



## Lessons Learned from Others' Stories: How Changemakers' Stories Changed Us

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## **Lessons Learned from Others' Stories: How Changemakers' Stories Changed Us**

*Abstract*—What happens when your research changes you? In the Fall of 2011, we came together to analyze eight transcripts from interviews with Changemakers, prominent change agents who have exemplar records in enabling socially beneficial change in STEM education. Through this collaborative sensemaking research experience, we ourselves have changed. We have changed the way we think about change. In this paper we share the rarely told stories about how research can assist researchers in thinking through who we are and what we care about. Specifically, research assists in encouraging the development of collaborative learning processes which includes being able to deal with emerging themes from research data in an attempt at sensemaking.

*Keywords*-educational transformation, change processes, transformative learning

### **Introduction**

In the fall of 2011, we came together to analyze eight interview transcripts of Changemakers, prominent change agents who have exemplar records in enabling socially beneficial change in STEM education. Changemakers are considered to be change agents given their extensive backgrounds and actions in science, technology, engineering, and mathematics (STEM) fields. As Changemakers, their individual journeys and transformational experiences have shaped them into change agents who are their own models of change. These Changemakers are university and college educators, administrators at educational institutions and government agencies, philosophers, and educational consultants. These Changemakers have participated in reforming engineering education policy in government and educational institutions, expanding and exploring new scientific fields, and initiating engineering service programs and environmental policy.

Each of the authors had our own reasons for participating in the project. For some it was an opportunity to learn how to conduct qualitative research; for others the topic itself was compelling. Through iteratively reading and discussing these transcripts, we are learning about these Changemakers' backgrounds, motivations and inspirations, how they see themselves as change agents, and how they approach change. Emerging from this process is a view of how these themes connect as part of a bigger picture illustrating the relationships between personal stories – such as transformative moments that shaped a change intention – and personal theories about how change happens<sup>1</sup>. In this paper we share the rarely told stories about how research can assist researchers in thinking through who we are and what we care about.

### **Guiding Framework: Collaborative Inquiry**

This is a paper about the process and personal outcomes of collaborative inquiry. In this paper, we share our experiences and the impact of this experience on how we envision someone finding a role for and approaching social change and developed frames of reference for qualitative research particularly on ways to interpret interview data. Collaborative inquiry<sup>2,3</sup> also known as co-operative inquiry<sup>4</sup> is a framework that describes how people may set up an opportunity for comprehensive learning and change for themselves. Participants come together

with a goal of developing their own capacities while collaboratively addressing a compelling question through cycles of reflection and action. There are no hierarchies in these kinds of collaboration and so every individual's view has an equal potential to play a role in the interdependent dynamics that shape emerging outcomes for each of the collaborators of the inquiry. The interdependence of individuals constructing new meanings is mediated by critical validation procedures<sup>2</sup> which are the iterative cycles for achieving consensus as part of collaborative meaning making. Such a collaborative process evokes multiple ways of knowing for each participant. Individual experiences are considered fundamental in providing grounding for new knowledge. The collaborative inquiry framework entails methods for participants to share their experiences, which may allow other group members to develop an intuitive or expressible sense of their experiences<sup>5</sup>. These methods involve participants reporting their observations to each other and making sense of similarities and differences among different perspectives, a process that may lead to presentational and propositional meaning.

Studies on work groups provide a theoretical perspective that can further explain our group collaborations. Research indicates that group diversity in terms of members' perspectives for the group task may or may not have positive effects on group outcomes<sup>6</sup>. Homogeneity generally leads to better cohesion and commitment in a group. However diversity in groups can positively impact group outcomes when the task is about meaning or decision making, and has been shown to have transformative potential when individuals with different epistemological perspectives engage in cross-disciplinary work<sup>7</sup>. Van Knippenberg et al.<sup>6</sup> propose in their categorization-elaboration model that diversity can stimulate the process of elaboration of task-relevant information and perspectives within the group. The attempt to find integration among diverse perspectives can bring the group to new insights. They further propose that a group is more likely to engage in discussions for elaborations on each other's perspectives when the task has a strong meaning and decision making component, the group members are highly committed to the task, and group members have skill in engaging in the discourse and for the tasks of the group.

Collaboration develops a space for transformation<sup>8</sup>. The potential of this space for transformation lies in the relationships between people while sharing the power and responsibility among them. Collaboration facilitates and generates discourse among participants that provides a context for transformative learning. Mezirow<sup>9</sup> emphasizes the importance of effective communication in collaborative discourse, which is achieved when participants have the emotional maturity of having awareness of one's own emotions and empathy for others. As such, the space for transformation comes to life through the dynamics of collaboratively searching for shared meaning across diverse perspectives as individuals participate with a critical subjectivity as learners<sup>10</sup>. Complexity theory<sup>11</sup> illustrates how balancing dynamics between randomness and coherence can provide enabling constraints. Here, the existence of interdependent interactions among diverse agents enables the potential for novel, unexpected outcomes. A convergence among such diverse perspectives may never be achieved which can keep the dynamics going until participants choose to give closure to their collaboration.

### **The Experience: Data Collection and Data Analysis**

In the following paragraphs we describe our experience with a unique dataset of eight Changemakers. First, we set the stage for how this collaboration developed and then we describe our experience of analyzing the data. In the following section we share our personal insights into how this experience transformed us as researchers and potential change agents.

This collaboration began as a project, plain and simple; a project without funding, without any external driver other than personal reasons. There were no explicit deadlines or expectations regarding deliverables. About two years ago, Vanasupa and Adams were talking about change processes and Vanasupa discussed some data she had collected with Herter as a personal project to investigate the concept of educational change and engage in conversations with change agents who were extremely influential in STEM education, research, and administration. The interviews were conducted in the summer of 2008 during Vanasupa's sabbatical and used a conversational-based, narrative style interview process. Interviews were not particularly uniform in style but generally addressed the same broad questions about backgrounds, accomplishments, goals, and theories about change (related to an image of a feedback loop model of change processes).

Vanasupa sent a copy of the interviews to Adams in the spring of 2010, who promised to read them and share her thoughts. As the nature of such projects goes, Adams did not have time to look at the interviews until the summer and fall term of 2011. By that time, Adams was looking for a small team-building research project that would build on some of her work with Siddiqui (whose thesis project was also in the "change space"), and Mondisa and Chua, students in their first year of their PhD program in engineering education who were looking for opportunities to learn about how to interpret qualitative data. Adams talked with Vanasupa to see if she would be interested in opening up the data to students in an engineering education program in the spring of 2012. With Vanasupa's approval, Adams wrote up a description of an open research project and sent out an invitation email to all graduate students in the program.

The data analysis process was extremely iterative and emergent. Originally it involved six people at Purdue and two people at Cal Poly San Luis Obispo. Our early discussions (via skype) focused on how to get started (such as learning the story of how and why the data was collected) and how to collaborate (including discussions on how to share the data and the data analysis process more publicly). The first pass through the data we did as a group, reading and discussing one interview at a time. We replaced the original names of each participant with a letter of the alphabet for their last name to protect identities and limit access to publicly available data beyond what was provided in the interview. There were 8 interviews and so this process of making sense of the interviews took about two months. Each time we met we identified potential ideas for how we could focus the analysis and share these ideas with others. This resulted in a work-in-progress paper<sup>1</sup>.

Our initial expectations of methodological rigor were low in the sense that we understood that the interviews were conducted as part of an inquisitive, informal study on the behalf of the original researchers' curiosity. Also, the interviews did not consistently follow a specific protocol. At times, some of the interview questions seemed a bit leading; at others, the interview bypassed some of the protocol questions. Through our group discussions we came to understand that the interviews fit a narrative tradition, where there was an overall goal to gain insight into

how each Changemaker thought about change and acted as a change agent. During these discussions we took copious notes, explored ideas and tried to give them names, compared and contrasted across the interviews, and shared our own interpretations and ideas about change processes and change agents. A synopsis of these discussions is provided in Table 1.

Table 1. Synopsis of Change Agents

Change Agent Aliases	Characteristics
Mr. A	<ul style="list-style-type: none"> <li>• Raises awareness among people, find connections to what’s already being done</li> <li>• Communicates vision to develop awareness</li> </ul>
Mr. Am	<ul style="list-style-type: none"> <li>• Possesses the mental complexity to deal with challenges of change, understanding of “big picture”</li> <li>• Facilitates change leading to capacity to deal with social complexity</li> </ul>
Mr. B	<ul style="list-style-type: none"> <li>• Conscious connection to world as participatory</li> <li>• Embodiment of consciousness</li> </ul>
Mr. C	<ul style="list-style-type: none"> <li>• Needing others to understand reality</li> <li>• Able to see connections to larger contexts</li> </ul>
Mr. F	<ul style="list-style-type: none"> <li>• Diverse cultural links in constructing knowledge in connection to the historic and cultural context</li> </ul>
Ms. K	<ul style="list-style-type: none"> <li>• Expresses that there is a need to understand how something really works before being able to accurately improve or change it</li> </ul>
Mr. S	<ul style="list-style-type: none"> <li>• Awareness of resistance</li> <li>• A synthesizer/connector who recognizes the importance of team building to collaborate and negotiate in academia</li> </ul>
Ms. Z	<ul style="list-style-type: none"> <li>• Aware of system view, has a systems perspective, although does not speak in typical systems language</li> <li>• Awareness of “leverage points” in a system</li> </ul>

As our ideas about the data began to take shape, the authors of this paper designed a second pass through the data where the goal was for each researcher to create a summary for 2-3 interviews. The template for each summary addressed the following: (1) greatest accomplishments, (2) motivations, inspirations, personal drivers, (3) journey and influential experiences, (4) change model (including disagreements with current paradigms), (5) model of change leadership, and (6) perspective on what needs to change and why. Each summary was discussed in depth, and each researcher either validated or challenged the interpretations provided. A particular struggle was finding ways to bring the 8 interviews together while allowing them to independently exist as uniquely personal and context-dependent sets of experiences and ideas. This shaped the third pass through the data where we grouped participants into dyads of similar backgrounds such as government, industry, and academia, and similar change philosophies or goals. Our second iteration of summaries focused on four themes: (1) systems view thinking, (2) contextualized models of change, (3) motivation of socially beneficial change, and (4) the process of problem identification in different approaches to change. By this time we could see the light at the end of the tunnel: a way to talk about the data as a set while honoring each interview as a story of its own. Therefore, our third iteration had a more holistic

approach that connected themes of being, knowing, and doing. Each summary analyzed the Changemaker's story from the standpoint of (1) who am I (becoming / being), (2) what is my vision for change (ways of thinking and frames of reference), (3) what experiences and values have shaped my thinking, and (4) what are my theories about change or change practices.

Through this iterative process, we learned how to make sense of this unique and sometimes surprising dataset as well as grow comfortable with a very emergent data analysis process. Each discussion pushed us to work through our own theories of change and each iterative analysis cycle forced us to think through our own theories about qualitative research. For us, this project provided new insights and language for how Changemakers envision and model change. More importantly, it transformed us. In the following section we share some of our personal experiences with this data and our own lessons learned.

### **Personal Reflections: How this experience transformed us**

In the process of iterative coding and analysis of the Changemaker data, we have had discussions about the ways Changemakers talk about change and how their personal stories are embodied in these views. This has brought our own views about change to the forefront and has opened us up to new ways of thinking about how change occurs. The lessons these Changemakers have learned and their sometimes unexpected language for talking about change have affected our individual personal relationships to our own research by pushing us to make sense of our own research interests. The following are our own personal reflections on how this process of evaluating change has changed us.

#### **Adams' Reflection: Insight into Human-centered Design and Change**

I've been interested in theories of educational change (either as something to study or something to guide my own work) for a long time and have felt that something really important seemed to be missing but I couldn't put a name to it. I felt intuitively that our current language of change overlooked or trivialized something about the human dimension. Rather, there would be talk of logic models, a lack of incentives or other structures that would motivate change efforts, or a need for administrative buy-in. People seemed to exist as objects in the system – if we changed them, things would change. But people aren't objects, they're learners; they have ideas about what works and what doesn't, about what is important and what is not, and those ideas guide their actions and those actions become learning experiences. So, when I first heard of this set of interviews I was hoping it would give me some grounding in new ways to unpack the human dimension of change. Beginning with the very first interview, I was immediately struck by the ways these Changemakers talked about people, relationships, and connected ways of knowing and learning.

For example, our first interview was Mr. A. Even when prompted by the interviewer, he didn't use words like "battling resistance" but rather used words evocative of "finding synergy". Mr. A described how when he talked with people he would find ways to connect with what they are currently doing and essentially reframe it as being in alignment with a new perspective. His approach was all about listening, building relationships, making connections, and inviting people into new ways of thinking that honored both who they were and who they could become. Similarly, Ms. Z talked about finding and creating mutually beneficial opportunities where she

could leverage what someone or an organization desired by making connections with a change initiative. Mr. S talked about being a “nudger”, a “speed bump” and not “a pothole”, who can push people just a little bit to try something different.

There were many other examples in the interviews, but in almost 10 hours of conversation there were almost no examples of using such words as “resistance”, “inertia”, “incentives” or “power”. This insight brought about a long conversation where one of the members of the research team shared how it reminded her of jujitsu and aikido, where the goal is to use or redirect someone else’s energy rather than using your energy to attack them. It was an interesting metaphor that helped us talk about how these Changemakers seemed to intentionally create the conditions for change to happen in a system, enabling people to use their own energy to act in new ways. Surprisingly, these ideas show up in how people who engage in interdisciplinary work talk about what they do and who they are (bridges, translators, communication specialists, etc.)<sup>7</sup>.

Stepping back, this situation also triggered a useful conversation about the ways researchers can introduce language into a study that can potentially misrepresent the participants. When we were first naming this theme we called it “dealing with resistance”, because this was the way others *outside of this study* talked. But it wasn’t the way these Changemakers talked. At first, we were expecting this language and so we introduced it into the analysis as a way to make sense of the data. After our discussion we dropped this language and recommitted ourselves to attending to the language used, and the way it was used, in these interviews.

Stepping even farther back, some new perspectives about change were beginning to take shape in ways I would not have anticipated at the beginning of this study. One perspective is that the “doing” of change is only one piece of a much larger picture. We have begun to call this new theme, “I am my model of change”. This new framing is opening up a view of change as a developmental process that integrates epistemological, relational, and ontological dimensions of educational transformation. Another perspective came from connecting to my other research in design and interdisciplinarity<sup>7</sup>. The more we discuss the data, the more I am seeing connections between how these Changemakers talk about the human dimension of change and taking human-centered approaches to design. In human-centered design, a goal is to engage stakeholders as active participants in designing for meaning<sup>12</sup>. This insight surprised me, but is starting to make sense from the perspective that human-centered design involves engaging multiple perspectives and thinking in terms of complex systems; that a successful design (or change) is not imposed but is rather an invitation to an emergent process of shared meaning making. I’m looking forward to more discussions in our research group (and beyond), and pushing back on these ideas to see if they are useful ways for thinking about educational transformation.

### Siddiqui’s Reflection: Transformative Thinking and Learning

My interest in understanding the challenges of educational change made me join the project team. I joined when I was in the third year of my life as a Ph.D. student actively working on my research. I had a background in faculty development and that role gave me some opportunities to reflect on social change and qualities of people who might lead change. However my recent time as a graduate student, reading literature in courses and for my research,

was strongly influential as I went into analyzing the interviews of Changemakers. I had studied several paradigms of looking at change and I had started to develop a bias towards a perspective about change in which change in a social context is seen to be ground up, driven by individuals but larger than any single individual. Theories of systems thinking and transformative learning are central to what I know about change.

As I engaged in the initial pass through the transcripts my mind focused to look for patterns which relate to theoretical categories that I already knew. For example when I read in a transcript the statement: “It focuses your mind on how to - to wonder why we can't prevent these things in the first place and to start thinking about how would you go about preventing these things in the first place.” I wrote next to this statement “Critical assessment of assumptions!” Critical assessment of assumptions is a stage that transformative learning theory identifies as part of a transformative learning process. Using theoretical abstraction as a way to look at the transcripts gave me a good starting point as I was able to see some meaning in the interviews instead of reading interviews as impressive words of some wise people. However I had the feeling right from the beginning that taking a view from an abstract theoretical level might not be very fulfilling. Many of my teammates did not share the same knowledge for some of the theories that I had developed a bias for. It did not take me much time to move my focus to start looking at each transcript holistically as an artifact to be studied on its own right. I started to see what is it that these influential people are saying about how they think and act, what they believe in and what has shaped their thinking. For example I commented on one transcript on the thinking of the person that “He has a very wide canvas systems view. He is connecting points from very different ontological frames.” Working through this project I experienced the process of developing a feel for other people’s words to find deeper meanings in what they are saying explicitly as well as what they are saying implicitly.

Analyzing these interviews was strongly related to my research focus on studying transformation of engineering education. These transcripts are a rich set of authentic cases to provide examples of several of the theories I am using. These stories let me see examples of individual transformation, how adopting systems thinking plays out in a realistic context, what it means to be a visionary, how one recognizes the struggles of others in seeing their perspectives and what values one holds in facilitating others to develop new perspectives. Finding patterns in the stories of some of the theoretical abstractions not only validated those theories for me but also helped me calibrate a sense of significance and meaning for those abstractions. For example many of the interviewees emphasized the need for systems thinking. I had a theoretical sense for systems thinking as I had been reading literature on systems thinking before reading these transcripts. It, therefore, made me a bit surprised that almost all talked about systems thinking in a language that sounded more personal rather than theoretical. It is with this dissonance that my later experiences and reading of the literature brought me to an awareness at a personal level for why systems thinking might be needed as opposed to reductionist thinking when dealing with the transformation of a complex reality such as a social context and what it means to take a systems perspective for it. These stories also revealed how various theories come to interact in a realistic context. These interactions are highly contextual that give a complexity to any story and that makes each story to be unique. Being part of this research process provided me the privilege to critically reflect on some great change stories which took my view for change to a new level. I



hope that what our team will publish based on our work will be as insightful for the readers as it has been for us in learning what it means to be a Changemaker.

Working in a team in which the dynamics of the process of us working together emerged more interactively rather than based on any design made the process enriching. The process took more time than I anticipated and there was sense of ambiguity at times. However this complexity of the process forced the process to seek a synergy that pushed us to find a deeper meaning than we might have achieved otherwise. The experience helped develop my expectations for working on analyzing qualitative data in a diverse team setting like this and developed my tolerance to live with the ambiguity of the process.

### Mondisa's Reflection: The Importance of Storytelling and Modeling as it Relates to Mentoring and Learning

Working on the Changemakers project was my first attempt at the process of reading, coding, and analyzing data as a first year PhD student. What was most intriguing about the data to me is that the interview data possesses a storytelling capacity. Each individual Changemaker transcript reads like a story of their life providing a timeline of their experiences and thoughts and glimpses into the process of how they became who they are and who they are becoming. I recognized similarities between my fascination with the Changemaker stories' landscapes and my research interests in mentoring and learning for underrepresented undergraduates. I am interested in the stories of African American undergraduates in STEM education and how their lives have been touched or shaped by mentoring and learning experiences. Analyzing the Changemakers transcripts led me to evaluate how I want to tell the stories of mentors and protégés in a timeline fashion that will reflect their life models and how experiences in their lives have contributed to their success in becoming who they are. Also, analyzing what Changemakers think about change and how they learned what they know has affected the way that I think about learning partnerships and learning in mentoring dyads.

In a learning partnership model framework, there are three key principles and three key assumptions<sup>13</sup>. The three key principles are to: (1) validate learners' capacity to know, (2) situate learning in learners' experience, and (3) mutually construct meaning. The three assumptions are (1) knowledge is portrayed as complex and socially constructed, (2) self is central to knowledge construction, and (3) authorities and experts share in the mutual construction of knowledge among peers. Relevant to the three key assumptions, Changemakers portray and understand that knowledge is complex and socially constructed which is exhibited in their individual approaches to change. They also understand their roles in changing the way knowledge is constructed and navigated at different systems levels, and share their knowledge with peers by meeting them at their respective levels of understanding. A learning partnership analysis of Changemakers relationships is very similar to the mentoring relationships I intend to explore in dyadic mentoring. The Changemakers research has given me the idea to research how the role of a mentor or protégé is to create change through their own personal models which then extends and comingles with their mentoring relationship. Changemakers synthesize and connect knowledge in complex ways that are beneficial for social, global, and economic issues relevant to education similar to the mentor's role in assisting the protégé to be successful in his or her pursuits. The way in which Changemakers utilize their knowledge has made me rethink how can individual

change models be leveraged in dyadic mentoring relationships so that mentors synthesize and use their knowledge and systems thinking to be beneficial for their protégés.

The Changemakers research project has also changed the way that I intend to use interviewing as a research tool as an implicit form of storytelling and how I think about the process of dyadic mentoring as a learning partnership to not only create success but to impart change. Some research data seeks to answer a question, but not necessarily to evaluate how the answer came about and what can be learned from that process which is something that is invaluable linked to the Changemakers data and could be pivotal in the storytelling of mentoring. Understanding the development of Changemakers through reading about their stories and perspectives has changed how I will approach the storytelling aspect of my research. I will seek to try to provide details about the experiences and lessons of mentoring participants with the intent to show the effects of their own personal models and successes as a means of providing examples to be leveraged in future mentoring relationships.

### Chua's Reflection: Open Source, Radical Transparency

My main contribution to the project sprung from a naive question as a first-year grad student: what if we could share all our raw data and analysis results with anybody in the world? My background prior to grad school was as an engineer and community facilitator in open source projects, where data is "open by default" to the public as soon as it's generated. I saw how quick access to information could help ideas flow from and between unexpected places, and asked the group what would happen if we ran a qualitative research project in the same way, working with our interviewees to make full transcripts publicly available under an open license, and moving our analyses "into the open" so that anyone could watch and comment? After all, we wanted our research to have the largest impact possible.

And so we did; it's been a longer, harder journey than expected, with detours into learning about copyright law and open licensing and open access and explanations to our IRB. "Radical transparency" (the term we've chosen to use for it) is foreign to many people, and it's easy to confuse transparency with publicity, which is a very different thing. Inaccessible things can be trumpeted (technologies that are expensive, of limited supply, or not yet released) and open doors can sit quietly and unannounced. Transparency is not about making sure that everybody finds a thing, but rather about making it accessible and easy to use and remix and share once it's found. Radical transparency is not a magic bullet -- it's not an "if you build it, they will come" route to millions of readers. But it is a way to give the readers you get an opportunity and a choice to engage more deeply with a work on their own terms.

What surprised me was how foreign (and consequently scary due to being an unknown) transparency was to so many people in academia. The mode of sharing that I'd taken for granted in the open source context was much more constrained by data privacy concerns in the scholarly realm. There are good reasons for this; ethics are vital, and sometimes preserving privacy is the right thing to do, but there are cases in which it isn't necessary. If you'd tell a story to grad students you've just met at a conference, you can probably tell the same story to just about anyone else without great harm being done. Instead of open source's "default to open" culture, which emphasizes constant feedback from all angles at all stages in the process, I was struck by

what initially seemed like a "default to closed" mentality in academia, with admonitions not to submit anything until it was polished and done. Over time, I learned the picture wasn't so black and white; there are small, informal circles of scholarly conversation where people get rapid formative feedback, and even the larger and more formal dialogues had revisions and continual improvement built in; it's mostly that the cycle is less visible, harder to access, and slower to move -- not because of a deliberate desire to hinder access, but because of the difficulty and depth of the thought involved.

I still believe that it is often possible to keep that depth while opening up access and making the conversation cycles faster and easier for peripheral participants to follow, and that this doesn't need to take much in the way of resources. There were promising glimmers at the very beginning, when we'd just opened up our analyses to the first study participant who had agreed to make their transcript open-licensed. I saw alumni of that participant's institution peek in curiously, and the interviewee mentioned how unusual and edifying it was to go over his thoughts while hearing other people's voices on them. Making sense of one's own roles and actions is a prerequisite to successfully participating in or initiating transformational change<sup>14</sup>, but sensemaking is a woefully unfamiliar skill in higher education institutions<sup>15</sup>; it's a luxury that academics don't seem to have time for because they're always busy with the next semester, the next project, the next thing onwards and upwards and forwards.

I'm fascinated by how we might help people address the unfamiliarity of being transparent with their stories, and how this transparency might broaden and enrich the ways we teach and learn. The sociotechnical change abilities our study participants so beautifully exhibit are rare things, hard to capture and hard to teach. The more we open the doors and allow others to join us in making sense of the stories in our data, the more chances we and they will have to develop sociotechnical change abilities ourselves, with the Changemakers project itself becoming a sociotechnical system we can practice shaping, guiding, and growing with the insights we gain from the data within it. You never know what will happen when you put a possibility out there.

### Vanasupa's Reflection: The Power of Thoughts to Create Change

For me, I can see that my own perspective of change has dramatically shifted from the time I conducted the initial interviews in 2008. I used to hold a very mechanistic model of change in human systems, replete with coping mechanisms when people did not behave in the prescribed ways. Having considered the impact of the Changemakers' careers and listened to their stories, my current belief is that our thoughts have a more powerful role in what occurs to us as the physical world than I had previously considered. This is a concept that the Chilean biologists, Humberto Maturana and Francisco Varela have captured in the aphorism, "All knowing is doing."<sup>16</sup> The evidence that he offers for this coupling of cognition and "real"-ization is embedded in the basis of biological life forms.

In terms of the partially-virtual research collaboration that this paper represents, it was the presence of this gentle community of researchers that enabled me to understand something about my own biases as I read the interviews. The experience has reminded me of the criticality

of collective, reflexive practice as a researcher. There seems to be no other way in which the "Eye can see the eye." To explore and inquire together is a life-giving way that we can serve one another.

### A Summary of Our Reflections on Change

Our research collaboration has caused each researcher to have different reflections about change and how Changemakers' stories relate to our individual research and our thoughts about change. A summary of a key point of each authors' reflection is provided in Table 2.

Table 2. Authors' Reflection Summarized

Author	Summary of Reflection
Adams	The Changemakers collaboration has provided insight and understanding regarding the connection of human-centered approaches to change and a perspective that human-centered design involves engaging multiple perspectives.
Siddiqui	Examples of individual transformation, how adopting systems thinking plays out in a realistic context, what it means to be a visionary, how one recognizes the struggles of others in seeing their perspectives and what values one holds in facilitating others to develop new perspectives validates transformative learning theories.
Mondisa	Changemakers' stories have provided the opportunity to relate how change agents think about change relative to how mentors and protégés create change through their relationships. Mentor/protégé relationships can be examined to determine how to create change through personal models and how that affects mentoring relationships.
Chua	The Changemaker project has been an explorative, experimental opportunity to investigate how the transparency of stories can broaden and enrich the ways we teach and learn. The Changemakers project captures the essence of stories about change that are difficult to teach while allowing us to develop an understanding of our own change abilities.
Vanasupa	Change in human systems is not represented by a mechanistic model, but rather the power of our thoughts is responsible for creating change in the physical world.

### Discussion

One implication of this research is for researchers to use research data and the collaborative inquiry and analysis process as an opportunity to think through who we are and what we care about. It also provides an opportunity to reflect on why what we do offers insight into how we can better understand our research and explore ideas from multiple frameworks to

enrich discovery. This project was critically reflective, collaborative, and transformative due to the environment and nature of the topics discussed. This project was solely driven by personal motivations in conjunction with no external pressures or deadlines. As such, each of us came with our own intrinsic motivations and a shared desire to learn (about change, about the process of qualitative research, and through a social process). While we followed a methodology that aligned with the tradition of how the original data was collected, we were purposefully open to ideas and directions as they emerged. In qualitative research, efforts to address the limitations of researcher's interpretive bias is not trivial; perhaps, because we were neither invested or involved in the original data collection process, we were more likely to be open and free to follow where the data led.

Our new views on qualitative research:

A tradition in qualitative research is to “let the data speak for itself”. Yet, what does this really mean? What does it mean to articulate and face the biases a researcher brings to a study? For us, we found that there are no easy answers to these questions. Rather, we found a way to sit more comfortably in the paradox of both living with and challenging the biases we bring to any study, and to see this as a critical part of lifelong learning as researchers. We have found that a critical feature of this process is creating a supportive environment for dialogue and discourse, which are essential for transformative learning to happen<sup>9</sup>.

Similar to the stories of our Changemakers, this experience reminded us that “we are our research”: our questions are not just significant to others, they are significant to us. The goal is not to separate yourself from your research, but rather to be open to examining the assumptions and values that guide your research and allow them to evolve. Conducting research as a learning partnership provides such a mechanism.

Our new views on change – educational transformation:

While we didn't start this process believing that this dataset would answer all the important questions about educational transformation, we believed that there would be something that held the experiences of these Changemakers together. We found that change cannot be prescribed as a universal set of rules. While there is a pattern in the eight interviews, the pattern is less about what they did and more about the complex interactions between personal motivations and experiences and personal theories of change. We also found that change involves challenging prior assumptions and beliefs about how change happens and why. It is a learning process that integrates beliefs, action, and identity. Finally, we found that change is a human process, a learning process, and a system. As such, insights about the process of change can map to many other phenomenon such as understanding mentee and mentor relationships.

## **Conclusions**

Some important themes we have noted in our reflections and making connections are: (1) how the collaborative learning process has developed and influenced us during this research, (2) how the process of learning to become researchers has affected us, (3) what it is like dealing with qualitative data where you begin with a certain expectation of what it will be like to work with

the data, (4) working towards a goal of being able to read and say something about the data while dealing with team transitions, and (5) being comfortable with emergence, dealing with coming up with theories. Perhaps the most important lesson learned is how to be continually open to learning – about the process of research, collaborative sensemaking, and, for this project, the process of educational transformation.

## Bibliography

- [1] Adams, R., Chua, M., Denick, D., Mondisa, J., Sambamurthy, N., Siddiqui, J., Vanasupa, L., & Herter, R. “Work in Progress: In Their Own Words – How Changemakers' Talk About Change.” *Frontiers in Education Conference Proceedings*, October 3-6, 2012, Seattle.
- [2] Kasl E., & Yorks L. Collaborative Inquiry for Adult Learning. *New Directions for Adult and Continuing Education*. 2002;2002(94):3–12.
- [3] Heron J., & Reason P. A Participatory Inquiry Paradigm. *Qualitative Inquiry*. 1997;3(3):274–294.
- [4] Heron J., & Reason P. The Practice of Co-operative Inquiry: Research with Rather than on People. In: Reason P., & Bradbury H., eds. *Handbook of Action Research: Participative Inquiry and Practice*. London, UK: Sage Publications; 2001:179–188.
- [5] Heron J. *Co-operative Inquiry: Research into the Human Condition*. Thousand Oaks, CA: Sage Publications, Inc; 1996.
- [6] Van Knippenberg D., De Dreu C. K. W., & Homan A. C. Work Group Diversity and Group Performance: An Integrative Model and Research Agenda. *Journal of Applied Psychology*. 2004;89(6):1008–1022.
- [7] Adams, R.S. & Forin, T. (in print). “Working together across differences.” In B. Williams (ed), *Engineering Practice in a Global Context: Understanding the Technical and Social to Inform Educators*. Oxford, UK: Taylor and Francis.
- [8] Leahy M. J., & Gilly M. S. Learning in Spaces between Us. In: Fisher-Yoshida B., Geller K. D., & Schapiro S. A., eds. *Innovations in Transformative Learning: Space, Culture, & the Arts*. Counterpoints: Studies in the Postmodern Theory of Education. New York, NY: Peter Lang Publishing Inc. 2009.
- [9] Mezirow J. Learning to Think Like an Adult: Core Concepts of Transformation Theory. In: Mezirow J., ed. *Learning as Transformation: Critical Perspectives on a Theory in Progress*. San Francisco, CA: Jossey-Bass; 2000:3–33.
- [10] Yorks L., & Kasl E. Learning from the Inquiries: Lessons for Using Collaborative Inquiry as an Adult Learning Strategy. *New Directions for Adult and Continuing Education*. 2002;2002(94):93–104.
- [11] Davis B., & Sumara D. *Complexity and Education: Inquiries Into Learning, Teaching, and Research*. Mahwah, NJ: Lawrence Erlbaum Associates; 2006.
- [12] Krippendorff, Klaus (2006). *The Semantic Turn; A New Foundation for Design*. Boca Raton, London, New York: Taylor & Francis, CRC Press.
- [13] Magolda, M. B. B., & King, P. M. (2004). Learning partnerships: Theory and models of practice to educate for self-authorship: Stylus Pub LLC.
- [14] Smerek, R. (2010). Sensemaking and Sensegiving: An Exploratory Study of the Simultaneous "Being and Learning" of New College and University Presidents. *J Leadership & Org Stud*, 18(1), 80–94.
- [15] Kezar, A., & Eckel, P. (2002). Examining the Institutional Transformation Process: The Importance of Sensemaking, Interrelated Strategies, and Balance. *Research in Higher Ed*, 43(3), 295–328.
- [16] Maturano, H.M. & Varela, F. (1992). *The Tree of Knowledge: The biological roots of human understanding*. California: Shambhala.