

The strategies against poverty and social exclusion: the distance learning system for after-school learning in a rural community

YU-FENG WONG

Center for Humanities and Social Sciences, National Cheng Kung University

Abstract

There is rich literature either individual research or review articles pointing that social determinants of health inequality are vary but the income distribution is more evident one resulting in health inequality (Wilkinson and Pickett, 2006; Deaton, 2003). Marmot (2002) vividly addresses “This may be because education affects health precisely because those with more education have higher incomes. ... it reflects a lifetime of different experiences, good and bad, that may affect health”. That is, availability of education resources may result in income inequality, then impact on health. How to improve availability of education resources that prevent disadvantaged community from poverty and health inequality becomes more important issue since it involves reconciliation of social improvements with social transformations. The following case of distance learning demonstrates the management of the reconciliation of social improvements with social transformations in Gongguan Community, Tainan, Taiwan.

The Gongguan Community is a disadvantaged rural village that the only primary school has been abandoned since 2006. About 20 pupils have to get on school bus for their education at another primary school, which is 8 Km away from the community. To strengthen their future competitiveness, the local church has provided English after-school learning since 1987, and the demands of other subjects are remained high. However, no one would like to teach the village children because of time consuming distant rural transportation.

To resolve the inequality, we had meeting between the local church, the community, and the primary school, and introduced distance learning system to the church through inviting 10 different organizations/units to offer resources. We developed a serious procedure to communicate with these resources providers, and managed and integrated the resources redistributed for the after-school learning. The after-school learning system further induced a transformation of Service Learning Course Committee in my university that makes the after-school learning system more sustainable with the analysis of actor-networks perspective.

Correspondence E-mail: wongyfuk@gmail.com

1. Introduction

According to literature of health equity and health disparities, both medical and non-medical determinants are relevant to health inequality (Deaton, 2003: 130; Braveman *et al.*, 2011: S152), and the social determinants of health inequalities are drawn a particular attention by WHO Regional Office for Europe (Marmot, 2005: 1102). Education is considered as one of the social determinants of health inequalities (Sen, 1990: 54-55; Braveman *et al.*, 2011: S152; Deaton, 2003: 129; Ruger, 2010: 44) although its direct causal effect does not reach a consensus among scholars in the field of health equity (see Deaton, 2003: 114; Braveman *et al.*, 2011: S151; Coogan, 2007: 4; Marmot, 2002). Hence, Coogan (2007: 4 and 47) urge that “health policy must be expanded to include efforts to make education and environmental policy” for the goals of human health, and “such a policy should be guaranteeing access to adequate schooling for children of all ages, including post-secondary education”.

Whatever outcomes of health inequalities observed, scholars have recognized that they involve unfair distribution of available resources, including facilities, to social disadvantaged groups (Whitehead, 1991: 221; Marmot, 2005: 1101), who may have little choice but to live in the situation that led to ill health (Whitehead, 1991: 220), and need capability in policy making for resource allocation (Braveman *et al.*, 2011; Ruger, 2010).

In order to respond to the situations of health inequalities at national or international level, different aspects of solutions are proposed by different fields, including philosophy, health policy, economy, public health etc. for example, Rawls (1974; 1999), Braveman *et al.* (2011) and Whitehead (1991: 221) provide principles of resources distribution based on the concept of primary goods in terms of social justice, or of equal utilization for equal need. Coogan (2007) pays attention to education policy. Sen (1990) and Braveman (2006) focuses on measurement of health outcome associated with social determinants.

However, the literature reviewed above shows what Braveman (2006: 188) noted in her paper, “this topic may seem of primarily academic interest, with little relevance for health policy and action”. For example, Whitehead (1991: 222-226) proposes 7 principles to promote greater equity of health, including improving living and working conditions, enabling people to adopt healthier lifestyles, encouraging people to participate in every stage of the policy-making process, assessing health impact together with intersectoral action. Few further designation of the principles for action is provided but required functioning structure for social organization and collective action (see Ruger, 2006a: 1000). What and how the resources may be redistributed or structured for the goals of human health are remained questions need to be answered through policy design and implementation at rural region where the most disadvantaged groups may live in.

Participation, whatever terms are, fully participation in society, political participation, collective action, or engaging in political process, is one of key policy domains mentioned in the major literature reviewed within this paper. Thus, participatory decision-making of resources allocation is our aim to be addressed through our practical case of community development in Tainan.

Many scholars point out that participation is associated with health equality in mitigating health disparities (Whitehead, 1991: 223; Ruger, 2006b: 409; Marmot, 2005: 1103) as termed by Ruger (2006b: 409) “shared health governance”, and needs to be established even without proving its causality (Braveman *et al.*, 2011: S152). However, same questions come about: what and how the participation process can be built for resources allocation within a local disadvantaged community in particular since different stakeholders are involved.

There is few answer in responding to our questions with some convincing cases in the major health equity literature. As long as health equity is a topic that involves multi-stakeholder collaborations required for solving complicated and interconnected issues of resources allocation for human sustainability. This paper goes beyond principle or outcome-based alike solutions without precise allocation process of resources but provides practical participatory one based on the perspective of sustainability science developed by Dedeurwaerdere (2014).

2. The complicated problems of health inequality

Under the umbrella of Humanity Innovation and Social Practice, the Department of Science, Taiwan, sponsored four universities to create innovative solutions for disadvantaged social groups at a local level since June 2013. National Cheng Kung University (NCKU) was the one of research teams amongst them. There were four communities under the project of NCKU, and three were remained later of the first year research. Gongguan Community (GC), the case of this paper, was one of them. Two full-time research members, one assistant researcher plus one assistant, formed the taskforce for the GC comparable to the other two taskforces working at Ling-nan-Dadongyuan with 4 full-time research members in rural area, as well as YingToung Community with three full-time research members in inner city.

Our Gongguan Community Taskforce (GCT) formally enter the GC in January 2014 after a few initial enquiries with local leaders and residents. Since then, we collaborated with the Gongguan Community Development Association (GCDA), and gradually expanded to the other five local organizations, the Kongana Kau-hoe/Church, the Zuojhen Elementary School (ZES), the Zuojhen Junior High School(ZJH), the Guang-Rong Elementary School (GRES), and Kowpi Experimental Elementary School (KEES) at a regular basis using a more deliberative form, which will be repressed later of this paper.

The main reason for NCKU to send the GCT to the community was because of its disadvantage status, a remote area with inconvenient public transportation, bad land for agricultural production, brain drain, and aging village at the first glance. However, this could not tell how disadvantaged it was, and a need for more detailed investigation. We visited six opinion leaders in person, and a couple of local residents in a meeting organized by the GCDA, one workshop collaborated with the GCDA, and exclusive secondary data, including, historical studies, population statistics, “Kau-hoe-su-oe” series (《教會史話》), biographies, transportation timetable, google map by root planner etc.

GC is formed by three tiny villages with a huge land. It is about 25 kilometer away, or one hour journey by car from the flourish Tainan City, where NCKU located. It is a quiet countryside, few people appearance on street since there are only 500 residents occupying 37.5 square kilometer, equal to 13.3 persons per square kilometer, a very low population density. 40 percent of the population is aged 65 or more, 10 percent is schooling, and the rest of them is wage earners by and large with a few unemployed. It takes one hour and six minute to drive through without stop alongside the main roads, S168, S162, and S171, making a circle round the GC as a whole (see Figure 1).

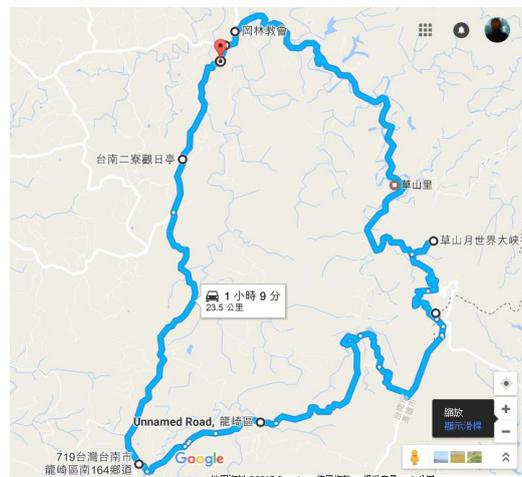


Figure 1 Round trip of the Gongguan Community (Source: [Google Root Planner](#))

This community was highly civilized with cultural diversity at least hundred years ago. Human fossils were found in this area that has been dated back to three thousand years ([Tsang, 2015](#)). Four pieces of Sinkan Manuscripts, the ever first written language for local aboriginals introduced by Netherlanders in seventeenth century ([Tavali, 2012](#)), were found in the GC that were transcribed between 1723 and 1798 (Li, and Huang, 2015). There was also military force deployed around the community in 18 century by Qianlong, the Emperor of China (Li, 2012; [Zuan, 2016](#)), then perhaps replaced by Kongana Police Station when Japanese colonial government was in power since 1895 according to a historian’s study ([Katz,](#)

2006). About 1871, the chapel of Kongana Church was formally founded in service ([Zuan, 2016](#)). The first educational organization, Kongana Elementary School was established in 1919 ([Zuojhen Elementary School, 2010](#)). The very last modern official health care unit was not introduced until 1980s or so according to one of our interviewees. It was the center of the town with flourish agricultural economics in the past time from local point of view.

However, the GC was turned to disadvantaged alongside the industrialization and the extensive and efficient road that led to brain drain. The population gradually decreased to one thousand or so by 2015. Three significant resources of social determinants of health recognized by scholars such as Ruger (2010: 45) were withdrawn between 1990 and 2006. The first withdrawn public service was health center, then, followed by merging police station to the one in town center (Tainan County Police Department, [2008:18、20-21](#)) and combination of the elementary school because of cost effectiveness concern in comparison of the same public institutions in urban area ([CY, 2013 : 4、43、46、218](#)). That is the health capability was serious endangered as a result of differentiated right to health despite of some compensation measures, such as outreach medical care with a physician, school bus, or more frequent patrol, were provided by the local government. For example, some of school children could not get after-school learning organized by the ZES; elderly people could not have the same accessibility to health services and social activities provided by the Department of National Health Insurance or Department of Social Welfare; there is no policeman on site to guard people's security in time. Because of place matter, distance often obstacles the local accessibility of health resources.

It was a panic of village extinct that went on inside the community for more than seven years as the resources of health services, education, and safety, a supporting structure of health equity were withdrawn to the Zuojhen town center, at least 8 kilometer away and 15 more minutes by car.

The GCDA mobilized residents to rebuild the campus of the abolished elementary school by its own volunteer basis in 2007. Afterwards, Zuojhen Badland Eco-tourist Information Center was created on-site ([Tourism Bureau, 2011](#)), a series of vision was developed and implemented by following the Project of Rural Regeneration sponsored by Department of Agriculture since 2011 ([Soil and Water Conservation Bureau, 2011](#)). The original idea of the vision was to create humanistic eco-tourism industry based on its flourish history, culture, natural resources, such as low altitude sun rise, large scale badlands landscape, and friendly agricultural production. Part of the profit generated from the tour or products sold by the GCDA, would become a fund for aging care operated by the GCDA under a very little sponsorship from the Bureau of Social Welfare, as well as scholarship for local schooling

children. This is a resources redistribution model in terms of health equity for aging health services, local economy, education and employment (see Figure 2). However, as can be seen, it was a huge burden of human power to run so many different projects from different central and local official offices. It is a complicated work to get all kind of resources to be integrated toward the direction of the community’s will. The major leaders and some members indicated that they did not have capacity to employ any further staff or to urge human power from outside for organizing resources needed to approach their vision since brain drain.

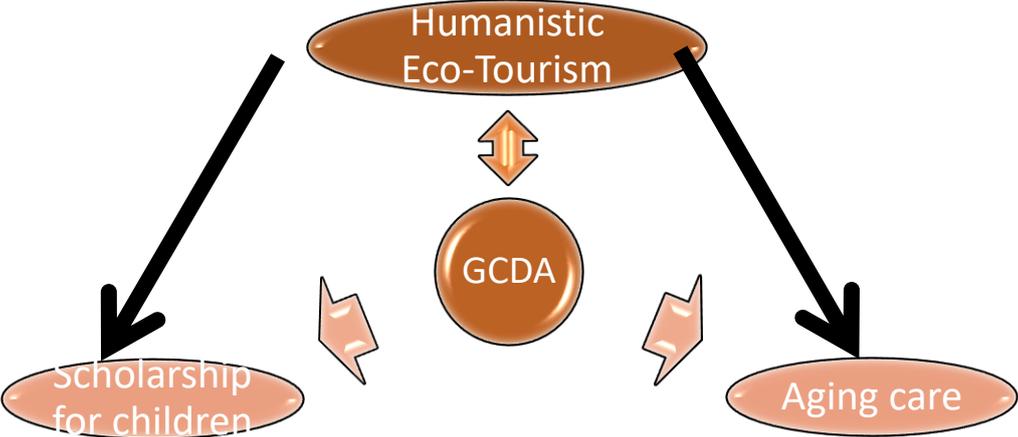


Figure 2 The model of resources redistribution powered by the GCDA (Source: Author)

This point was where our taskforce got start to form a participatory model collaborating with the GCDA in dealing with resources redistribution of social determinants in health equity at a community scale with production rather than just consumption.

3. Education as a driving force of resources redistribution

To overcome the difficulties prescribed above, we worked with the GCDA with participatory approach, which meant that each action plan in building up resource networks under the model of GCDA, the members of community always participated in decision-making process either needs prioritization or resources connection. The same procedure was applied to resources’ providers / organizations from the local and outside (Figure 3). The main human power and low amount of material or financial resources brought to the community was course based from the NCKU. The main material or financial resources with low amount of human power linked to the needs of the community development was champion based in a particular field, such as education, tourism, agriculture, ecology, law, charity, health care, health promotion, science education, media etc. The GCT served as a liaison between the different resource groups to assuring decision of resources connection governed by stakeholders.



Figure 3 The participatory approach in building up resource networks (Source: Author)

The after-school learning in distance was the first redistribution networks built in the community after three trials related to community economy ended in failure within 2014. The intersectoral action for establishing distance learning networks gained a sound support from both the local and the outside organizations, and served as **a driving force to create the other two redistribution networks with potential productivity supporting the development of humanistic eco-tourism**. Accordingly, the TGC also acted as a companion of the GC in discussing and modifying their redistribution framework from consumption basis to production basis (Figure 4).

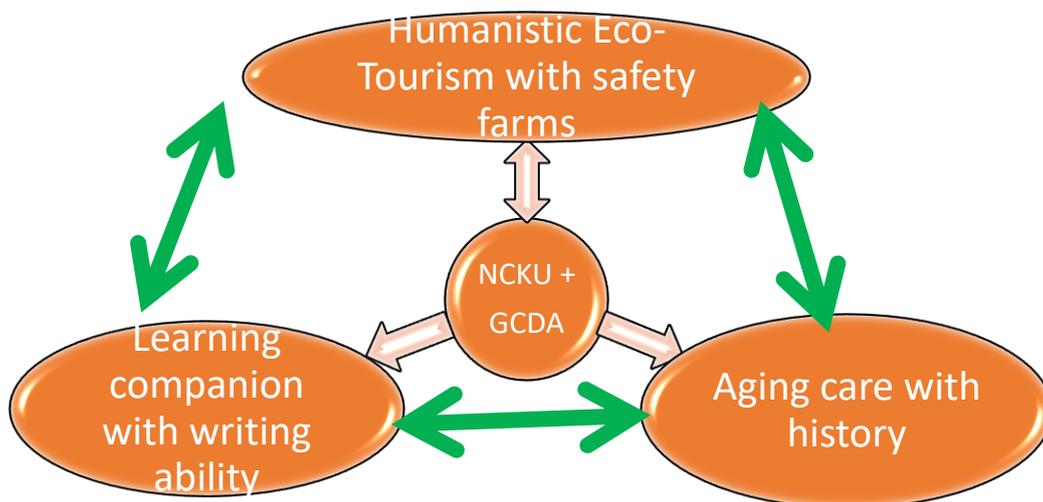


Figure 4 The modified model of resources redistribution (Source: Author)

At the stage of needs identification, we collected information and discussed with local organizations and/or residents (e.g. parents, farmers, church members et al.) by means of meetings, personal visits, occasional conversations, text on e-mail, line, or messenger for

opinion circulation and decision making. In this process, after-school learning became an evident issue to be resolved in 6 Dec. 2014 because the payment provided by the Church was not sufficient to compensate instructor's cost, and the burden of caring children was high, and confirmed by the GCDA.

At the second stage, we came up with some key words for after-school learning to search possible resources through internet and checked their availability. Distance learning was one of the options when the first discussion being held at the church. As soon as a successful case was found on TV news, we contacted with the organizer, Alliance of Teaching for School Children in 22 Counties (T22), for establishment consultation of the facilities. With concrete number of children to be served, the leaders of T22 immediately promised that they were happy to provide know-how and distance learning platform for the community without fiscal cost if the local community and the NCKU would like to go for it.

The technical resources were ready and the Church and the GCDA were informed. We started the third stage by holding a meeting to make decision and integrate available resources. The main concerns in the meeting were interior decoration of computer room with capacity of 20 children, computers plus earphone-mic. The Church could not afford IT facilities but computer room without decoration. The principal of ZES was called to the meeting by the GCDA. After reconfirming the willingness of NCKU for operating distance learning, he provided 20 IT facilities from ZES and ZJH, repaved cables for internet connection, and desks and chairs needed under a Project of Distance Opportunity Center, sponsored by the Ministry of Education. The GCDA contacted another NGO to support full decoration for the computer room.

With the available resources integrated for the community end, we brought this case back to the NCKU, and looked for computer room with comparable IT facilities to the community end. We approached 7 units in NCKU and obtained supports from three of them, the Main Library for tutorial room, the Computer and Network Center, and Property Management Division of General Affairs Office for second hand IT equipment. Recruitment of on-line volunteer tutors at service learning basis, preparation of training course, and technical troubleshooting were fully supported by Center for Caring Rural Education, Fu Jen Catholic University, which was also sponsored by the Ministry of Education. From the second phase, part of the tutors were from a service learning course, Distance Learning for Rural Disadvantaged Children, led by Professor Xu at Department of Pharmacology.

During the course of implementation, both tutors and children were expected to note down what have been taught, what responses and feelings were experienced. The TGC checked

each note and discussed main issues with tutors and children separately or face-to face for modification of tutorship and further preparation of training. As time went on, some of the key issues were out of the professional scope for TGC members. We called Pastor's wife, who was responsible for the community end, to have advisory meetings with the tutors to affirm attitude, personal development, personality, academic achievement and achievement in general that helped tutors to plan adequate schedule, learning contents, and pace for their own pupil. Furthermore, we invited clinical consultant from the Consultation Division to mitigate learning pressure that occurred at the university end, community end, or both. For reducing cognitive burden of the children, we also approached three pedagogical professionals to form an advisory forces for the tutors in producing a teaching plan suitable for their little partner.

In addition, NCKU's Professor Su, the chair of Program the World, an NGO for rural education, approached us with his successful programing training in a small village between 2013 and 2015. Based on the idea of multi intelligence, Pastor's wife agreed the training to be commenced in summer and winter vacation for the children. However, because of cognition burden resulted from, and the shortage of supervisor during the course of the training program, many of the children showed low motivation to the programing. For improving their motivation, our research assistant commenced free software program such as web design, blogger etc. weekly. Every child has to publish one article with short sentences either on their own website or blogger. The companions of distance learning will be invited to review and proofread their sentences positively. The change of programing training has been accepted by the Church and professor Su after more than 5 intensive discussions. It is believed, that the written pieces published on website or blogger, may improve children's writing skills, and help community to promote aging care, and eco-tourism. It makes after-school learning as a productive learning rather than consumption one. Similar idea has also been implanted to the scheme of aging care with history.

As can be seen that the TGC acted as a liaison between different groups, different instructors of service learning course in particular, a platform for good and sufficient communication became an obvious issue inside the NCKU since some instructors delivered community based service learning without cross checking with collaborative mentality. The TGC brought opinions from companions, research assistant, course students, and the church, and negotiated this issue with Associate Vice President, Office of Academic Affairs, and director of Center for Humanities and Social Sciences (CHASS). This action triggered the amendment of Rules of Service Learning Course Committee, which entitles the director of CHASS as one of Service Learning Course Committee members to participate in information exchange, decision-making, and implementation process. This pushes the Learning Course Committee towards a more transdisciplinary organization with integrated frameworks under research

basis as the CHASS becomes one of taskforces of the Learning Course Committee.

4. Discussion and conclusion

The model of resources redistribution shown (see Fig. 4) with a participatory approach (see Fig. 3) as practical strategy contains a tendency of strong sustainability in the field of sustainability science, focusing on “coupled socio-ecological systems, a transformational agenda, within an explicitly ethical perspective on strong sustainability, and an engagement with stakeholders” (Dedeurwaerdere, 2014: 28). The distance learning established and expended is coupled with the eco-tourism scheme and aging care scheme which contains the main principles of sustainability science and transfers the characteristic of after-school learning and aging care from consumption to production through engaging more than 17 different stakeholders inside and outside the community. In terms of strong sustainability, all stakeholders collaborated in the way what Dedeurwaerdere (2014: 16) says “at an equitable use of the different types of capital that are essential for the functioning of coupled social-ecological systems” at community level of governance. This not only changes the community, but also changed the NCKU in terms of decision-making process with integrated and transdisciplinary research for health equity.

According to establishment of after-school learning system in this case study, the 4-stage practical process participatory approach shown in figure 3 is not only comparable to the ideal–typical conceptual model of transdisciplinary research process presented by Lang *et al.* (2012: 28-29), and highly recognized by Dedeurwaerdere (2014: 36-37), but also realized it at local context.

The points of the conceptual model above include three phases: (a) collaboratively framing the problem and building a collaborative research team with academia and non-academia actors to identify the real-world problem, and co-design an agreed societal action plan with methodological framework for knowledge integration; (b) dynamically implementing the agreed societal action plan (or termed as solution) with different levels of stakeholder involvement and forming transferable knowledge by analyzing results of the implementation ; and (c) a feedback pathway that (re) integrate and apply the produced knowledge in both scientific and societal practice (see Fig. 5). (Dedeurwaerdere, 2014:37; Lang *et al.*, 2012: 28-29)

The phase A of this ideal–typical conceptual model may need a modification in accordance with our experience of after-school learning action plan in framing the problem and team building. For Lang *et al.* (2012: 27), their model might contain two characteristics: linear process, and iterative or recursive cycle, and three design principles with guiding questions

are formed for each phase accordingly. The guiding questions of phase A are regarding to what to be done rather than how to achieve what to be done. In other words, the ideal model assumes researchers have been familiar with the community facing real-world problem. However, the ideal model leaves an unresolved question that how can a research to get start a transdisciplinary research in a community that different groups members have not got to know each other.

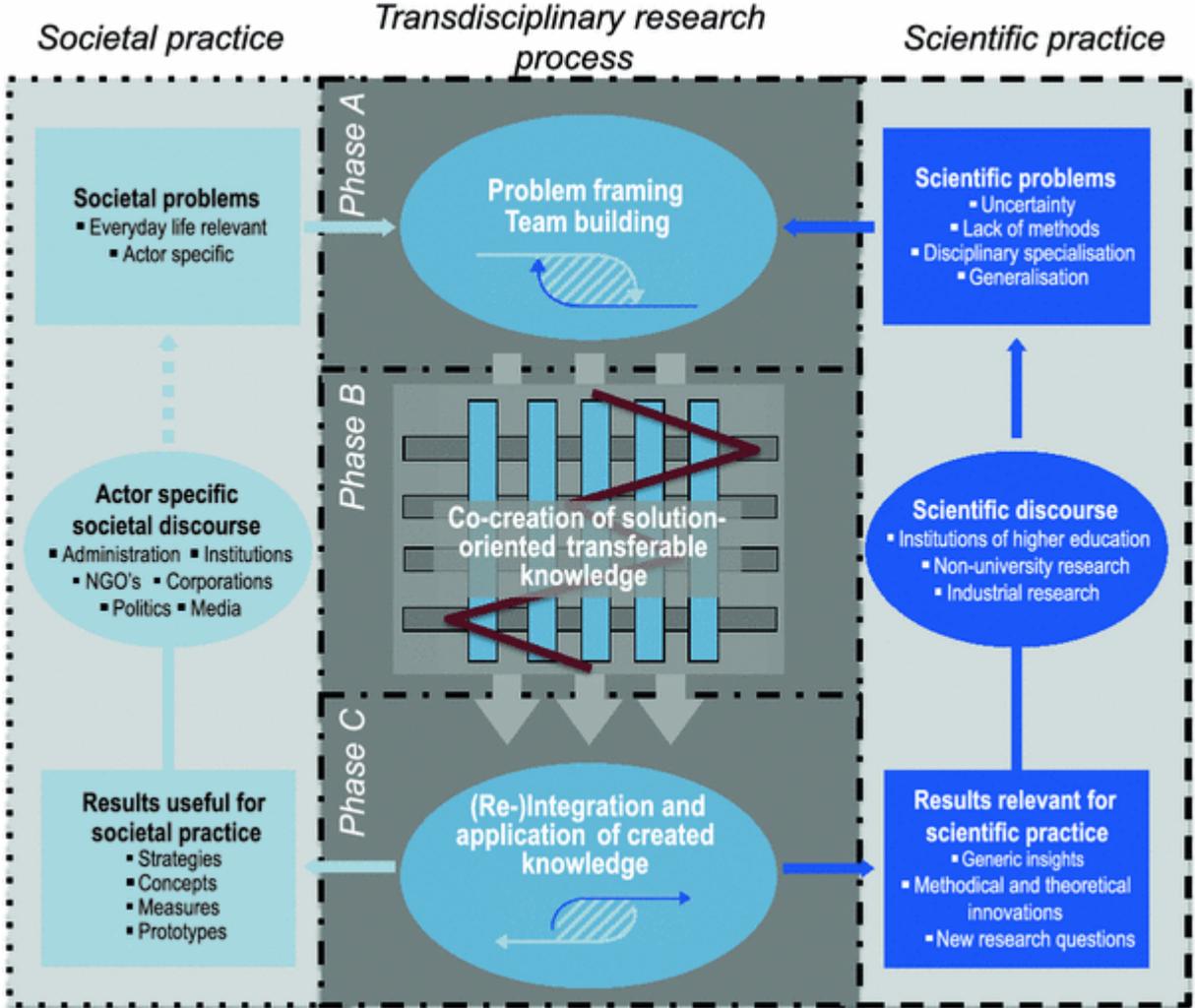


Figure 5 Conceptual model of an ideal–typical transdisciplinary research process (Source: Lang *et al.*, 2012)

Our model is dealing with this matter and has been applied to the other two redistribution networks, humanities eco-tourism, and aging care, in the community. It may be useful to break problem framing and team building down to two different phases, and problem framing goes to the first phase followed by team building. As can be seen in stage 1 (see section 3), collectively identifying community needs through interview and keywords surfing played the keys to form the first foundation for team building. Pastor told us the difficulties in serving after-school learning, and we did listen. This is identification of the real-world problem. At

the time, the Church had not formed a team with us. Then, we looked for possible stakeholders through TV news, internet, e-mails etc. the collective team was built until the academia and non-academia actors showed their will to form a technical support team for the children. This first block, collective identification of community needs, did paved the way for team building process as well as phase 2 and phase 3, and made societal practice and scientific practice possible.

4.1 An insight from Actor-Networks Theory

The results or effects of the case in this article seem to be successful according to the model above. However, how the models were created and maintained within the communities or even will be applied or extended to other communities since they involved many organizations, skill, technology, innovative public good and services? It is not only connecting resources from human power, the most needed resource by the communities, but also object power, interacting with each other to make the cases. In other words, the cases encompass the characteristics of actor-network theory (ANT) at their origin.

4.2 Differentiated interests and translation

Although ANT was began in studying the process of science and technology, it may similarly picture “all of social life”, including the economy ([Law, 1992](#)). Accordingly, social enterprise may be seen as what Law calls “a product or effect of network of heterogeneous materials” (Law, 1992). This process has been termed as translation, “heterogeneous association”, or “heterogeneous engineering” by Law (1992), Latour ([1996](#)), and Callon ([2007a](#)), the actor-network authors. From the case study of scallops, Callon (2007a) points out that the translation is “the simultaneous production of knowledge and construction of a network of relationships” and constituted with four moments: problematization, interessment, enrollment, and mobilization. Through different case studies, scallops as well as of strawberry market, in Callon’s works (2007a; 2007b), the process of translation is also a process of negotiation happened at any of the four moments. Actors “express their preferences or interests and proceed to evaluate the different possible decisions” that have positive or negative effects on each of themselves (Callon, 2007b). The ANT pays attention on negative ones in particular since each actor is from another actor-network, and the translation is a process of negotiation between different actor-networks. Such social ordering makes the actor-network precarious because the representativeness of an actor cannot be foretold (Law, 1992). That is, the process of translation would be more successful as long as representativeness of an actor is higher. What does that mean “higher representativeness”? According to the two cases, scallops and strawberry market from Callon (2007a; 2007b), information transparency could be one of the crucial elements. In the case of scallops, because of low representativeness of actors from the fishermen, the scientific colleagues, and the scallops, the actor-network for breeding young

scallops was eventually failed with low transparency of information in decision making (Callon, 2007a). By contrast, the wholesale market was devised with new technology to decide price of strawberry that buyers and sellers can only see the prices without directly contacting with each other (Callon, 2007b). In this perspective, it is where we are going to turn to the cases in Taiwan and Indonesia.

4.3 The translation arrangement and process

In the case of Taiwan, it is trustworthy to analyze the building process of the actor-network of distance learning and its translation because it is the very foundation that was applied and expanded to another two actor-networks, namely, eco-tourism and aging cares, and form the whole SE model on site of the community development. The actor-network building is to be explored under the frame of the four moments indicated above.

First of all, it took almost one year to form the first primary actor-network, the T22, the Church, the GCDA, and the GCT of NCKU through problematization, interessment, enrollment, and mobilization. During the course of its building, the four moments occurred in sequence, overlapping, or by random. However, translations were happened at each moment that made the heterogeneous engineering continuous progress. The second primary actor-network was formed on the same day, 15 January 2015, as the set of the first primary actor-network. This network included four actors. The third actor-network, providing teaching services from NCKU, was successfully established on 3 March 2015.

Why and how did these actors come together? According to Callon (2007a), at the moment of problematization, the main actors, scallops, fishermen, and scientific colleagues, are identified by the three researchers, who have been learned the knowledge of breeding scallops from Japan, and laid down of criterion to select the main actors. That is, experience of issue concerned plays a critical role in problematization to decide who the actors are participating in scientific knowledge making or problem solving. This is also similar to the case of strawberry market, the person with economy background plays a key role of actor identification. And Callon terms this translation process made by the three researchers as interdefinition of the actors. However, in the case of Taiwan, it happened in a different way. Within the same network, the issue of resources shortage of after-school learning brought actors mutually identified and recognized by each other actors rather than by the actors organizing the network.

4.4 Interdefinition of the actors

For example, in January 2014, the members of GCT, who made the second visit to the community, were identified as the qualified actors to organize and deliver after-school

learning in the community by the General-Sectary of GCDA, who usually was on behalf of the Chairman of GCDA Board members. Though, none of the GCT members were trained in the field of pedagogy, and did not think themselves could deliver such services. The problematization was not succeeded by GCDA through mutual definition of the actors although after-school learning was the issue recognized by both side.

On 10 January 2015, thing changed. The GCT were identified as the qualified actors to organize and deliver the distance learning by the organizers of T22:

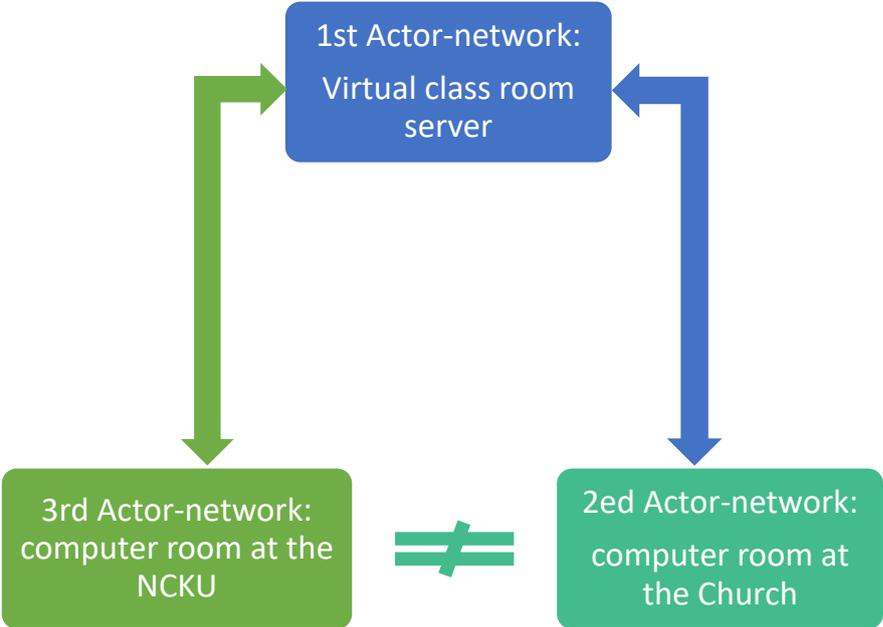
You have got pupils from the church. We are happy to transfer our know-how and help you to set up this learning system if your university would like to take the role in operating it. (field note: 2015/01/10)

The GCT accepted the role identified by the promising expertise transformation, then they identified the Church and the GCDA as the main actors, and called a meeting to decide whether establishing distance learning system for local education on 15 January 2015. The second actor-network began to form through the cycle of problematization, interestment, enrollment, and mobilization.

In the meeting, the GCT presented the basic arrangement of a distance learning system as well as willingness of expertise transformation from the T22. As soon as the General-Sectary of the GCDA knew the critical role of computers playing in this project, she identified Lee, Principal of Zuojhen Elementary School (ZES), as a main actor on this issue, called him to join the meeting. After introducing the framework of distance learning provided by the T22, Lee reconfirmed the members of GCT several times with a very simple but important question, “are you, National Cheng Kung University going to hold the distance learning system here?” With the expertise supporting promised by the T22, their answer was sounded “yes”. This not only convinced Principal Lee to provide 20 desktop computers, but also accessories, such as sets of desks, webcams, ear mics, internet cable installation etc.. As to the Church, they were hesitated to become the main actor on 31 December 2014 with a question concerning overpriced facilities: the distance learning requires computers, doesn’t it? This question is reasonable. Church was in its scarcity: there was a mortgage for its new rebuilding at the expensive 8 million NT dollars. In addition, there was no obligation to file accounting documents during the course of distance learning project. It was a great relief in terms of manpower shortage for the Church and the GCDA always had a difficult time in filing accounting documents that highly interrupted their routines. Hence, the T22, the Church, the GCDA, and the GCT formed the first actor-network, establishing learning platform, the virtual classrooms at remote, for the distance learning. At the same time, the latter three and the ZES formed the second actor-network at the community end for decoration of computer room provided by the Church, and the GCT went back to NCKU to organize the third actor-

network for facilitating distance learning resources at the teaching end. The three actor-networks formed the complete distance learning network (Figure 6)

Figure 6 the heterogeneous engineered actor-network of distance learning



(By Wong, 2017)

Through the meeting, more actors were enrolled by the ZES and the GCDA at the second network, and by the GCT at the third network in terms of computer room, the key place where learning activities took place. They were mobilized to find proper space as computer room, to find donated computers and fit them into the room, to install virtual classroom software, to test the stability of internet bandwidth etc.

Forming such heterogeneous network does face many resistances during the course of translation at any of the four moments. These resistances are not the willingness of resolving the inequality distribution of education resources but the capacities that each actor encompassed. Some actors approached by the main actors either withdrew from or even could not link to any of the three network. One of the T22 members actively promised to provide know-how of distance learning system and their server of virtual classroom for the Church. In terms of virtual classroom, they did not carry out their promise because they owned only ten rooms, far less than the request from the Church, which was 20. However, they enrolled another actor, Center for Rural Education in Taiwan (CRET) based at Fu-Jen University, doing distance learning with larger virtual class room space than theirs, to fulfill the local need. For the third network, a room equipped with sufficient computers and quality of internet bandwidth were required. The GCT approached their Computer Center and Medical Library with such criteria. Unfortunately, both units refused to provide their facilities with a fixed

time slot throughout whole semester because of utility in overturn rate:

The regulation says the computer room can be occupied by the same person or the same unit at the same time slot within the same semester. Otherwise, it is seen as low utility.

(fieldnote: 2015/02/05)

Interestingly, the Education and Training Room with over 60 computers in the main library played a different story. In responding to the request of GCT, the chairman of the main library spent about one month to clarify internal regulations associated with the Education and Training Room, and asked his director of IT Division to provide the Training Room for establishment of the distance learning. He said distance learning is also training, and is fulfilled the requirements of its usage. This shows the different materiality of the application criteria of the three computer rooms. The first two were constrained by the utilities in terms of occupation length of an applicant. The last one concerned utilities rather than the occupation length. Such difference is because the first two rooms were student-training based with thousands users enrolled through wide variety of IT courses, however, the third one was only for the purpose of library services, or activities organized by any organization with permission issued from the chairman of the main library. The differences lead to the first two computer rooms could not be mobilization, and the third one could be.

4.5 Who are represented?

According to Callon (2007a), low representability of actor will be unable to sustain an actor-network. The distance learning was designed for pupils who are living in rural with less learning resources or even low learning motivation. That is, the pupils as the main users of this new established distance learning system were well represented by the second network? If yes, in what sense, if not, how the whole actor-network could be sustained through this heterogeneous engineering process? According to the field notes, the GCT and the CRET were weaving the network toward the direction of higher representability by holding an introduction of distance learning and establishment for all pupils, their parents, principal of the ZES, leaders of the GCDA, principal of Sunday school, Pastor and his wife at the Church. The director of CRET and her assistant present text and photos to explain why, how, and what have been done about distance learning throughout Taiwan, and made sure the willingness of all participants, including the pupils. The very point stressed by the director of CRET was to build up companion relationships and role model for the local pupils through one by one distance tutorship from NCKU students. This multilateral negotiation looked successful without challenge from the floor, and the three actor-network began to pave the whole learning system since 7 February 2015.

To monitor and maintain the companion relationships between the local pupils and the remote

tutors, the distance learning system was devised with learning log book for both actors to express their learning experiences of the day. There was coordinating teacher each side and responsible for reading and responding to the log book after each learning day. Such technoscience network did help to maintain and sustain the whole actor-network of the distance learning.

Through reading the log books, the GCT began to find that the companion relationships were endangered. For example, there were few words written by the local pupils, and the issues such as low learning motivation, less responding, low academic performance were described by the remote tutors. Some of the remote tutors often challenged the GCT why should they pay so much attention to those pupils with low learning motivation. To increase the tutors' understanding of the pupils status and to hold the third network, the GCT arranged the tutors to have face-to-face talks with the Pastor's wife, who had organized and taught the local pupils at the Church for 28 years, and well knew each pupil's family background and the need of participating in the distance learning. By the way, face-to-face activity between the pupils and the tutors was also held once a month to increase mutual understanding.

In doing health equality through resources redistribution according to social determinants' point of view, the multilateral negotiations show the GCT had tried to increase possibility of negotiation amongst actors from different actor-networks rather than negotiated through a few representatives from both local pupils and remote tutors. Such arrangement minimized the problem of representability occurred in the case of scallops in Callon's work, and increased the networks' durability as termed by Law (1992).

References updated

References

1. Braveman, P. A. (2006). "Health Disparities and Health Equity: Concepts and Measurement", *Annual Review of Public Health*, vol. 27, p. 167-194.
2. Braveman, P. A. *et al.* (2011), "Health Disparities and Health Equity: The Issue Is Justice", *American Journal of Public Health*, Supplement 1, vol. 101, no. S1, p. S149-S155.
3. Callon, M. (2007a). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Briec Bay. In Kristin Asdal, Brita Brenna and Ingunn Moser (eds.). *Technoscience: The Politics of Interventions*, Oslo: Unipub.

4. Callon, M. (2007b). Actor-Network Theory – The Market Test. In Kristin Asdal, Brita Brenna and Ingunn Moser (eds.), *Technoscience: The Politics of Interventions*, Oslo: Unipub.
5. Control Yuan (CY) (2013). *Report of effectiveness in regenerating spatial utilization for merged schools*, Taipei, Control Yuan.
<http://www.cy.gov.tw/AP_HOME/Op_Upload/eDoc/%E8%AA%BF%E6%9F%A5%E5%A0%B1%E5%91%8A/102/1020001081010833345.pdf>, accessed August 27 2015.
6. Coogan, E. H. (2007), *Rawls and Health Care*, Honors Theses. Paper 501.
<<http://digitalcommons.colby.edu/honorstheses/501>>, accessed August 3 2015.
7. Deaton, A. (2003). “Health, Inequality, and Economic Development”, *Journal of Economic Literature*, vol. 41, no. 1, p. 113-158.
8. Dedeurwaerdere, T. (2014). *Sustainability Science for Strong Sustainability*, Cheltenham, Edward Elgar.
9. Katz, P. (2006). *When Valleys Turned Blood Red: the Ta-pa-ni Incident in Colonial Taiwan*, Taipei, Institute of Modern History, Academia Sinica.
<<http://thcts.sinica.edu.tw/themes/rd101-3.php>>, accessed February 26 2017.
10. Lang, D. J. *et al.* (2012). “Transdisciplinary research in sustainability science: Practice, principles, and challenges”, *Sustainability Science*, vol.7, Supplement 1, p. 25-43.
11. Latour, B. (1996). On actor-network theory: A few clarifications. *Soziale welt*, 369-381.
12. Law, J. (1992). Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systemic practice and action research*, 5(4), 379-393.
13. Li, G. (2012). Torch, Pigeon, and Holy Music, *Taiwan Church News Network*, 30 Nov. in Chinese. <<http://www.tcnn.org.tw/news-detail.php?nid=3846>>, accessed February 26 2017.
14. Li, P. J., and H. Huang (2015).” Four Recently Uncovered Sinkang Manuscripts”, *Taiwan Historical Research*, vol. 22, no.4, p.167-189. in Chinese.
15. Marmot, M. (2002) “The influence of income on health: views of an epidemiologist”, *Health Affairs*, vol. 21, no. 2, p. 31-46.
16. Marmot, M. (2005). “Social determinants of health inequalities”, *Public Health*, vol 365, p. 1099- 1104.
17. Rawls, J. (1974). “Reply to Alexander and Musgrave”, *The Quarterly Journal of Economics*, vol. 88,no. 4, p. 633-655.
18. Rawls, J. (1999). *A theory of justice* (rev. ed.), Cambridge, Harvard University Press.
19. Ruger, J. P., 2006a, “Ethics and governance of global health inequalities”, *Journal of Epidemiology and Community Health*, vol. 60, p. 998–1003.
20. Ruger, J. P., 2006b, “Health, Capability, and Justice: Toward A New Paradigm of Health Ethics, Policy and Law”, “Cornell Journal of Law and Public Policy”, vol. 15, p. 403-482.
21. Ruger, J. P., 2010, “Health Capability: Conceptualization and Operationalization”,

- American Journal of Public Health*, vol. 100, no. 1, p. 41-49.
22. Sen, A. (1990). "Development as Capability Expansion", in K.Griffin and J. Knight (eds.): *Human Development and the International Development Strategy for the 1990s*, London, MacMillan. p. 41-58.
 23. [Soil and Water Conservation Bureau \(2011\)](#). *Learning Records of Rural Regeneration in Gonggaun Community*, Nantou, Soil and Water Conservation Bureau.
<https://ep.swcb.gov.tw/EP/Community.aspx?RG_ID=RG2014041414512100>, accessed February 26 2017. In Chinese.
https://ep.swcb.gov.tw/EP/Community.aspx?RG_ID=RG2014041414512100
 24. Tainan County Police Department (2008). *Work Report of Tainan County Police Department*.
<<https://www.google.com.tw/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&ved=0CEIQFjAJahUKEwj6jePCmYjHAhWD5aYKHW04BWg&url=http%3A%2F%2Fcategory.www.gov.tw%2FForms%2FFiles%2F376510200C%2F376510200C-I6Z-001-forms.doc&ei=ueW8VbrNOoPLmwXt8JTABg&usg=AFQjCNGOrxpInBrbTaZuo3mpUJpcSHzRpw&sig2=dIc43MGr9YPv0T9KmsqjJg>>, accessed August 27 2015. In Chinese
 25. Tavali, P. (2012). "Searching for Pingpu Tribe between 16-19 Century", *Aboriginal Archives*, vol. 3. In Chinese, <http://ihc.apc.gov.tw/Journals.php?pid=609&id=655>
 26. Tourism Bureau (2011). *New Open, Zuojhen Badland Eco-tourist Information Center*, press release, Tainan, Tourism Bureau of Tainan City, 28 Jan. in Chinese.
http://www.tainan.gov.tw/tainan/dep_news.asp?id={6DE611A3-C317-4730-A575-239F6238A81D}, accessed February 26 2017.
 27. Tsang, C. (2015). "The new prospect from the fossil of Zuojhen", *National Geographic Chinese News*, 29 Dec. <<http://www.natgeomedia.com/news/ngnews/25222>>, accessed February 26 2017. in Chinese
 28. Whitehead, M., 1991, The concepts and principles of equity and health, *Health Promotion International*, Vol. 6, No. 3: 217-228.
 29. Wilkinson, R. G., and Pickett, K. E., 2006, Income inequality and population health: A review and explanation of the evidence, *Social Science & Medicine*, 62 (7): 1768–1784.
 30. Zuan, Z., 2016, "Unsolved history of Kongana : the family of Li Shun-yi and the Kongana Church", *Elder John Lai's Archives*, 22 Nov..
<<http://www.laijohn.com/articles/Ng,CHeng/Kong-a-na.pdf>>, accessed February 26 2017.
in Chinese
 31. Zuojhen Elementary School (2010) *History of Zuojhen Elementary School*.
<<http://www.tjes.tn.edu.tw/90year/from.php>>, accessed February 26 2017. In Chinese

Acknowledgement

This paper was part of phase I (MOST104-240-H-006-001-HS3) and phase II (MOST105-

2420-H-006 -009 -HS1) Project of Humanity Innovation and Social Practice, sponsored by the Ministry of Science and Technology, Taiwan.

Many thanks for the following commentators on this article: Thai Hwa, Ching-Ping Tang, Kuo-hsing Hsieh, Pau-Ching, Lu, Chang, S-syung, Jolan Hsieh, and those anonym reviewers.