it? Simply did you like it?
  o Select the grain.
  o Has everyone chosen?
  o We will come around with a bowl and you can cast your vote into the bowl.
• Question nine:
  o Next, we looked at two groundnut shellers and compared them.
  o Our goal was for you to understand that there are different choices you can make when you are working out the details of building your prototype.
  o Thinking back on that session, how well did groundnut sheller session work to achieve our goal?
  o Now that you have thought about it, select your piece now.
• Question ten:
  o Thinking of the same session, did you enjoy it? Simply did you like it?
  o Select the grain.
• Question eleven:
  o At the end of the second day, we made maize shellers.
  o Our goals were for you to understand that different materials could be used to make the same thing, for you to work with some metal, and for you to make something that would be useful to you.
  o Thinking back to that session, how well did the maize sheller session work to achieve our goals?
  o Now that you have thought about it, select your piece now.
• Question twelve:
  o Thinking of the same session, did you enjoy it? Simply did you like it?
  o Select the grain.
• Question thirteen:
  o Today, we looked at the paste maker.
  o Our goal was for you to understand the importance of continuing around the design cycle again in order to improve your designs.
  o Thinking about that session, how well did the paste maker session do to achieve our goal?
  o Now that you have thought about it, select your piece now.
• Question fourteen:
  o Thinking of the same session, did you enjoy it? Simply did you like it?
  o Select the grain.
• Question fifteen:
  o Throughout the three days, you have had an ongoing project, the groundnut thresher.
  o Our goal was for you to understand the entire design process by doing it as we went along, and for you to practice each step of the design process after we showed an example.
  o Thinking about that project, how well did the ongoing project work to achieve our goal?
  o Now that you have thought about it, select your piece now.
• Question sixteen:
  o Thinking of the thresher project, did you enjoy it? Simply did you like it?
  o Select the grain.
• Questions seventeen:
  o Now thinking about the entire training, our goal was to teach you a process that would be useful to you in solving your own challenges.
  o How well did the training as a whole do to achieve our goal?
  o Now that you have thought about it, select your piece now.
• Question eighteen:
  o Finally, thinking about the entire training, did you enjoy it? Simply did you like it?
  o Select the grain.
• Open ended questions:
  o Next we will ask you write down your own answers to some questions. We won’t need to select the grains or beans any more so we can take those away. For those of you who have your pen and notebook, please open to a blank page.
  o Please put the name of your group on the top. I will ask a question, please talk within your group, and capture everyone’s thoughts on the question. We will try to do this fairly quickly so we can finish.
    ▪ What did you learn from this workshop?
    ▪ Is this process something you would use to solve a problem?
    ▪ Have you built a machine that helps you with your work before this workshop? If no, would you try it now? If yes, would you do it differently now?
    ▪ What did you think about this training?
    ▪ What kind of support and/or resources would you need to continue with your own projects?
    ▪ What suggestions do you have for improving the workshop?
• Closing:
  o Thank you so much for your input, it will be very useful as we move forward with this work both here and in other communities. We appreciate your help.
Teaching Notes:

- Practicing clearly articulated questions in advance really helped make the second evaluation session more effective than the first.
- When explaining the process and what the different markers meant, doing a role play was more effective than trying to articulate the process in the abstract.
- We chose to use familiar objects for the markers, but also wanted to be certain not to be wasting food; all of these markers were dried and could be washed and cooked after use.
- More than half of our participants were not literate; we feel that this agricultural marker system was worthwhile even though it took some time to explain.
- Clear questions are important. We seemed communicate best with the group when we framed the questions in terms of whether each session achieved the goal we said it was trying to achieve, as opposed to asking them to just rate the session. By coupling this with asking people to rate their enjoyment of the same session, we hoped to get at different dimensions of why someone would like or dislike a session. It is, however, worth considering whether this is important and only doubles the number of questions for a group that is not accustomed to this kind of process.
- We allocated two minutes to each of the 12 multiple choice questions and 2-4 minutes for people to respond to the open ended questions.
- It is useful to have pre-labeled bags or envelopes to put the responses into, as it can get confusing if too many bowls of beans are coming in at the same time.
- It’s very important to have enough beans. We were short of black beans, and had to recycle them, which complicated the system.
- For the open-ended questions, it is important to encourage the people who can write to capture the responses of the members in their group who cannot; unfortunately the tendency was for them to just put down their own thoughts. It would have been nice to have a translator serve as a scribe and facilitator for each of the small groups, however we did not have enough translators to do this.
- We think it is better for the integrity of the data to have the evaluation session before having the wrap up session in which we talk about follow-up support, potential funding and access to tools and resources.
Photographs:

The grains and beans used for answering multiple choice questions.

The sign-in sheet gives an indication of literacy levels.

Collecting the votes.

The results for one of the sessions:
top: did the session achieve its goal?

3.4 Wrap Up and Next Steps (~30 minutes)

Goals:

- To acknowledge and appreciate the time we have spent together
- To determine appropriate mechanisms for follow-up
- To identify additional design challenges
- To set the stage for further collaboration
Materials:

- notebook for taking notes

Things to prepare in advance:

- it is good to have put in place possible mechanisms for following up with the groups; this could include the following:
  - a toolkit library, so that groups can borrow tools to work with.
  - a revolving fund to purchase the materials needed for groups to work on their designs
  - a staff member who can help them with their projects

Different requests may come up, but these are things that every group we have worked with has asked for.

Presentation:

- Thank the participants for the time we spent together, and comment on the good work that was done.
- Have a discussion about ideas for other technologies that could be developed.
- Discuss mechanisms for continuing the work.

Teaching Notes:

- We often frame the discussion about other technologies by asking people what are things that they do in their lives that are difficult, and then we explore together if there might be technologies that could make these things easier.
- Interestingly, when we were asking about additional design challenges, they talked about shea oil pressing as a problem, and we asked them if they got oil from other nuts, such as groundnuts. They replied that it was not possible to get oil from groundnuts. This led to a discussion about the possibility of making an oil press for groundnuts. We decided that we would both work on presses for the next few months, then come back together to share our work, and perhaps make a new press. It was very encouraging to see how directly the creative capacity building can lead to co-creation.
- The discussion about continuing the work is a very open-ended discussion, but there are certain things that we anticipated, so we had worked out with the Caritas staff how tools might be made available (one of the Caritas staff members was willing to run a tool lending library), how technical support could be provided (we hired Denis to work with the communities for the first few months after the workshop to help them keep up the momentum) and how resources might be made available for materials for new projects (we set up a small revolving fund that they could borrow from to make projects). Having set these things up in advance was very useful, as we could adapt the plans to the community requests, but the infrastructure was already there.
Final Thoughts and Comments

Our experiences in Pader left us with the conviction that we needed to change the way that development is practiced; that we had to find a way to ignite the fire of creativity that is within each one of us. We wanted people to become creators of technology, not just recipients of technology, not just users of technology. We wanted people to know that they could solve create the solutions to their own problems. Creative Capacity Building is a methodology that is still a work in progress and we look forward to getting feedback, both in terms of your experiences in the field and whether or not you found this document helpful.