Participatory design innovation to solve challenges in rural Uganda: A model for the future

Aloysius Wilfred Raj Arokiaraj
Office of Service-Learning
Lingnan University
Hong Kong
aloy@ln.edu.hk

Joshua Schapiro
CREATE Lab, Robotics Institute
Carnegie Mellon University
Pittsburgh, USA
joshua.schapiro@gmail.com

Jessica Pachuta
CREATE Lab, Robotics Institute
Carnegie Mellon University
Pittsburgh, USA
jpachuta.createlab@gmail.com

Illah Nourbakhsh
CREATE Lab, Robotics Institute
Carnegie Mellon University
Pittsburgh, USA
illah@cs.cmu.edu

Taihua Hu
Office of Service-Learning
Lingnan University
Hong Kong
taihuahu@ln.edu.hk

Ka Wing Jessica Wong
Office of Service-Learning
Lingnan University
Hong Kong
jessicawong2@ln.edu.hk

Albert Ko
Office of Service-Learning
Lingnan University
Hong Kong
albertko@ln.edu.hk

Academic outreach projects have been largely ignoring the knowledge of local communities in working on challenges which exist in these places. In the recent past, data has been pointing to the fact that a majority of the community outreach projects in developing countries have failed or proven to be unsustainable. Many of these projects are driven by charitable values, driven by the strong urge to help the people in need. This however might be in direct conflict with ground up problem solving approaches. Charitable work doesn't approach the community challenge with a problem-solving mindset, so the effectiveness and sustainability of the work are undermined [1]. A new approach was designed and the possibilities of a collaborative fact finding, collaborative problem definition and co-designing to solve the challenges were tested. This will ensure the solutions are integrated into the communities' social, economic and cultural landscape while at the same time providing an effective solution which has community ownership. The project will leverage an existing network of collaborating partners to maximize impact.

The community partner, Kyempapu, is a grassroots non-profit organization that is committed to community development, environmental management, and poverty alleviation in Kirinda, Uganda and its surrounding communities. Kyempapu works with over 50 schools, provides agricultural education and mentorship, and builds community-mindedness through international service-learning, conferences, and programs. The staff are residents of the surrounding communities who facilitated introductions to their networks and participated in our approach as team members to conduct fact finding, problem identification, and design. The CREATE Lab and Kyempapu have worked together for over 6 years sharing educational technology tools and learning. CREATE Lab has over a decade of experience developing practice as both a technology lab and a community partner. CREATE's work alongside formal educators and communities of practice privileges sustained relationships over research with the goal of authentic empowerment experiences, with or without technology.

Lingnan University's Office of Service-Learning (OSL) has pioneered multiple long-term projects in Hong Kong around elderly care and reaches over 3000 elderlies every year. OSL works with organizations serving the elderly in the fields of social innovation, management, culture, health, and many cross-disciplinary issues. Through over 12 years of services, OSL developed a model of Service-Learning which gives equal importance to community empowerment and student learning. This grassroot model focused around taking deep dives into understanding the community's ground reality and holding off thinking about solutions as outsiders in the process. Solutions developed with the local people based on extensive field data yielded greater impact and wider adoption of the solutions [2]. It was of utmost importance that the interaction with the community was as efficient as possible as the liberty of time which is typically the case for anthropological research did not exist [3-4].

A group of staff members and 15 university students from Hong Kong formed a fact-finding team and visited villages and schools in Bukomansibi District, 130 km south west of Kampala, a place where agriculture prospers and provides a livelihood to the community. The community proved to be an ideal location to engage the local population. The two-week exploration tour in the middle of July 2019 focused on providing local high school students with a basic understanding of electric circuits and design thinking with a hands-on ideation and prototyping experience. In the first week, the focus was on building rapport with high school students from selected schools followed by a visit to their schools to build an understanding on "*hair on fire problems*" and challenges which impede the personal growth of the students. Lingnan University students and the local students worked in pairs during fact-finding missions.

The second week focused on the community, working with women's self-help groups, farmer groups, village bodies and individual farmers to create a comprehensive understanding of the day to day challenges in their ventures. Working with these different groups, the fact-finding team defined a set of challenges, which were communicated back to the community members to ensure the analysis is grounded and mutual understanding is achieved. With this comprehensive understanding the fact-finding team and community members discussed various approaches and identified interesting ways in which some of their community members have tried to solve the challenge. All findings were documented for design validation at a later time. This is done to ensure the possible solutions are in line with the practical difficulties in the community. Radical solutions, however innovative, are useless if the community finds it hard to integrate into its daily routines.

List of challenges identified:

Water storage: The community experiences drought in 2-3 month stretches, we validated that community members with effective water storage units (10,000 Litres) can get through those dry spells. A low-cost water storage unit, with some education on rationing we could effectively save an average time of 2 hours spent by family members to fetch water and drastically improve the quality of the water they consume.

Domestic energy system: About 60% of the household has solar panel and use lead acid battery to store the energy generated. A common grievance among the community member was how unreliable the batteries were. Due to the lack of understanding among the community members, they have been sold a complex system of energy generation and conversion for their domestic use which usually caters some LED lamps and mobile phones (non-smart).

Waste management: The population density in these rural communities are low, this creates interesting challenges around plastic recycling and waste management in general. The most common and effective solution currently practised, 'a large enough pile- then burn it'. There is also a lack of knowledge around the ill effects of burning plastic and other hazardous material. When we spent time explaining to them the problems around burning them, they were very eager to know of alternative methods.

Lack of textbooks and current affairs resources for students: Most students do not have access to standard textbooks in schools. The workaround they have is the teachers write down all the content in the textbooks on the board and the students copy them. The students also do not have access to any kind of current affairs publications like newspapers or magazines; nor do they have access to information about higher education.

Daily sports and other community engagement activities were organised in the evening to strengthen the relationship with the local community. With Kyempapu, we aimed to develop an ideal model to build outreach projects to solve community challenges irrespective of the location. A long-term approach will be adopted in this project: after debriefing, the university and local partners will work on-line to develop the solutions further, and prototyping and further development will take place in multiple iterations. In the following visit, the solutions will be deployed and tested with the community partners while empowering some of the locals to become community champions who can implement these locally development solutions. A similar process was adopted in other projects in Kazakhstan, Cambodia and Nepal. A comprehensive report on the other project locations will be made available in the near future, this will also cover the explored solutions and the process of deployment of solution prototypes in the community.

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