

# DESIGN THINKING INTEGRATION INTO A RESEARCH COURSE: A CASE STUDY

Maria Teresa M. Fajardo

University of Science and Technology of Southern Philippines, Lapasan, Cagayan de Oro City, Philippines

Correspondence Tel.: +63 917302 6633, E-mail: mariateresa.fajardo@ustp.edu.ph

**ABSTRACT:** *Dengue is a social and health issue that continues to threaten communities. This study described students' experience and insights in a research class taught using Design Thinking Methodology with dengue as problem focus. The study aimed at providing students with real problems to solve to allow them to apply the concepts learned in the classroom. Moreover, research outputs that answer a certain community need to emphasize the relevance of research to students. Design Thinking is a creative process that helps student design meaningful outputs to solve a problem in a community. Students working in groups go out to communities of choice to practice data gathering using survey instruments, conduct an interview, take pictures to capture a community's profile and do field observation. Most students realized that information should be validated in many ways. They also learned that people perceived government initiatives differently and recognized the importance of cooperation between residents, community health center staff and the local officials for a community program such as dengue awareness and prevention to succeed.*

**Keywords:** experiential learning, design thinking, research, social innovation projects, dengue awareness

## 1. INTRODUCTION

Dengue is a problem that is difficult to control and eradicate. Multiple root causes of dengue as identified include uncontrolled urbanization, increased global spread of dengue viruses, and vector and dengue control programs not being provided adequate resources [1]. Principal drivers of the rapid spread of dengue in the 21<sup>st</sup> century are urbanization [2], globalization and lack of effective mosquito control [3]. The solution to this problem is multi-faceted and requires close monitoring of community participation [4]. This is because dengue transmission is directly associated with poor hygiene and poor socioeconomic and literacy levels, especially for female heads of households [5]. Thus, making dengue as the focus of research activities to be conducted by pre-service science teachers is a worthy undertaking. In addition, students will benefit from the experiential learning in a number of ways.

Kolb's Experiential Learning process emphasizes the central role that experience plays in the learning process. Kolb [6] stated that the Lewinian Model of Action Research, which is one of the models of experiential learning process, that learning to change and growth is best facilitated by an integrated process composed of the here-and-now experience, collection of data and observation about that experience, data analysis and generation of conclusion and feedbacking of the conclusion to the actors of the observed experience as input for behavior modification of the actors and their basis for future choices and decisions. Many students in higher education are conditioned to be passive recipients of information from previous educational experiences [7]. The authors recommend exposing students to opportunities that enable them to take control and be responsible for their learning can greatly enhance their ability to learn from experience. Pugsley and Clayton [8] found out that students exposed to experiential learning have a more positive attitude towards research when compared to students exposed to the traditional way of teaching research. Moreover, students are likely to gain the most benefit from research, in terms of depth of learning and understanding, when they are also involved in research, for example, through various forms of active learning [9]. Healey [10] calls for more focus on research processes and problems through hands-on activities

rather than focusing on research content and the treating of research students as active participants rather than the audience for the transmission of knowledge. To enable the students to participate actively in the research activities, Allison and Pomeroy [11] recommended that educators must facilitate the access to learning environments and support the learners in the exploration, problem-solving, growth and development. Students who are involved in experiential learning process have increased the level of optimism [12]. Another benefit of experiential learning was found by Downey [13] who claimed that younger students performing service-learning significant increases in empathy. Having considered all of this relevant literature, the researcher hypothesized that exposing students to experiential learning in research through the use of the Design Thinking process will be beneficial for them.

## 2. METHODOLOGY

### 2.1 Research Design

The study is qualitative in nature and it describes the experience of using the design thinking in the conduct of research among pre-service science teachers.

### 2.2 Participants

The participants of the study were 40 pre-service science education third-year students enrolled in an educational research course in a local university in the Philippines.

### 2.3 Data-gathering Procedure

In this study, the researcher opted to provide the students with a research theme to work on for ease of supervision and management of outputs. The theme for the class research was dengue awareness and prevention. The goal of the research for every group is to find a solution to an existing problem in their community of assignment. The selection of the communities was based on a 2015 Department of Health (DOH) report on dengue prevalence in a major city in the Philippines. The criteria for group composition includes having a member or two who are residents of the community of assignment and the other members residing near that community.

The students in the research class were introduced to design thinking by stages alongside its equivalent form in the elements of research. The researcher informed the students

about the goals and objectives of the research class for the semester and what processes the class will undergo to attain the goals and objectives. Initially, all groups started with the common theme for the investigation which is dengue awareness and prevention in the country. The students gathered all the information they needed about the theme from online and printed sources. Then the students were given the task to go down the community level to get more information. The researcher provided the guidelines on what information are needed to be taken from the community officials and community health center in the form of interview such as the population of the community, number of dengue cases, solid waste management, availability of water supply, existing program and activities initiated by the community or local government pertaining on dengue awareness and prevention and how information campaigns are conducted and how often. Pictures to support the information were also taken.

Next, the students armed with a survey questionnaire called Knowledge, Practices, and Attitude towards Dengue questionnaire sought residents willing to be interviewed in the community of assignment. Using purposive sampling, five residents with dengue experience and another five residents without dengue experience were asked to answer the questionnaire and interview questions. The students were trained on how to conduct an interview in the classroom and how survey questionnaires should be administered prior to the field work. Timelines and schedule were strictly followed and the classrooms become the equipping and sharing ground for field experience. To provide the students with beyond the classroom resources on research and dengue, a Facebook group called "Design Thinkers" was created at the start of the semester. The data taken from submitted fieldwork observation forms and portfolio completed dengue survey questionnaire and focus group discussion were analyzed by the researcher. Students working in a group go over the information they have on their community of assignment during brainstorming sessions in the classroom. The groups went through the different Design Thinking stages to identify the gaps in the dengue awareness and prevention program and identify a user that will be represented by a created persona. The students extracted the user's needs and generate insights from the interview transcripts in a brain-storming session. The students went through the ideation process a number of times and come up with an initial prototype that will be shared to the end-users for improvement.

### 3. RESULTS & DISCUSSION

The students made a number of interesting discoveries and insights from their field exposure. In terms of awareness, the students found out that local officials and community health center personnel worked closely hand in hand and these officials perceived that they have done everything to make the health program work. From the data gathered and results from an interview with residents indicated that there are still a number of things that the residents are not aware of dengue. The residents were not knowledgeable about the life cycle of the dengue mosquito, the mode of transmission and the breeding place. The residents claimed that many of them cannot participate in scheduled clean-up drives and

educational campaign spearheaded by the community officials and health workers due to a variety of reasons. As a result, many of the respondents lacked essential knowledge about dengue. Although the attitude of the respondents are positive towards dengue awareness and prevention, they still believe that it is the responsibility of local officials to ensure that people are made aware of dengue and that practices to reduce the dengue incidence are in place. Majority of the community members do not take the initiative to be educated about dengue. It was also evident that people have the tendency to store water as water supply is erratic and sometimes non-existent. This practice of storing water contributes to the presence of dengue mosquito larvae in the community. Moreover, solid waste management is still a problem as well as sanitation in terms of working drainage system. Many discarded materials such as tires and empty plastic containers and bottles were found to have the presence of mosquito larvae. Waste management is associated with dengue transmission as waste, such as plastic bottles and discarded plastic, provides habitats for dengue vector [14]. Gurtler, Garelli and Coto [15] stated that it is difficult to reduce the number of dengue mosquito larvae when there is lack of adequate and sustained community participation and limited source reduction efforts. Community participation is crucial since the most important community-household risk factors identified were poor habits of cleanliness and attitudes regarding cleanliness and prevention [16]. Many of the residents simply do not care about dengue prevention programs. Apathy may result in a lack of knowledge on how to respond properly to the dengue outbreak. This was discovered by the majority of the research students who created a persona centered on knowledge gaps in dengue prevention and control. Students make use of adjectives such as uninformed, clueless, helpless, busy, and passive to describe the persona. As a result of this finding, the students focused on information dissemination. Moreover, pre-service science teachers can make use of their skills in conducting an educational campaign in the community. The proposed prototypes include a comic book for elementary students, a song or jingle for teenagers, an informative calendar on dengue, infographics on dengue, and educational flipchart for high school students. Some of the groups are working on strategies using social media such as Facebook and Instagram to educate people about dengue. Others came up with the use of informative text messages to enable residents to be updated about a community's scheduled activities on dengue awareness and prevention. These prototypes will then be the object of the research proposals for the evaluation of its effectiveness in improving knowledge, attitude, and practice about dengue prevention. Students will then proceed to the formulation of a research title, research questions, conceptual and theoretical framework, methodology and literature review.

Many of the groups have to revisit the communities many times when they found out that there is information that they failed to acquire or validate. The students realized that the group must plan carefully before they conduct the visit and do the tasks such as an interview. Collaboration and communication among team members were also mentioned as very essential to the success of the research tasks. All

group members must contribute their ideas and equally understand the undertaking that the group is pursuing. Most importantly, the students realized the value of tailoring the intervention to the interest and level of education of the intended users. They learned to apply learning principles, study inherent personal characteristics of age groups, consider cultural beliefs, and incorporate marketing strategies to ensure that the proposed prototype will be relevant.

To answer the question of whether the students find the field exercises to be relevant and worth their time, the researcher asked the research students to explain how Design Thinking helped them understand research better. Majority of the research students perceived that the integration of the Design Thinking Process into the research course helped them understand research better. Below are some of the verbatim comments.

**Student A:** *Design thinking helped me slowly understand the process of research. For me, learning comes easily when a person will have a chance to experience it by himself. It made me realize that doing research is not easy but it's a blessing to have one, to broaden my knowledge about this. Though it's hard I know this will help me a lot someday. In research, you really need to think outside the box, observe even the little things around you. Through design thinking students like me, will develop something in ourselves especially in socializing to people whom we don't know. We learn to listen to people and know their thoughts and feelings.*

**Student B:** *The design thinking process uses four stages of creating social innovation. These stages include sense and sensibility, empathy, ideation, and prototyping. These stages for me are very essential tools in conducting research. First is, in formulating our research proposal, we needed to get through the first two stages: the sense and sensibility and empathy, by such we will have a clear vision to where we would like to get to with our research. Next is, in considering the social intervention we would like to introduce in the community, the next two stages are applied. To sum up, the design thinking process immerses us, students, to the real-life setting, and give us the idea to what research really is--the careful study to a certain subject, create new knowledge and innovate things in the community*

**Student C:** *Design thinking process help me understand research because we need to get involve ourselves in learning experiences through research and use our developing understanding as a bridge to begin a certain design. Also, develop ourselves in sharing our thoughts and feelings to someone to aware themselves.*

**Student D:** *Doing research is not an easy feat especially when you have no idea what it is. But with the design thinking process, it helps me understand what research in a way that it opened my eyes that research is not just simply gathering articles from the web nor from the published writings of who did research before. Research is digging deeper into your user's point of view. What I need the most may not be the same with them. So in order to come up with good research, you have to interview your users, empathize with them, and co-create with them and reiterate. There is always room for improvements, for something better, and the best way to achieve this is to let your users identify what needs to be improved. Research, I come to understand with the help of*

*the design thinking process, is a combination of carefully studying a problem and designing the solution with the help of your users.*

#### 4. CONCLUSION AND RECOMMENDATION

Although the study is exploratory and qualitative in nature, findings indicated that exposing students to experiential learning through the use of the Design Thinking Process had helped the students understand research as an academic activity better. Giving the students learning spaces and opportunities to apply immediately what has been learned in the classroom is beneficial in many ways. It provided the students with a better view of their communities while the issues and challenges of a health program were clarified. Students saw the relevance of conducting an in-depth analysis of data and situation. Moreover, they realized that information must be validated to come up with a better solution to an identified problem. Students became sensitive in designing their intervention as design thinking specifies that it should be user-centered. This study is subject to many limitations as it lacked quantitative data to measure the effects of the design thinking process on students' research knowledge and skills. A more structured way of quantifying the effects of the design thinking process on the collaborative, communication and innovative skills of research students may, therefore, be conducted. The assessment of which will be based on the different design thinking stages as it caters to different developmental needs of students.

#### 5. LITERATURE CITED

- [1] Eisen, L., Beaty, B. J., Morrison, A. C., & Scott, T. W. "Proactive vector control strategies and improved monitoring and evaluation practices for dengue prevention". *Journal of medical entomology*, 46(6), 1245-1255. (2009).
- [2] Neiderud, C. J. "How urbanization affect the epidemiology of emerging infectious diseases". *Infection Ecology & epidemiology*, 5(1), 27060. (2015).
- [3] Gubler, D. J. "Dengue, urbanization and globalization: the unholy trinity of the 21st century". *Tropical medicine and health*, 39 (4) (SUPPLEMENT), S3-S11. (2011).
- [4] Bonet, M., Spiegel, J. M., Ibarra, A. M., Kouri, G., Pintre, A., & Yassi, A. "An integrated ecosystem approach for sustainable prevention and control of dengue in Central Havana". *International journal of occupational and environmental health*, 13(2), 188-194. . (2007).
- [5] Gómez-Dantés, H., & Willoquet, J. R. "Dengue in the Americas: challenges for prevention and control". *Cadernos de saúde pública*, 25, S19-S31. (2009).
- [6] Kolb, D.A. "Experiential learning: experience as the source of learning and development". *Prentice Hall*. (1984).
- [7] Kolb, A. & Kolb, D. A. "Learning styles and learning spaces: Enhancing experiential learning in higher education". *Academy of Management Learning & Education*, Vol. 4, No. 2, pp. 193-212. (2005).
- [8] Pugsley, K. & Clayton, L. "Traditional lecture or experiential learning: Changing student attitudes". *Journal of Nursing Education*, 42(11). (2003).

- [9] Healey, M. and Roberts, J. "Engaging students in active learning: Case studies in geography, environment and related disciplines". Cheltenham: *Geography Discipline Network and School of Environment*, University of Gloucestershire. (2004)
- [10] Healey, M. "Linking research and teaching exploring disciplinary spaces and the role of inquiry-based learning: Reshaping the university: new relationships between research, scholarship and teaching". *McGraw Hill / Open University Press*, pp.67-78. (2005).
- [11] Allison, P. & Pomeroy, E. "How shall we "know?" Epistemological concerns in research in experiential education". *Journal of Experiential Education*, 23(2), 91-98. (2000).
- [12] Shemali, N. "Correlation between experiential learning and optimism among college students". Accessed from <http://bspace.buid.ac.ae/bitstream/1234/682/1/110095.pdf>. (2013).
- [13] Downey, C. "Student research in an introductory psychology course: Outcomes of two experiential learning projects and implications for instruction of human subjects research". *The Journal of Effective Teaching*, Vol. 13, No. 2, 21-37. (2013).
- [14] Siregar, F., Abdullah, M., Omar, J., Sarumapet, S., Supriyadi, T., Makmur, T., & Huda, N. "Social and environmental determinants of dengue infection risk in North Sumatera Province, Indonesia". *Asian Journal of Epidemiology* 8 (2): 23-35. (2015).
- [15] Gurtler R.E., Garelli F.M., Coto, H.D. "Effects of a five-year citywide intervention program to control *Aedes aegypti* and prevent dengue outbreaks in Northern Argentina". *PLoS Neglected Tropical Diseases*, 3(4). (2009)
- [16] Ibarra, A. M. S., Luzadis, V. A., Cordova, M. J. B., Silva, M., Ordoñez, T., Ayala, E. B., & Ryan, S. J. "A social-ecological analysis of community perceptions of dengue fever and *Aedes aegypti* in Machala, Ecuador". *BMC public health*, 14(1), 1135. (2014)