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POST-DISASTER RECONSTRUCTION TRAINING EFFECTIVENESS

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ABSTRACT

Training in a post-disaster environment offers an opportunity to build resilience within high-risk communities. Education research amasses a field of study that is large in both depth and breadth, but there is a considerable lack of focus in post-disaster contexts, specifically the effectiveness of post-disaster training programs. Addressing this gap meant exploring recovery efforts in the Philippine region of Eastern Samar following Super Typhoon Haiyan, regarded as the strongest tropical cyclone ever recorded at landfall. The purpose of this research first explores expanding education theories into the post-disaster context and second, examines the practical implementation of training programs in the wake of the 2013 typhoon. A mixed methods approach combined qualitative data derived from accounts of community members and aid organizations with quantitative data that delineated community members learning style preferences in respect to experiential learning theory (ELT). Findings show that aid organizations administered training largely in lecture format, aligning with the reflective observation mode of ELT, but lacked diversity in formats represented in other poles of ELT. Moreover, analysis revealed that community members showed a preference toward divergent learning styles. Since aid organizations provided predominantly lecture based training, this partially aligned with community learning preferences, but fell short in cultivating other forms of knowledge acquisition. Based on this research, the application of existing learning theories will improve construction training as it applies to a post-disaster environment.

KEYWORDS: Training, Disasters, Experiential Learning Theory

INTRODUCTION

In November 2013, Super Typhoon Haiyan decimated a large swath of the central Philippines. All told, the storm killed over 6,000 people, injured almost 29,000, destroyed or damaged 1.1 million homes and cost over \$12.9 billion in economic impacts (Del Rosario 2014; NEDA 2013). By February 2014, over 65 nations and private donors contributed close to \$663 million in relief aid in areas ranging from logistics, shelter, water, sanitation, and economic recovery (Lum and Margesson 2014). Numerous international organizations assisted the Philippines throughout early post-disaster response and recovery, with many of these organizations helping with shelter reconstruction projects.

Communities, recovering from a disaster event, tend to rebuild on the same site due to familiarity. Yet, new construction is only marginally safer than pre-disaster infrastructure systems (Olshansky 2009). While many factors contribute to this phenomenon, including financing, time, and skill; this research focuses on one—skill development through training. The focus on measuring the impact of involving the community in recovery and resiliency actions versus measuring merely the output of recovery activities (e.g., number of structures built) has gained increased importance for aid organizations (Lawther 2009). Consequently, to use training as a

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means of community involvement not only empowers locals (Davidson et al. 2007), but adds additional benefits such as psychosocial recovery (Sullivan 2003). Further studies (Barakat 2003; Barenstein 2006; Fallahi 2007; Thwala 2005) all present multiple advantages of communities active participation in the post-disaster recovery phase such as being cost effective, producing a superior quality product quality, increasing construction capacity, and preserving the cultural heritage of the affected community. Bearing these benefits in mind, using training to involve community members is not enough. There exists a need to study the *effectiveness* of training programs within a post-disaster reconstruction environment (Wang et al. 2008).

Within the scope of our research, training and education may act as synonyms. While educational research has focused extensively on improving learning outcomes by better understanding educational processes, few studies have focused their research in the context of post-disaster recovery. Yet, the scarcity of education theory within post-disaster training does not necessitate its application. However, when accounting for the charge of the international community that a key pathway to improving health and welfare in post-disaster communities lies in education, the gap becomes apparent.

As disasters and their corresponding effects continue to escalate (Guha-Sapir et al. 2015), the United Nations (UN) has championed the effort to combat the upward trend by improving sustainability and resilience of both the built environment and social systems. This charge crystalized with the declaration that the 1990s were to be the International Decade for Natural Disaster Reduction. The work derived from this program manifested with the UN adoption of the International Strategy for Disaster Reduction (UNISDR). One of its earliest priorities, set forth in the 2007 Hyogo Framework for Action, was to “use knowledge, innovation and education to build a culture of safety and resilience at all levels” by 2015 (ISDR 2007). The UNISDR’s newest guiding document, the Sendai Framework for Disaster Risk Reduction, also includes a priority that “enhances disaster preparedness for effective response and to ‘Build Back Better’ in recovery, rehabilitation and reconstruction” (UNISDR 2015). We propose that this pillar cannot be achieved by the target date of 2030 without implementing an effective strategy for educating the global populous on resilience principles and practices.

Due to its complexity, there exists no unifying technique or methodology for training, educating or teaching that is applicable to all students at all times. Because people are not homogenous in their learning styles and preferences, learners must receive information in a variety of ways to enhance knowledge acquisition effectively. Many studies, however, have shown that employing a variety of teaching methods fosters not only the acquisition and retention, but also the understanding and application of knowledge (Prince and Felder 2006). Problems arise, however, when a curriculum must teach in a group setting, as is the case for the majority of education endeavors and in post-disaster settings.

The application of learning styles to settings beyond traditional classroom education is lacking. Derivatively, as disasters continue to increase, it becomes even more critical to improve recovery practices, particularly in the area of training. A study of learning styles in the context of disaster recovery will therefore improve both the theoretical applications of education research and the practical implementation of post-disaster training programs. To address this gap, we seek to understand post-disaster construction training programs by collecting and analyzing information on training programs implemented by non-governmental organizations in Philippine communities following the 2013 typhoon. We ask:

RQ1: What types of training programs are implemented in post-disaster construction?

We assessed and categorized the construction training programs employed in the wake of Super Typhoon Haiyan through the lens of experiential learning theory (ELT). This theory defines learning as “the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience” (Kolb 1984 p. 38). This theory postulates four distinct learning modes or poles: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation.

An effective construction training program in the context of Super Typhoon Haiyan is one that provides the learning audience the greatest opportunity for knowledge retention and future application. One way to assess effectiveness of training programs is to determine the alignment of the training program with the learning styles of affected community members. Doing so requires assessing the learning styles of community members as well as the learning modes that non-governmental organizations use to administer the training programs. Therefore, we asked the research question:

RQ2: What are the learning styles of community members trained in post-disaster construction?

BACKGROUND

The world, through UN doctrine over the last three decades, expresses the desire to reduce disaster effects on the built and human environment. One manner in which to achieve this goal is by educating communities to “Build Back Better”, thus increasing the knowledge of sustainable and resilient construction. While there are no shortages of options in terms of learning styles, definitions, and applications, most frameworks and studies focus on formal academic settings, with limited research in post-disaster contexts. To understand the impact of alignment between learning styles and post-disaster training programs, this research employs experiential learning theory (ELT) and Kolb’s Learning Style Inventory (LSI) to assess training programs conducted by aid organizations to Filipino community members after Super Typhoon Haiyan.

Experiential Learning Theory

As Dewey (1938 p. 7) noted, “...there is an intimate and necessary relation between the process of actual experience and education.” Grounded in work by Dewey (1938), Lewin (1951), and Piaget (1973), Kolb (1984) developed experiential learning theory, which is an approach to education and learning based in philosophy, social psychology, and cognitive psychology. Kolb envisioned a “framework for examining and strengthening the critical linkages among education, work, and personal development” (Kolb 1984 p. 4). The links he describes attempt to bridge the gap between the “abstract ideas of academia into the concrete practical realities” of everyday life (Kolb 1984 p. 4). Experiential Learning Theory (1984) is based upon six distinct propositions:

1. Learning is best conceived as a process, not in terms of outcomes (p. 26).
2. Learning is a continuous process grounded in experience (p. 27).
3. The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world (p. 29).
4. Learning is a holistic process of adaptation (p. 29).
5. Learning involves transactions between the person and the environment (p. 35).

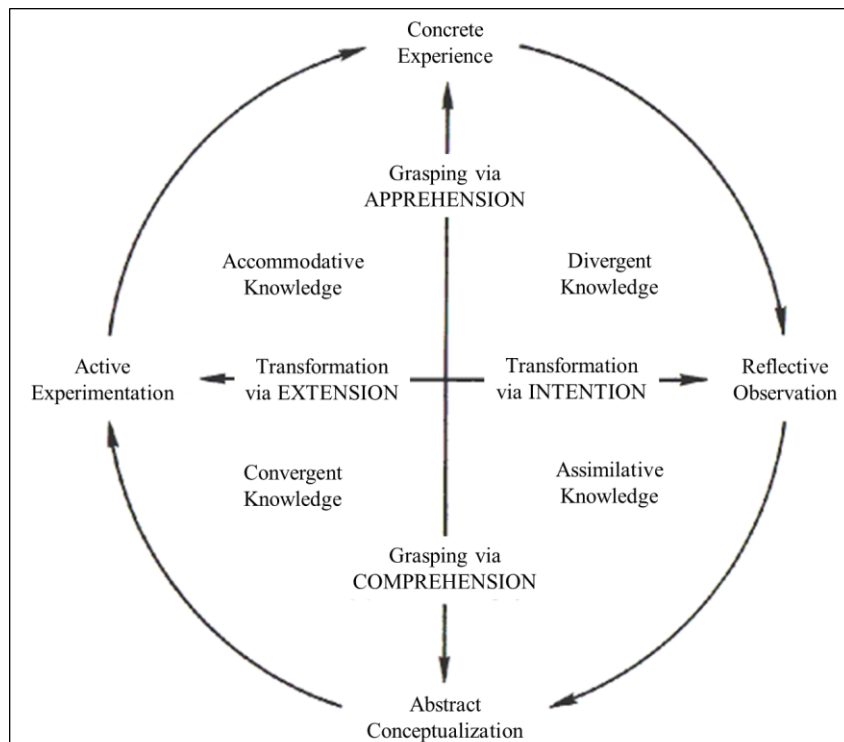
6. Learning is the process of creating knowledge (p. 35).

In Kolb’s theory for experiential learning, he submits that learning occurs within a “four-stage cycle involving four adaptive learning modes—concrete experience, reflective observation, abstract conceptualization, and active experimentation” (Kolb 1984 p. 40). These four modes are defined below:

- ❖ The *Concrete Experience* (CE) mode characterizes a person’s emphasis on feeling and analysis of the present reality, as opposed to thinking and a concern over the theories and concepts that apply.
- ❖ The *Abstract Conceptualization* (AC) mode, opposite of CE, centers on thinking rather than feeling. This mode focuses on logic and concepts and downplays any artistic influences.
- ❖ The *Reflective Observation* (RO) mode concentrates on understanding a situation’s meaning through observation. This mode is less concerned with the pragmatic application of ideas, but rather understanding the true underlying concepts that govern.
- ❖ The *Active Experimentation* (AE) mode places practical application of ideas over the need to understand their meaning. Therefore, this mode cares about what works at the present moment and not necessarily the fundamental concept behind it.

Therefore, the first of Kolb’s major assumptions is that a learner progresses through the stages in a clockwise manner that accentuates the adaptive and integrative process of learning by experience (See Figure 1). While learners may prefer a particular stage, they transform learning into knowing by navigating through all stages.

Figure 1: Kolb's Cycle of Experiential Learning (Kolb 1984)



Learning Styles

Kolb indicates that the relationship between abstract conceptualization vs. concrete experience (AC-CE) and active experimentation vs. reflective observation (AE-RO) are “two distinct dimensions, each representing two dialectically opposed adaptive orientations” (Kolb 1984 p. 41). This is Kolb’s second major assumption, effectively stating that learners must choose a greater partiality towards one mode or the other. To explain further, the AC-CE dimension consists of *prehension* while the AE-RO dimension is that of *transformation*. Prehension is the process of either grasping experience by tangible qualities, called *apprehension* (CE) or conceptual interpretation, named *comprehension* (AC). Transformation is then the processing of this grasped experience, focused on contrary methods of internal reflection, called *intention* (RO) or through active handling, called *extension* (AE).

Although Kolb describes that learning best occurs when the student travels through all four stages of the learning styles, he accepts the basic human tenant of gravitating to programmed tendencies that develop over time. Based on the observational research of Hudson (1966), Torrealba (1972), and Grochow (1973), Kolb thus characterizes four learning styles—convergent, assimilative, divergent, and accommodative—as shown in the quadrants in Figure 1.

The *convergent* learner is dominant between the abstract conceptualization and active experimentation modes. The convergent knowledge seeker’s prehensive tendency is toward comprehension (AC) and transforms it through extension (AE). He or she performs well when solving problems with only one answer and prefers to address technical tasks while avoiding social concerns. Oppositely, the *divergent* learning style relies on concrete experimentation and reflective observation. The divergent style grasps knowledge through apprehension (CE) and transforms it through intention (RO). This group tends to be problem solvers due to their imaginative nature and reliance on generating alternative perspectives to a problem. They thrive in interpersonal brainstorming sessions. Those that *assimilate* knowledge do so through abstract conceptualism and reflective observation. The assimilative style grasps knowledge through comprehension (AC) and transforms it with intention (RO). These individuals excel at development of theoretical models by integrating seemingly random pieces of information into a single thought. Lastly, and opposite to assimilators, are the *accommodative* learners who use concrete experience and active experimentation. The accommodative style uses apprehension to take in experience and transforms it via extension (AE). They are prone to the “trial-and-error” method, are action based, and heavily reliant on personal interaction. When the presented facts do not fit the proposed theory, they disregard the theory and adapt to the facts.

Learning Style Inventory

Kolb recognized that there would not be one model that fits individuals at all times; however, he recognized that individuals would condition themselves to prefer a particular learning style over time. Thus, to determine an individual’s preferred learning style within ELT, he developed the Learning Style Inventory (LSI). Kolb constructed LSI to adhere to a few basic tenets. The first is that LSI should resemble an actual learning experience for the user, thereby forcing the taker to address their partiality between concrete vs abstract prehension and reflective vs active transformation. Secondly, Kolb made LSI a self-assessment, convinced that people’s description of themselves would better represent their true self than a performance test would show. Lastly, he wanted a valid, simple, yet candid assessment that could provide virtually instant feedback.

The LSI has undergone several revisions since its creation in 1969, but we employed Version 3.1, published in 2005, for our research. This choice stems from its mainstream use in measuring learning styles and for its applicability across national and cultural context (Yamazaki 2005). For each of the 12 questions within the LSI, the respondent ranks four statements that complete a sentence stem (e.g., “I learn best when”) on an ipsative scale of 1 to 4 in a manner that reflects their preferences. The results include scores that highlight the emphasis that respondents place on each of the four modes (CE, RO, AC, and AE), and a derivative score that indicates their preference on the dimensional scales (AC-CE, AE-RO).

METHODOLOGY

This research aims to characterize residential construction training programs and analyze the link between employed training methods and a preferred community learning style in a post-disaster reconstruction setting. To accomplish this, we selected a mixed method research design. Mixed methods research is broadly defined as “the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration” (Johnson et al. 2007 p. 123). The narrative data adds context and meaning to the numerical data derived from the Kolb LSI survey. Conversely, the LSI figures corroborate and add precision to the interview accounts. In the end, the two sets of data become mutually beneficial.

Community Selection

We collected and analyzed data within three communities from Eastern Samar – Cantahay, Cogon, and Sulangan. We selected these communities because they had similar damage levels from the typhoon, were comparable in size and socio-economic demographics, but had notable variation of post-disaster recovery training strategies. We selected a community (or barangay) as the unit of analysis for our research since a regional breakdown was too broad and individual study too specific. A community includes the active participation of aid organizations’ leadership and members, along with local stakeholders defined as government officials and shelter beneficiaries.

Data Collection

Within the three communities identified for analysis for this paper, data collection occurred in two distinct phases. In the first phase, the second author conducted semi-structured interviews with community members and aid organizations that focused on training efforts at different recovery stages. He conducted the interviews in Waray, with aid from a translator, which were then translated into English and transcribed. Within these three communities, he conducted interviews with six respondents from three separate aid organizations and with 38 members across the three communities.

In the second phase of research, we collected additional quantitative data from within the selected communities. A local research assistant, familiar with the region and a native speaker, administered a written survey to community members, which collected basic demographic information along with administering Kolb’s LSI. The research assistant translated the survey responses, conveyed in the native Waray dialect, into English for our analysis. We also wanted to ensure a range of participants, including both males and females, and obtain responses from individuals who had participated in a structured training program. Of the 118 total responses, 47%

(56 respondents) were male, 53% (62) were female, and 34% (40) noted they had participated in a structured training program.

Data Analysis

Qualitative Analysis

We imported the interview transcripts into NVivo coding software to conduct content analysis. We blended our approach by including deductive and inductive coding that generated relevant themes for further analysis. Our initial coding structure used “top-down” or deductive information derived from experiential learning theory and were revised through “bottom-up” or inductive refinement that incorporated any emergent categories (Fereday and Muir-Cochrane 2006). In order to ascertain accuracy, we continually reviewed the data for coding and categorized various aspects according to the established themes (Creswell 2013).

The final codebook contained several categories, but for the purpose of this paper, we will focus on the following major themes: **Training Methods; Training Objectives; and Community Perception**. Training methods stemmed from our deductive coding, which attempts to align the employed training methods to the learning modes of ELT. For example, when an interviewee said “*Yes, there were lectures done like on the measurements, and they were taught how to use the carpenter’s meter. That was important, how to use the meter,*” we coded it as lecture format, which in turn deductively relates in ELT terms to reflective observation. Training objectives and community perception emerged through the process as prominent themes that addressed the alignment of these methods to the preferred learning style as a latent measure of effectiveness. As an example for one these themes, one shelter beneficiary stated, “*I have learned some new things in this construction, like making the rings on the steel bars. They are using a different way from what we used to do here.*” This statement fits into the Community Perception theme, which we then coded inductively as a positive sentiment.

Quantitative Analysis

We recorded each respondent’s responses to Kolb’s LSI. To review, the LSI is a 12-question survey that provided statements of learning methods where respondents rate their agreement or disagreement according to their preferences. The completed LSI produces a measurement of six ELT variables of four primary scores that are tied to the learning modes (CE, RO, AC, AE) and two combination scores that measure the preference on the two continuums (AE-RO, AC-CE). For example, when a respondent ranked a statement that was *most* preferred, it translated into a score of 4 and conversely a score of 1 meant it was the respondent’s *least* preferred statement. Each of the four statements per question correlate to a learning mode and the resulting summation of ranks produced its score. With the four primary scores calculated, we derived the combination score by subtracting the two dialectic modes on the two separate continuums (AE – RO; AC – CE). The combination scores for an individual were then plotted on the Learning Style Type Grid.

The next step was to aggregate the individual plots into our unit of analysis: the community. This aggregation incorporated two measures: the mean plot based on the two continuums (AE-RO, AC-CE) and the variation from the mean for the community at-large. We derived the mean by plotting the average AE-RO score on the *x*-axis and the AC-CE average on the *y*-axis. We visually represented the variation of a community’s mean plot by calculating the standard deviation along each continuum, scaled it to the Learning Style Type Grid, and then assigned these values to the dimension of an oval, whose center was the mean plot. The oval’s height represented the scaled standard deviation for the AC-CE axis, while the width represents the same for the AE-RO axis.

KEY FINDINGS

The key findings of our analysis split according to our two research questions. The first depicts the types of training programs employed by aid organizations in the aftermath of Super Typhoon Haiyan. We analyzed training programs based upon their objectives and methods employed within the community from the qualitative analysis of the interviews with training organizations and community members, triangulating the results with training materials collected on the ground. These findings first explore the trainings' overall objectives and then account for the frequency of applied training methods, coded against Kolb's learning modes. Secondly, we present the individual and aggregated community learning style preferences resulting from administering Kolb's LSI within the selected communities. Lastly, we present whether aid organization's training programs employed learning modes that effectively aligned with the learning styles of the community members.

Training Objectives

It is widely noted in literature that setting training objectives aids significantly in effective knowledge transfer (Gagne 1985; Kontoghiorghes 2001; Kraiger et al. 1995; Lee and Pucel 1998; Mager 1975). Optimally, a training program's design should start with needs assessment to determine: organizational goals, where training is needed, and a robust analysis of the training audience in order to determine their learning needs and preferences (Arthur et al. 2003). This process establishes the evaluation criteria needed to conduct the evaluation of how the training program performed its intended function. Thereby, the effectiveness of the training program conveys itself through a specific measure of the intended changes to an individual's skill or behavior. Through the coding process, we found specific references to stated objectives of the three organizations within this paper. Our findings discuss the training objective similarities that all of the organizations emphasized and shared in their interviews. All three organizations discussed two distinct training programs within each community—one geared towards the builders of post-disaster shelters and the second centered on training the individual homeowners.

Builder-Centric

For the builder-centric training program, the method of training relies heavily on certification from the Filipino government agency known as the Technical Education and Skill Development Authority (TESDA). Enacted in 1994, TESDA's overall purpose is to "provide national directions for the country's technical-vocational education and training (TVET) system" (TESDA Planning Office n.d.). Within this program, middle-level skilled workers, including carpenters and masons, undergo a structured program that concludes with a certification if trainees meet certain prescribed competency standards. While TESDA's training program lacks at specifically addressing disaster shelter construction, it remains a highly coveted skill set to both aid organizations and shelter beneficiaries who seek to employ builders in disaster-affected areas. All references, no matter the source, spoke positively of having TESDA trained and certified builders. One of the organization's team leader instructed shelter beneficiaries, "*It's more practical to hire the builders that were trained by TESDA*" and that "*before we started the construction of houses, we have this training with TESDA. The builders and those who were interested attended the training.*" Although certification is not a requirement to work on building shelters, organizations definitely encouraged community members to hire a trained and certified builder. The Director of Education for an organization described complementary characteristics for builders in that "*they are the people with the construction experience, they are the builders, they*

are the people from inside the community, that people that we have worked before, very familiar with our systems, the best people to train.”

On top of their TESDA training and prior work experience, skilled builders receive additional training from aid organizations on the specific construction plan for the designed structure. In terms of ELT, an initial lecture-based review of blueprints and technical documents allowed builders to grasp the new design through the lens of the abstract conceptualization mode. The education director reinforces the reliance on the document review, by saying, *“We use the construction documents as the main point of reference for everything. So for all training, there is always the relationship to the construction documents.”* They progressed through the ELT cycle by moving out of the classroom, typically to the construction of a “pilot” house that transformed the grasped construction concepts via active experimentation. When asking an organization’s shelter consultant if this step helped assess the builder’s knowledge, he responded, *“Yeah, by doing rather than having all these theoretical ways to do it.”*

Homeowner-Centric

Whereas the builder received technical instruction on specific construction methods, if possible from TESDA, aid organizations indicated that homeowners needed broader and less technical training. A shelter cluster coordinator stated, *“We train all the beneficiaries at recovery but the expectation isn’t that they will be able to build a house for themselves after this training but rather that they are aware of the key messages.”* The key messages he mentions refer to the “Build Back Better” initiative found with the UN’s Sendai Framework. In essence, this organization’s success criterion was to raise awareness of these key messages within the community so that they may better understand the purpose behind certain building practices. Building on this objective theme, the shelter consultant conveys the importance that raising homeowner awareness of sustainable construction methods is paramount to resiliency by saying, *“we developed the methodology, we don’t do anything, people will have to do it, [and] we can facilitate and train them to do it.”* He continues by saying a key aspect of their training program is that *“people can do it [learn] so they can train each other, others can’t do it but they can help each other...and that is resilience.”*

A second stated objective for homeowners was to train them on how to effectively screen and hire competent builders for their homes. An organization’s area team leader described that once they identified a beneficiary for a new shelter, *“before you [beneficiary] will be given this project, you have to go through first with the homeowners training, to ensure that you can find a builder who will pass the builder’s screening.”* The team leader continued that once a homeowner hires a builder, any subsequent decisions and agreements made (e.g. material purchases) are between them and do not involve the aid organizations. While homeowners desired to hire reliable and capable workers, the future working relationship added additional hiring criteria for the homeowner to consider. Therefore, the aid organizations deemed builder screening a particularly essential skill to train.

A last collective objective for homeowner training found among the organizations was that homeowners needed to know how to procure good, quality materials for building their homes. It is an important aspect as noted by the Director of Education when he said, *“material quality is included in this training, for [the] homeowner is responsible for that.”* An architect from one of the aid organizations reiterates this point when he said, *“We explain to them that you will be living in this house so you must know how to choose materials. We usually had training with our consultant engineer and we trained homeowners...how to choose materials that are safe to use in the construction.”*

To summarize, the training objectives set forth by the aid organizations split into two categories: builders and homeowner training. The builders, preferably TESDA certified, received technical instruction on how to build the designed shelter by focusing on the provided plans and practical experience on a pilothouse. For shelter beneficiaries, they wanted to raise their awareness concerning resilient building practices, how to screen capable builders properly for hire, and how to procure safe and reliable building materials.

Training Methods

The coding process revealed two distinct dimensions concerning training. The first dimension portrays the interviewees’ occupation. This ranged from fishermen or unemployed beneficiaries (titled “Homeowner”) to an individual that had construction experience who also participated in the shelter building process (titled “Builder”). There were a few cases where these two categories overlapped, such as a fisherman who also actively participated in construction, so they coded as “Mix.” The second metric classified the training delivery method into the four Kolb learning modes. For instance, when a community member spoke of attending a seminar presentation regarding construction methods and processes, but it lacked any participatory activities, this interaction coded as solely within the reflective observation mode. Table 1 lists the percentage of community members, separated by occupation type, which received training in a manner tied to one of the ELT modes. It is worth noting that 27 of the 28 interviewees received training that classify as reflective observation and members from Cantahay experienced the widest variety of ELT modes.

Table 1: Relative Frequency by ELT Mode

		Total Respondents	AC (Thinking)	AE (Doing)	CE (Experiencing)	RO (Reflecting)
Cantahay	Homeowner	5	0% (0)	20% (1)	40% (2)	100% (5)
	Builder	0	0% (0)	0% (0)	0% (0)	0% (0)
	Mix	3	33% (1)	67% (2)	67% (2)	100% (3)
Cogon	Homeowner	6	0% (0)	0% (0)	17% (1)	100% (6)
	Builder	1	0% (0)	100% (1)	0% (0)	100% (1)
	Mix	0	0% (0)	0% (0)	0% (0)	0% (0)
Sulangan	Homeowner	10	0% (0)	20% (2)	40% (4)	100% (10)
	Builder	1	100% (1)	0% (0)	0% (0)	0% (0)
	Mix	2	0% (0)	0% (0)	50% (1)	100% (2)

However, further analysis linked these training methods with the training objectives and intended audience. For example, a builder from Cantahay first received an extensive plan overview (AC) and a lecture that included “*how to do the construction work, like how to do the flooring, the footing, the posts, and the like*” (RO). When asked to elaborate, the builder stated the lecture was *just for half a day only, and it was done one morning; in the afternoon we proceeded with the actual house construction*”. Therefore, aid organizations rounded out a builder’s skill set through additional training on a “pilot” house with the aid of a supervising engineer (AE, CE). The Director of Education explained, “*You can look at a construction plan, but you can’t visualize in your mind what it looks like. So, being able to have these completed structures, and being able to do this training in that kind of environment really helps them to build.*” The combination of all these ELT

modes sufficiently provided these builders with the necessary skills to build a reliable structure according to the design drawings.

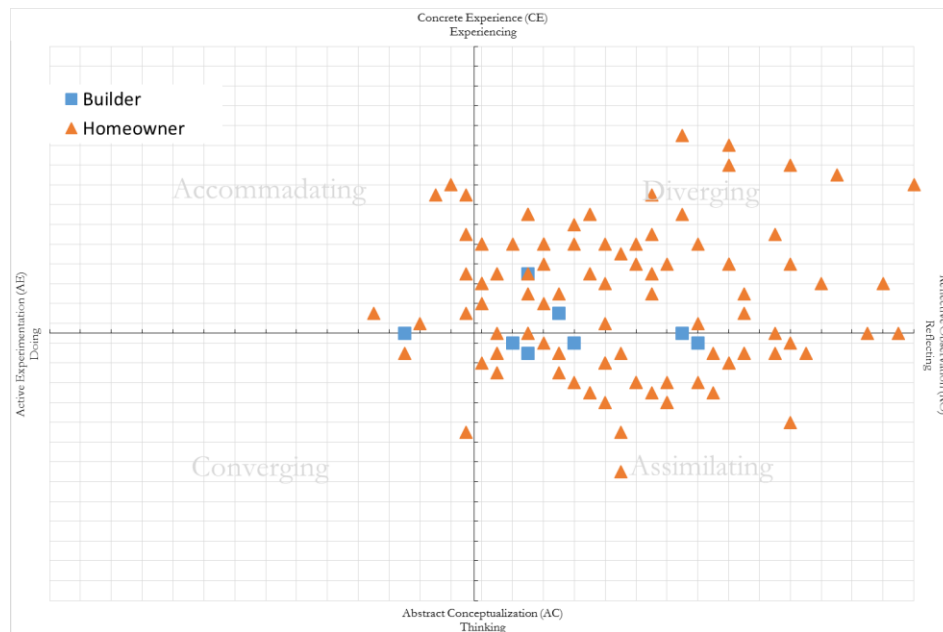
In contrast, the homeowners experienced a vastly different method of training. The first exposure that homeowners faced occurred during an early coordination meeting hosted by the aid organizations. As a part of this meeting, they presented technical blueprints and photographs of shelters in various stages of construction to shelter beneficiaries as a technique in the realm of reflective observation. A Sulangan beneficiary, when asked if they received an explanation regarding the new shelter design specifications, responded that, *"They just asked us to give it to the carpenters for them to follow."*

Additionally, the aid organizations across the three communities used these communal lectures to present information that included topics on construction, material purchasing, and preparation tactics. However, there remained a significant absence of additional references to any subsequent organizational training that would have satisfied the other training modes described in ELT. Yet, it emerged that beneficiaries often sought learning opportunities from within the AE and CE modes through informally observing the builders constructing their house. One respondent, with no construction experience, noted, *"Since they were already skilled carpenters and had undergone training, I got to learn from them."* These impromptu lessons covered complex topics such as blueprint interpretation to practical construction skills like measurements, nailing, bracing, joints, and foundations.

Community Preferred Learning Style

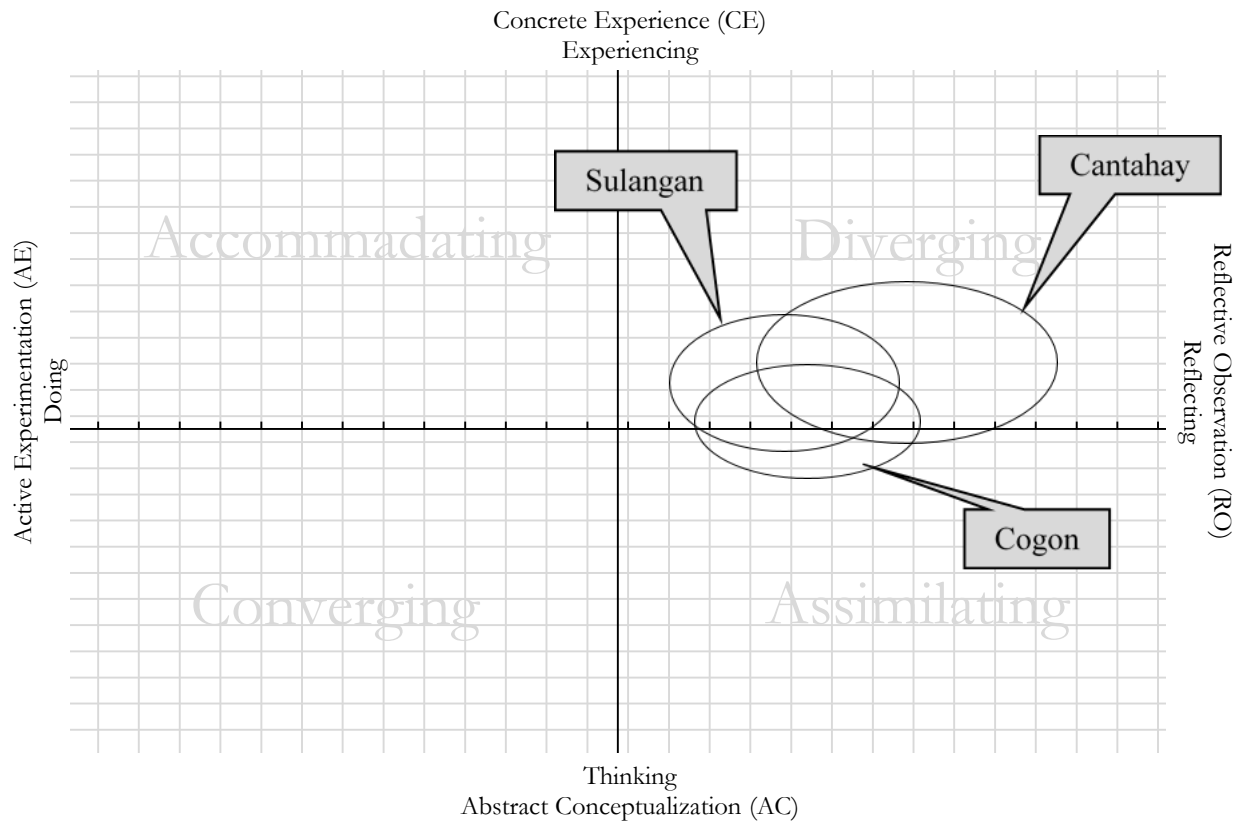
From the collection of LSI administered to all three communities, the depiction of the individual scores, broken down in the occupational categories of builder versus homeowner, seen in Figure 2 below:

Figure 2: Homeowners & Builders LSI



Using the aggregation method described in the quantitative analysis section, Figure 3 displays community averages and accounts for variability visually through the height and width of the respective ovals.

Figure 3: Aggregated Community LSI



As the figures depict along the prehension continuum (AC-CE), there remains a varied preference on how communities prefer to grasp new experience. While a majority of respondents and communities prefer Concrete Experience, there is a slight partiality for using Abstract Conceptualization to think about new concepts. The respondents, on the transformation continuum (AE-RO), gravitate toward the Reflective Observation mode over Active Experimentation, which connects how the respondents prefer to transform these grasped experiences. Across all three communities, therefore, the preferred learning style is mainly diverging, but teeters close to the assimilating style.

Kolb submits the greatest strength of the divergent learning style lies in using “imaginative ability” to gather “many perspectives” in a manner that is best suited for the “generation of alternative ideas and implications” (Kolb 1984 pp. 77–78). Alternatively, the assimilator relies on “inductive reasoning” to incorporate “disparate observations into an integrated explanation” (Kolb 1984 p. 78). While the choice for a lecture-based format suited the emphasis on reflection rather than active experimentation, the aid organizations fell short when addressing the need to process. These two descriptions are apt in explaining the importance of alignment in terms of a community’s preferred learning style and that of an organization’s approach to teaching resiliency principles.

Alignment

Kolb’s ELT is rooted deeply in the learning process, whereas a learner progresses through the cycle of learning modes to gain true knowledge of a given subject. The four learning modes

(*CE, RO, AC, AE*) he defines as separate poles, but as the theory builds, they are split across dialectically opposed continuums (*AC-CE, AE-RO*). Through the relationship between these continuums, Kolb defines learning styles (*convergent, divergent, assimilate, accommodate*), since it portrays the relative emphasis of how a learner grasps (abstract versus concrete) then transforms (active versus reflective) experience into knowledge. While Kolb highlights the progression through the learning modes and by default, the learning styles, he accounts for the human tendency to form habits and preferences that stem from experience, skill, and attitude. It should be concluded, therefore, that an effective learning program first acknowledges a learner's preference, but then purposefully addresses the remaining gaps to complete the cycle of experiential learning.

Through the content analysis of aid organizations and community members, we noted two distinct findings regarding the types of post-disaster training administered: (1) those that actively participated in the construction of new shelters (skilled workers or those with construction experience) received a wider exposure to each of the learning process phases; (2) unskilled shelter beneficiaries received formal training predominately through lecture (*RO*), but actively sought out informal experience through observing the construction process (*CE*). Builders, therefore, had greater coverage of the ELT cycle, through detailed plan reviews, demonstrations on pilot shelters, and active construction work.

Conversely, aid organizations had a tendency to employ fewer of the learning modes (mainly lecture-based seminars) for homeowners, thus depriving them of the full learning process as prescribed by ELT. Had aid organizations employed learning style research prior to training implementation, the resulting data would reveal the communities dominate preference toward *RO* when grasping information and a mix penchant to *CE* and *AC* when transforming new information into applicable knowledge. While lectures accurately aligned with the community preference toward grasping new experiences, the aid organizations fell short when providing learning opportunities for processing the presented concepts. Active demonstration or by increasing community participation during the physical construction work would have adequately addressed this gap in the learning process.

LIMITATIONS AND FUTURE WORK

We acknowledge limitations in LSI. For instance, there is little empirical evidence that shows the predicative ability of the LSI results towards an individual's performance in knowledge transfer, understanding, and application (Koob and Funk 2002; Manolis et al. 2013). Furthermore, Kolb claims that learners need to learn immersed within all four learning styles, yet his LSI ipsative rating scale forces respondents to narrowly choose between the four statements (Henson and Hwang 2002; Kayes 2005). There is also no room for flexibility or comparative analysis (i.e., it is impossible to score as strong or weak in all four styles). Additionally, by identifying a single preferred style, it makes it impossible to identify relevant substyles (Manolis et al. 2013)

Reliability is a measure of internal consistency of an instrument across similar scale items (Kayes 2005). Without reliability, there is no assurance that the model will consistently measure a construct. Additionally, reliability is directly related the validity of the measured output. This fact applies as the LSI is an attempt to empirically measure an observation on hidden brain processes that can only be inferred (Koob and Funk 2002).

Based on this research, we believe we can improve on the application of existing learning theories as it applies to construction in a post-disaster environment. We hypothesize that if an organization, set to teach a community the principles and practices of resiliency, customizes their teaching methods to accurately fit the dominate learning styles of the target audience, the retention

and application of the new knowledge will improve. This may result in stronger civil infrastructure construction, thus increasing resiliency within the community.

The preceding result lies outside the scope of this paper, but is a driving force for this research. The future strategy for testing this hypothesis is two-fold: (1) inclusion of 17 additional affected communities within the provinces of Cebu and Leyte; and (2) administering a construction knowledge examination that tests respondent's understanding and retention of the UN's "Build Back Better" themes that matriculated throughout organizational training. Our research team assumes the "Build Back Better" themes adopted by the UN and used by engaged NGO's represents the best answer for resilient and sustainable construction practices. Therefore, we hope to glean substantive results regarding training effectiveness through the analysis of the construction knowledge test.

CONCLUSION

This research analyzed the learning modes addressed through skill development training within a post-disaster environment. Through the application of Kolb's experiential learning theory, we increased theoretical application of education research into a previously under-represented scenario (disasters) to explore the effectiveness of implementing resiliency training programs for disaster victims. In this light, we have categorized the training programs administered by aid organizations in the recovery phase of Super Typhoon Haiyan according to Kolb's ELT. Previous sections show that builders had greater exposure to the full cycle of ELT modes, not only from organizational training programs, but also through past construction work and the TESDA formalized certification program.

While Kolb champions the strategy that incorporates all four modes into learning, he understands that human's may adapt programmed learning tendencies that arise from multiple influences, such as experience, skill, and attitude. For the case of the regular homeowner, this group predominately received structured training in the form of seminars and lectures that we solely linked to the RO mode. However, as the LSI results convey, the three communities tend to gravitate toward RO instructional methods when grasping new experiences. Yet, as Kolb describes, "more powerful and adaptive forms of learning emerge when these strategies [learning styles] are used in combination" (Kolb 1984 p. 65). Intuitively, homeowners sought out additional learning opportunities outside the organized classroom that crossed the AE and CE modes by merely observing the construction of their new shelter. By watching, or even participating in the construction process, they transformed their conceptual knowledge into applicable skills.

An effective learning system exists when the various differences between the students (gender, learning styles, employment, academic level, etc.) are met with a variety of learning methods (Lengnick-Hall and Sanders (1997)). The use of various methods creates the necessary opportunities for diverse students to transform presented material into lasting knowledge.

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