Chapter 15 Collaborative research and action: The Changzhou Worker Wellness Project

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Abstract
As emphasized in this book, collaborative research and learning, across disciplines and societal sectors, is critical to address complex health and social problems. Over the past century, there has been an increasing focus on such "transdisciplinary" approaches in the scientific literature, teaching and interventions. However, researchers and practitioners in specific disciplines often question the value of and scientific basis for transdisciplinary work. Further, putting transdisciplinary methods into real-world action remains highly challenging. What does it *really* mean to engage effectively with the diverse stakeholders needed to solve complex problems? Therefore, it is important to advance not only the scientific rationale for transdisciplinarity, but also have case examples. In this chapter, we summarize the pragmatic problem-solving concerns that catalyzed the transdisciplinary movement as well as the transformation of perspectives about ontology and epistemology that provide a scientific foundation for transdisciplinary research and action.

We describe a collaborative research and action initiative in China. The goal of the Changzhou Worker Wellness Project is to address problems of migrant factory workers in China. Over 250 million Chinese rural residents have moved to industrial areas for work and struggle with serious health and social issues and many prior government "top down" efforts have not been successful.

Beginning in 2011, a collaborative of researchers, government officials, service providers, factory workers and managers and other stakeholders developed a transdisciplinary project to support migrant workers. By using participatory methods drawn from multiple models and methods, collaborators identified many worker issues and created innovative interventions. This chapter summarizes project strategies, challenges and successes.

Key words: knowledge collaboration, transdisciplinary, participatory design, action research, community-based participatory research, migrant worker interventions

A major worldwide challenge is to understand and address highly complex problems, such as poor health, poverty and environmental degradation. A powerful way to do so is to integrate and implement knowledge across multiple disciplines and sectors, a process called "transdisciplinarity." Using transdisciplinary approaches is difficult, because university teaching, research institutions and practice organizations all tend to have disciplinary specialization. However, since the emergence of transdisciplinarity in the mid-1900s, we now have not only a solid theoretical foundation to guide this work, but also a growing number of real-world transdisciplinary efforts to enhance our collective learning.

This chapter is intended as a companion case study to the chapter in this book entitled: "Practical and scientific foundations of transdisciplinary research and action" (Neuhauser 2018, chapter 3 in this book), which describes the pragmatic and theoretical roots of transdisciplinarity. This chapter provides a brief summary of the scientific foundation of transdisciplinarity and focuses on the design and implementation of a transdisciplinary project. We have four objectives for this chapter: 1) briefly summarize the emergence of transdisciplinarity to address complex problems; 2) briefly describe the scientific foundation of transdisciplinarity; 3) explore a case study of a transdisciplinary project in China; and 4) discuss issues and recommendations about transdisciplinary work.

15.1 The emergence of transdisciplinarity to address complex problems

The transdisciplinary movement was directly catalyzed by the realization that traditional approaches have not been effective to address complex problems, as summarized below and in other chapters in this book (Gibbs et al. 2018, chapter 1 in this book; Klein 2018, chapter 2 in this book; Ross & Mitchell 2018, chapter 4 in this book; Prior et al. 2018, chapter 5 in this book; Nicolescu 2018, chapter 6 in this book; Gibbs 2018, chapter 19 in this book). Key weaknesses include: 1) research integration; 2) research translation and implementation; and 3) participatory processes.

15.1.1 Research integration

Because most researchers work within a limited number of disciplines, it is difficult for those who conduct research and those who apply it, to access knowledge from many disciplines and perspectives (Bammer 2013; Lubchenko 1998). Research studies do not usually consider the fundamental determinants of problems, and many interventions fail (Phelan et al. 2010). For example, research and interventions about factory worker health are often guided by the traditional "medical model" that focuses narrowly on worker access to medical services, rather

than on the many other underlying socio-cultural and environmental "determinants of worker health." Key determinants include health knowledge, working conditions, social connections, diet, exercise, relaxation, and ability to manage life issues. There is now a strong movement to explore the many determinants of a problem across disciplinary boundaries and over the "life course" (Halfon and Hochstein 2002; Smedley and Syme 2000; Wilkinson and Marmot 2003; Whitehead 1991). Beginning late last century, new models of research integration advocated bringing together researchers of diverse disciplinary backgrounds to work on complex problems (Bammer 2013; Neuhauser et al. 2007; Best et al. 2006).

15.1.2 Research translation or implementation

Another issue is that even when researchers integrate multiple disciplinary perspectives and identify key determinants of a problem, they often overlook engaging with beneficiaries and stakeholders across sectors and resulting interventions do not work in "real-world contexts" (Neuhauser et al. 2007). Jensen (2003) estimated that interventions rarely reach more than 1 per cent of the target population. The "social-ecological model" (Stokols 2006) has now become a widely used framework to translate scientific findings into effective interventions. This model guides those who research problems and those who develop and implement interventions to consider interactions at all societal levels: from individuals, families, neighborhoods, communities and organizations, to broad cultural, political and environmental influences.

15.1.3 Participation in research and its implementation

Another weakness of traditional research for action approaches is the lack of deep participation from researchers, practitioners, policymakers and beneficiaries that affects all aspects of research integration and research implementation (Neuhauser and Kreps 2014; Minkler and Wallerstein 2008). Lack of participation among diverse stakeholders from an adequate number of disciplines and societal sectors makes it harder to get to the root causes of problems, and design effective interventions. "User participation" is often limited to "feedback," of already-designed interventions, rather than true co-collaboration from the start.

Since the mid-1900s, theory and methods of participatory design have emerged from disciplinary roots in social sciences (sociology, public health, etc.) and in socio-technical, or "design" sciences (engineering, architecture, etc.) (Neuhauser and Pohl 2014). Action research and community-based participatory research models emphasize reciprocal cycles of "research for action" and "action for research" and provide important guidance on strategies to create co-collaboration among researchers, implementers, beneficiaries and other stakeholders (Lewin, 1946; Reason and Bradbury 2008; Minkler and Wallerstein 2008). Action research, especially community-based participatory action research, generally involves long-term processes of community-researcher engagement, problem identification, reflection and intervention development, implementation and revision. Design science models are also highly participatory, but tend to use rapid, iterative problem identification and solution development methods that engage developers and end users as collaborators.

15.1.4 Transdisciplinarity: a unified concept to address complex problems

"Transdisciplinarity" has now emerged as the concept with the best fit to unify research integration and implementation across disciplines and societal sectors with intense participatory

processes. There are multiple definitions and models of transdisciplinarity (Gibbs et al. 2018, chapter 1 in this book; Klein 2018, chapter 2 in this book; Ross & Mitchell 2018, chapter 4 in this book; Prior et al. 2018, chapter 5 in this book; Nicolescu 2018, chapter 6 in this book; Gibbs 2018, chapter 19 in this book; Gibbs 2014; Hadorn et al. 2010; Hoffman-Reim et. al. 2008; Nicolescu 2010). One example is Pohl and Hirsch Hadorn's (2007:20) definition:

'The starting point for transdisciplinary research is a socially relevant problem field. Within this field, transdisciplinary research identifies, structures, analyses, and deals with specific problems in such a way that it can:
a) grasp the complexity of problems,
b) take into account the diversity of life-world and scientific perceptions of problems,
c) link abstract and case-specific knowledge, and
d) develop knowledge and practices that promote what is perceived to be the common good. Participatory research and collaboration between disciplines are the means of meeting requirements a)-d) in the research process'.

Transdisciplinary work is characterized by highly participatory, mixed (quantitative and qualitative) methods that engage researchers, beneficiaries and stakeholders from multiple disciplines and societal sectors from the beginning, rather than in disconnected phases.

15.2 The scientific foundation of transdisciplinarity

In addition to the practical motivation to solve complex problems that led to the transdisciplinary movement, a parallel transformation was taking place in thinking about the nature of reality and scientific inquiry that provides a robust theoretical foundation for transdisciplinarity. Perceived weaknesses in scientific inquiry and its application to addressing societal problems prompted the so-called "scientific revolution" in the mid-1900s (Kuhn, 1962). There was a shift away from the view that only one reality (ontology) exists and that it is knowable. A newer perspective is that reality is made up of multiple dimensions, (or, "directions in motion") with neither a beginning nor an end—like the Internet, and that reality is complex, contextual, and ever changing (Deleuze and Guattarti 1980; Cook 1985).

Changes in thinking about ontology led to parallel changes in thinking about epistemology, or ways of understanding reality. In this newer perspective, knowledge is "collective" cannot be found through any single discipline, and requires that multiple investigators and stakeholders gradually study phenomena from as many different perspectives as possible, and by using multiple theoretical frameworks, methods, settings and interpretations of evidence (Kahn and Prager 1994; Cook 1985). Such changes in scientific inquiry would be critical to investigate complex 'wicked' problems that are changeable, contextually localized, value-laden, difficult to understand and solve, and which must be constantly reevaluated (Rittel and Webber 1973; Tapio and Huutoniemi 2014). This has contributed to the emergence of new epistemological paradigms.

Until the mid 20th century, the dominant epistemological "natural science" paradigm assumed that the world is knowable, governed by universal laws and that knowledge can be generalized to multiple settings. This approach to scientific inquiry uses controlled experimental methods and has generally been a good fit for the natural sciences, such as physics and chemistry, but was insufficient to study phenomena affected by human behavior. This catalyzed the emergence of the 2nd major epistemological paradigm: the "human sciences," such as

sociology, anthropology, etc. (Dilthey 1988). This paradigm acknowledges that because human phenomena are not as predictable as those in the natural sciences, they must be studied using multiple methods in many settings (Cook 1985).

Both natural and human science inquiry study what exists, but solving complex problems means studying not only the present, but also the *future*—such as the process of developing effective new programs and revising them over time. To address this gap, a 3rd epistemological paradigm emerged in the mid-1900s: the "design sciences" (Fuller 1963). Design sciences, are concerned "not with how things are, but with how they might be" (Simon 1996). In design sciences, researchers and other stakeholders study human-created objects, activities, services and environments to solve problems and meet goals (Buchanan, 1992). Design sciences are especially useful to develop and constantly refine health and social interventions. Because the goal of design science inquiry is to solve problems, rather than to test theories, design science methods are highly participatory, qualitative, inductive and iterative (March and Smith 1995). A popular method is "design thinking" in which participants engage in rapid, simultaneous cycles of identifying problems and solutions. See Neuhauser (2018, Chapter 3 in this book) for more information about design science models and methods. All three epistemological frameworks and methods provide useful guidance for solving complex problems and are commonly combined in transdisciplinary work.

15.3 Transdisciplinary case study: the Changzhou Worker Wellness Project

In this section, we describe the Changzhou Worker Wellness Project as an example of using a highly participatory, transdisciplinary approach to address the complex problem of supporting migrant workers in China.

3.1. Project background

The People's Republic of China (China) is experiencing one of the largest demographic transitions in recorded history as hundreds of millions of rural residents (migrants) come to urban areas for work—especially in the new economic development zones. It is estimated that there are over 250 million migrant workers. Most of these migrant workers are under 30 years old, have low educational levels (less than high school), and limited understanding of managing life issues in their new urban environment (Lu and Xia, 2016; Zhang, 2010). They struggle with many challenges such as isolation from their rural families (including their children), depression, infectious diseases and reproductive health problems, and limited educational opportunities. In addition, the vast majority of migrant workers do not have a local *hukou* (official residence registration) in the urban area to which they have moved. Because they are not official residents, these workers often lack access to social security, education for their children, health services, housing and other services—as compared to official residents—and have poor knowledge about how to protect their health and create a stable and positive future.

The Chinese government developed its 12th five-year plan (2011-2015) that emphasizes the improvement of human wellbeing, especially among vulnerable migrant workers with lower education and resources. In 2017, President Xi Jinping announced the 'Healthy China' policy intended to provide high-quality health and wellness services for people over their lifetime.

Despite these major policy mandates, China has struggled to find effective ways to support migrant workers. Many traditional "top-down" approaches have not been successful to connect workers with health and social services or promote their health and wellness in other ways. This situation exhibits many attributes of a complex (or wicked) problem in which it is hard to plan in a rapidly changing demographic environment. Problems are sometimes caused by those charged with addressing them (in this case, by conflicting government policies), and problems are difficult to understand and solve without the perspectives of a range of stakeholders including those most affected (Rittel and Webber 1973; Tapio and Huutoniemi 2014). It is, therefore, a complex problem for which a participatory, transdisciplinary approach is recommended.

In 2011, the Chinese government contacted Pathfinder International and the Health Research for Action center (HRA) at the University of California, Berkeley to assist them with the development of a new, participatory strategy to support the health and wellness of migrant workers. Pathfinder International (http://www.pathfinder.org/) is a global non-governmental organization, which since 1957 has been committed to participatory approaches to health interventions, with a focus on sexual and reproductive health. HRA is a center in the School of Public Health at UC Berkeley (http://healthresearchforaction.org/). For over 25 years, HRA has used highly participatory and transdisciplinary approaches to co-design, co-implement and co-evaluate health interventions globally (Neuhauser et al. 2013). Other non-profit organizations contributed to the technical assistance and early start-up costs, including the Levi Strauss Foundation, the Institute for East Asian Studies at the University of California, Berkeley and Oxfam.

15.4 Project Model and Methods

Beginning in 2011, Pathfinder International and HRA partnered with the Chinese government and other stakeholders to develop the Changzhou Worker Wellness Project ('project'). This pilot project is located in the City of Changzhou in the south of Jiangsu Province between the cities of Nanjing and Shanghai. Changzhou has a population of about 4.7 million including over 1.5 million migrant workers. It is one of China's earliest industrial development zones and has a rapid influx of migrant workers. Although Changzhou had created many health and social services for migrant workers, worker participation was very low, due to distrust and lack of information and motivation.

Barriers to getting local resident status (*hukou*) was frustrating to workers who desired high quality education for their children and also a wide array of services. Further, migrant workers felt disconnected socially from their co-workers and from life in the city—leading to isolation and depression. Reports of high rates of unintended pregnancies and high risk for infectious disease were also a concern of factory managers and health providers in the city. And, factory owners and managers worried about difficulties recruiting workers and about high rates of absenteeism and turnover. From the outset, the project adhered to a transdisciplinary approach, drawing on guidance from many disciplines and from stakeholders in many sectors, with intense participation and the adoption of diverse, iterative, qualitative and quantitative methods. Key methods included those in the following sections.

15.4.1Training workshops

As mentioned above, a participatory, transdisciplinary approach has not been the norm in China, where decision-making tends to take place at high levels of authority. For this reason, beginning in 2012, we conducted three workshops with key stakeholders (government officials, researchers, service providers, factory owners and managers, media and other stakeholders) to explain the value of the proposed model and secure 'buy in' before the main activities were designed and implemented. These workshops focused on helping stakeholders understand: how to identify key determinants of health for migrant workers; the value of deep participation; results of baseline studies with migrant workers; and ways to identify potential intervention solutions. Although initially uncomfortable with the participatory process, stakeholders quickly began to appreciate it.

Methods used included lectures and discussion about participatory projects with migrant workers elsewhere, and "design thinking" exercises. For example, the design thinking exercise involved covering one wall of the training room with paper and having participants identify migrant worker issues and then pair those issues with ideas to address them. In that exercise, participants identified more than 50 determinants of migrant worker health, and many ideas for interventions. In the two initially participating factories (a garment factory and a computer component factory) workers volunteered to be 'worker leaders' and engage their co-workers to participate in the project and identify problems and practical solutions. Workers described used a variety of methods to engage other workers during non-work hours, such as in dorm rooms or other meeting places. In some cases, factories provided paid time off for worker leaders to conduct these meetings. The workshops and factory discussions were highly productive, resulting in high enthusiasm and confidence among the stakeholders and identification of specific problems and solutions.

15.4.2 Early engagement with factory workers
After the aforementioned stakeholders were trained and invested in the participatory approach and worker-leaders had discussed the project with other workers in their factory, the workers and other stakeholders had their first meetings together. This decision to not include the workers in the initial trainings was intentional. If stakeholders who held decision-making positions (government officials, health and social service providers and researchers) had not yet adopted the participatory approach, they would have been likely to follow the traditional approach of making decisions *for*, rather than *with*, the workers. The first meetings with worker-leaders and a small group of representative stakeholders were held at the factories. At first, the workers were reluctant to bring up wellness issues and ideas for the project—given that they were not used to being asked for opinions by those with more power.

We found that if the workers could identify a few problems and have their solutions adopted quickly, they became confident and participated enthusiastically in the project. For example, at one of the first meetings with workers and other stakeholders, workers asked for computers with webcams so they could communicate with family back in their home town. The factory manager immediately agreed to this request, which then motivated workers to come up with other issues and solutions. At another factory, workers identified the problem of having to travel long distances to take the required yearly health exam in their home town. They asked if they could have the exam in Changzhou instead. One stakeholder present was a national policymaker who, after checking the exact regulations with her national office during the meeting, granted the workers' request. These participatory exchanges modelled the value of "design thinking" strategies that rapidly identify problems and solutions among diverse

stakeholders, including those who experience a problem, and those with the power to approve solutions.

15.4.3 Identification of stakeholders and establishment of committees
In transdisciplinary processes, key stakeholders should be identified at the outset and provided with specific ways to collaborate. Project stakeholders included people from diverse disciplines: medicine, public health, sociology, social welfare, employment/labor, psychology, policy, government, education, statistics, government affairs, etc. They also included people from diverse sectors: government, academia, social services, health services, employment services, labor relations, education, private industry (factories), media and non-profit funding organizations. Stakeholders were represented on three committees: 1) Expert Committees of researchers and leaders from health and family planning with a focus on research and policy; 2) Service Committees of service providers and workers to focus on worker information resources; and 3) Administrative Committees of broad-based stakeholders to focus on linkages between factories and government organizations. The Committees brought together researchers, government officials, health and social service providers, factory managers and workers. The establishment of three committees proved to be an efficient and effective way to meet the transdisciplinary principle of engaging stakeholders from diverse disciplines and sectors in society, and at the same time focus their work on specific—rather than *all*—project activities. Representative committee members regularly meet across committees to integrate overall project activities.

15.4.4 Formative research—focus groups
During the first year of the project, Nanjing University of Posts and Telecommunications (Nanjing Youdian University) with the help of Pathfinder International partnered on focus group research to collect baseline information. Nanjing Youdian University conducted 5 focus groups with Changzhou leaders and health and social service providers and 6 focus groups with factory workers. Focus groups explored health and social service issues for migrant workers. Results identified major challenges faced by migrant workers, including: difficulties of providing services to workers who were spread across the city and disconnected from and distrustful of the system; lack of understanding of workers' rights; lack of participation in job training opportunities; lack of housing assistance; lack of social activities and support; lack of access to physical and mental health services and health information (Sun et al. 2012). An area of particular concern was that workers had little understanding of contraception and sexually transmitted diseases, resulting in high rates of abortions. Overall, results showed workers had little understanding about managing life issues in Changzhou.

15.4.5 Formative research—baseline worker survey
With input from HRA, Nanjing Youdian University conducted a survey with 1,114 workers in the two pilot factories to explore worker health and social issues (Sun et al. 2011). Results added to those from the focus groups. Workers expressed concerns about handling a wide variety of life issues, including: understanding their rights; accessing health and social services (few knew about available free health services); learning about health (many had incorrect knowledge about diseases like AIDS); understanding reproductive health and contraception (over 75% did not have accurate information about contraception); preventing unwanted pregnancies (about 30% of women had had an unwanted pregnancy and 22% had had an abortion); and having opportunities

to socialize and improve job skills. In addition, interviews with factory managers showed that they were very concerned with worker health issues—especially lack of worker connection with health services, lack of knowledge about positive health behaviors, high rates of unplanned pregnancies and abortions, and high worker turnover rates (sometimes 100% per year).

15.4.6 Problem and solution identification
Design thinking methods and worker discussion groups were used to identify problems and solutions from the perspectives of workers and diverse stakeholders. As mentioned above, the design thinking exercises with stakeholders took place during the workshops, resulting in lists of problems paired with ideas for potential solutions. The worker groups led by 'worker leaders' in the factories were a rich source of problem identification and solution generation. As transdisciplinary work on complex problems is a continuous cycle of problem identification and solution generation, these processes have been continuing over time in the factories. We note that as workers and other stakeholders become more comfortable with participatory processes, problem and solution cycles can improve in terms of more rapid decision-making and result in more refined interventions. This process has similarities to the business strategy of "continuous process improvement" (Fryer et al. 2007).

15.4.7 Iterative intervention design
The above research methods and stakeholder activities provided a large array of problems and potential solutions over a one-year period. Stakeholders refined priority interventions through the iterative process. Three key interventions emerged: 1) a worker- and expert-designed a low literacy 'Wellness Guide' about managing health and social issues in the local urban environment; 2) 'Wellness Houses'— rooms in each factory where workers could meet to socialize and discuss and solve issues, exercise, and have access to health care, job training and other services; and 3) peer-to-peer worker 'buddy' support systems in which experienced workers would be paired with new workers. Project stakeholders created a short video (in Mandarin with English subtitles) showing the project development, participatory process and interventions: https://www.youtube.com/watch?v=0WvVy1pyDbg

Although these interventions are primary interventions at the participating factories, the participatory process has generated many other interventions which (as described below) vary greatly according to specific factory contexts and also evolve over time. For example, in one factory, after the major intervention components had been implemented, women who were nursing mothers asked for a safe place to breastfeed their infants during work hours. The factory was able to accommodate this request. According to the principles of participatory design, it is the participatory *process*, rather than the specific interventions that is the most powerful part of the approach.

15.5 Project Progress and Findings

15.5.1 Project scope and primary interventions
To date, the number of participating factories has expanded from 2 to 31, with many more interested in joining and government commitment to expand the project citywide. These factories include more than 35,000 workers. In keeping with the project tenets of participatory design, each factory defines its own issues and creates its own Wellness House with worker and manager input. To support expansion and sustainability long-term,

the Changzhou government provides some initial funding for furniture and equipment in each Wellness House, and the factory pays the remaining costs, including for upkeep and build-out over time.

Wellness Houses are attractive and comfortable places where workers can socialize, receive training, solve problems, exercise, use the library and computers to find information and connect with families back home. The Wellness Houses are unique and adapted to the particular factory context and worker population. Intense worker input has been critical. In the earlier phases of the project, some factory managers acknowledged that when they shortchanged the participatory process and tried to push their own ideas for the Wellness Houses, their ideas failed. However, after they truly engaged with workers and other stakeholders, the interventions were successful. The project approach was also appreciated by factory managers who had experienced problems before joining the project. One factory general manager reported that his factory had set aside a space for workers to use, but did not know what to do with it until they joined the project and learned about how to collaborate with workers. Once engaged, those workers created a multi-faceted Wellness House that met their needs. In the design of one Wellness House workers identified low literacy as an issue and created literacy training activities. In another factory, workers wanted to address the problem of not having a local summer school for their children—a major factor leading to high turnover. They designed a beautiful children's classroom in the Wellness House, along a high-level curriculum.

During the development of the earliest Wellness Houses, project stakeholders decided to create one logo that would become an icon for all Wellness Houses. A designer developed several options. Interestingly, although professional project stakeholders (government officials and service providers) selected a traditional formal design, workers prevailed with their selection of the modern, positive and whimsical logo shown in Figure 1, that they think represents "workers smiling into the future." Project stakeholders frequently point to the logo with pride and often cite it as an example of the importance of worker input.

<Please add Figure 15.1 here >

Figure 15.1 The Changzhou Wellness House Logo selected by factory workers

The Wellness Guides—the second major intervention—are very popular with over 30,000 copies currently distributed. The easy-to-use Guides (middle school reading level) cover a wide range of topics as suggested by workers, experts, providers and other stakeholders including: health care access, sexual and reproductive health, infectious diseases (such as HIV/AIDS), diet, exercise, isolation and depression, education, job training, housing, dating, pregnancy and child care, workers' rights, and issues and local resources about living life in Changzhou. The Guide was originally modelled on a Chinese Wellness Guide developed in a highly participatory, transdisciplinary projected led by HRA (Neuhauser et al. 2013) and now adapted for use in Changzhou. This adaptation illustrates the transdisciplinary strategy of transferring and "re-creating" interventions within new contexts—rather than copying them. Workers and managers have many uses

for the Guide. For example, factories use the Guide to orient new workers to life in Changzhou. The Guide is a key resource at the Wellness Houses that offers workers information about many issues that are new to them. Figure 15.2 shows workers at a factory using the Wellness Guide during a discussion of worker issues. After feedback and refinements, a 2nd edition of the Guide was published, and a 3rd edition of the Guide is being developed and will be available in early 2018. The multiple revisions of the Guide have been created following transdisciplinary principles using a highly iterative, participatory process with input from workers, experts and other stakeholders.

<Please insert Figure 15.2 here>

Figure 15.2 Changzhou factory workers meet in their Wellness House and use the Wellness Guide to discuss issues.

Peer-to-peer training, the 3rd major project intervention, takes place in the factories by having a more experienced worker paired with a new worker beginning at orientation. The more experienced workers are typically paid to orient and be a "buddy" to the new worker and train them in technical factory skills, factory life and how to manage issues associated with living in the city. The Wellness House is frequently used for non-technical training and the Wellness Guide is a key resource for the peer-to-peer training. One factory general manager commented on the difficulties of recruiting workers and that the project spaces, resources and participatory strategies have become major enticements for workers to join their factory.

15.5.2 The participatory process and other project interventions
As mentioned above, the project is driven by a transdisciplinary, participatory process rather than by its specific interventions. When deep participatory processes among diverse people are established, there are no limits to creativity and solution-finding. Importantly, workers and managers have defined robust, novel strategies to improve participation. For example, one factory instituted a "feedback wall" in which workers can write about issues and ideas for change. In another factory, the general manager now invites workers to lunch and listens to their ideas, and worker union representatives are now taking an active role in the project. Workers and managers are also harnessing technology to improve participation. In one factory, the widely used social media app WeChat is used for worker input. Some factories have even set up their own internal evaluations of the project. Another important participatory method has been to share project issues and progress with stakeholder representatives in a yearly conference hosted by the local government. As the project began to expand, factory workers and managers were proud of their projects and eager to share them with other participating factories and with new factories considering joining the project. The conference includes refresher training about the project model, as well as discussions about project progress, planned expansion and discussion of issues and ideas.

The diversity and ingenuity of interventions generated by participation has been impressive. For example, at several factories, workers living within the factory complained about the poor quality of food. In one such factory, workers were successful in having the outside food service contract in one factory cancelled, having the workers design the menus and hiring onsite cooks. That effort then expanded to setting up trainings for workers about nutrition and food safety. In a number of factories, community gardens have been established. Because workers are typically not connected to health services, some factories have created their own clinics and invite health, family planning and social service providers onsite to do exams and health education. A common complaint from migrant workers is that they do not feel like they have a "home" once they come to live in a factory. With worker engagement, factories have transformed their worker dorms, set up the worker-designed Wellness Houses, created many opportunities for socializing (such as karaoke and photography competitions), outdoor trips for sightseeing and recreation and many other changes to create a sense of belonging and wellbeing.

15.5.3 Project evaluation and initial qualitative findings

A project evaluation is being conducted by Nanjing Youdian University, with input from HRA. In addition to ongoing interviews and observations at factories that have documented the above activities and descriptive early outcomes, the evaluation design includes an intervention-control study to be conducted among workers in intervention factories and control factories. Questions include those in the baseline survey comprising a wide range of health, wellness and life issue knowledge, attitudes and behaviors as well as the use of and satisfaction with project interventions (for intervention factory workers). In addition, a cross-sectional study will be done in all 31 factories that will include: a description of project activities, participatory processes, surveys with a sample of about 50 workers in each factory, and in-depth interviews with factory managers, general managers, with Changzhou health and social service providers and other key stakeholders. Case studies will complement these methods. The decision to evaluate all factories involved in the project and adopt a diversity of evaluation methods adheres to transdisciplinary principles of using mixed methods to gather highly contextual information.

Initial qualitative feedback indicates high satisfaction with the project from workers and stakeholders who cite increased availability of health education, psychological counseling, reduction in unwanted pregnancies and abortions, protection of workers' rights, more opportunities for workers to socialize and promote their personal development and increased motivation and efficiency at work. For example, in one factory, managers reported that at the outset of the project, there were high rates of unplanned pregnancies and abortions among workers, endangering workers' health and factory productivity. Once engaged in the project, workers asked for information and training about sexual and reproductive health. Once those activities were implemented for a year, managers reported that unplanned pregnancies and abortions were negligible.

In transdisciplinary programs, meeting the needs of all stakeholders is important. Interviews and case examples to date are showing high satisfaction not only among workers, but also among factory managers, including general managers who run the factories. There is evidence in case reports from management about the projects' impact on improving recruitment and reducing turnover. For example, when we interviewed the general manager of one factory on the outskirts of Changzhou City, he commented that

before joining the project, his factory had not been able to recruit workers for three years (they did not want to live so far from the city center), and had experienced an 80% turnover of staff. When the project was implemented and workers created an impressive Wellness House and changed other aspects of the factory setting to meet their needs and 'feel more like home', recruitment doubled and turnover dropped to 20%. The general manager commented that the participatory process was critical to meeting the goal of 'healthy workers and happy life'. The project has been so successful in that factory that every potential new worker is first shown the project spaces and activities—before seeing anything else. Likewise, at the outset of the project, health, family planning and social service workers were very concerned about the lack of worker connection to and trust of services and the resulting high risks of disease, unplanned pregnancy, abortion, and mental health problems. This situation is turning around among project factories, primarily because workers *themselves* are asking for services and designing effective ways to connect with them.

In addition, the project has been effective at generating important and initially unexpected policy changes not only for workers in project factories, but also for the 1.5 million migrant workers in Changzhou. One policy change was the aforementioned agreement to allow workers to have required health exams locally, rather than having to go back to their home towns. Another key change that project workers requested was to have their children be able to attend regular schools, rather than the lower quality "migrant schools." When it became apparent that this was a central issue to recruit and keep workers in Changzhou, policymakers agreed to this change. Another overall important policy change is that, as of 2017, the Changzhou government decided that the project would become a regular budget item, indefinitely. As noted above, the government provides one-time seed funding and factories assume responsibility for additional costs after the start-up phase. The shared cost model helps ensure project sustainability and expansion. Some factories report being so positive about the project spaces and activities, that they are expanding wellness spaces and activities—at their own cost.

15.6 Lessons Learned

Addressing the complexity and magnitude of migrant worker issues in China could only be successful with a highly participatory, transdisciplinary approach with collaborators from many disciplines and societal sectors. From the start, stakeholders—including workers who did not traditionally have a strong voice in changing their work and life circumstances—were attracted to and intensely engaged in collaborative processes. Drawing on multiple transdisciplinary frameworks and methods was essential to the success of the project. Importantly, managers were surprised about, and very appreciative of, workers' practical and creative intervention ideas, such as creating Wellness Houses. The Wellness House concept, the attractive, easy-to-use Wellness Guide, the practical system of pairing new and experienced workers and other actions generated by the participatory approach, are now garnering interest in other areas of China. The Project was also able to catalyze major policy changes such as establishing a social support system for migrant workers in the government's working agenda. The project improved grassroots health/family planning and other services for workers who are now much better connected to services and to their community. The detailed issues raised in the project promoted many

innovations to service management and to economic development. Finally, the project approach is now being considered as model for national expansion.

From the outset of the project, national leaders were adamant that it be successful on a large-scale, rather than one more 'one off' research project that ends when initial funding is finished. Several principles were adopted to meet this goal. First, the iterative transdisciplinary approach was approved, given its power to elicit problems, generate solutions and gradually refine actions over time—critical to sustainability and expansion. Second, in keeping with transdisciplinary principles, collaborators worked as partners, rather than having one group (such as researchers, professional providers or government officials) claim unilateral ownership and decision-making. Third, from the beginning, project collaborators considered and tested the shared, long-term funding model described above.

Another principle of transdisciplinary work is to engage in "build and evaluate" loops so that it is clear what is working and what needs to change. In this project, there has been constant evaluation and refinement of components. The baseline quantitative and qualitative data was central to early understanding of problems and priority intervention areas. The qualitative feedback gathered since then via observations, interviews and other forms of feedback has been invaluable to gradually revise the project. In the next phase of the project, quantitative (and other qualitative) data will be gathered to document the significance and magnitude of project outcomes on workers, factories, health and social service providers, and on government functions and goals. In keeping with transdisciplinary guidance and the theory and methods of scientific inquiry, diverse qualitative and quantitative methods are needed to guide project development and assess its impact.

15.7 Conclusion

Longstanding concerns about addressing complex problems catalyzed the strong movement toward collaborative research and action across diverse disciplines and societal sectors—or "transdisciplinarity." In parallel, the transformation of thinking about reality and ways of studying it provided a sound scientific foundation supporting transdisciplinarity. Successful transdisciplinary work requires drawing on theory and methods in a range of relevant scientific paradigms and engaging intense participation of stakeholders. Guidance and methods from the design sciences is especially helpful to iteratively plan and refine complex interventions. It is also novel to many of us in health and social sciences who have been trained on more traditional methods. We note that the transdisciplinary process is very different from the traditional one in which researchers define problems, hypotheses, methods and predict outcomes *before* conducting research—a main reason why such research often fails to yield effective solutions. Increasingly, studies are documenting the effectiveness of transdisciplinary work. The Changzhou Worker Wellness Project is an example of applying transdisciplinary strategies to the seemingly unsolvable problems of supporting Chinese migrant workers. We hope the challenges and successes of this project—and others included in this book—will inspire researchers, practitioners and policymakers to take advantage of the unlimited potential of transdisciplinary work.

15.8 References

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