

Sustainable Innovation and Entrepreneurship Short Course in Ecuador

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Abstract:

There are many underserved communities in Ecuador where there is an opportunity to provide support for further economic development. During a Fulbright grant from April to August 2023, the author developed and implemented a short course on sustainable innovation and entrepreneurship. The author laid the groundwork for the course by visiting communities in Barcelona and Sinchal, on the coast of Ecuador about two hours from Guayaquil. The course was then taught over a four-week period to a class of 20 students, professors, and researchers from various engineering disciplines at Escuela Superior Politecnica del Litoral (ESPOL) located in Guayaquil, Ecuador during July 2023. Students were introduced to topics such as value proposition, the business model canvas, the KEEN 3 C's framework on entrepreneurial mindset as well as concepts related to sustainable development. The students made a trip to the communities of Barcelona and Sinchal following the second week of the course to explore possible business development opportunities within these communities. After brainstorming ideas, developing business concepts, and refining their business concepts, the students went back to the communities in the fourth week of the class to present their ideas to the community members. Two business concepts were selected by the community members for further development. The author is now working with the students remotely from his home institution to help with the implementation of these new businesses.

A description of the course, how it builds on other sustainable development course approaches, and reviews and feedback of the course from the students will be presented in this paper.

Keywords: UN Sustainable Development Goals; entrepreneurship education; sustainable development

Introduction

Many areas in the world have challenges with access to clean water, access to electricity, and limited economic development opportunity. The UN Sustainable Development Goals [1] were agreed upon by most of the world's nations in 2015 following the limited success in achieving the prior Millennium Development Goals. One of the major concerns addressed by these goals was to provide sustainable economic development in poor regions of the world. It turns out that while aid programs to developing countries have provided some limited benefits, their impact on communities' economic development overall has been disappointing [2]. A more fruitful way of supporting economic development is through entrepreneurial means [3,4]. Another important element of economic development is to make it sustainable. There have been several initiatives to incorporate both sustainability and entrepreneurship into courses addressing the UN Sustainable Development goals [5,6].

During a Fulbright visit to Ecuador during the months of April to August 2023, Dr. Singh taught a Sustainable Innovation and Entrepreneurship class to professors and students at the Escuela Politecnica Superior del Litoral (ESPOL), one of the top technical universities located in Guayaquil, Ecuador. The goal of the one month long short course was to engage with rural coastal communities in southwest Ecuador to produce improved economic development in partnership with the communities. The challenge was to effectively do this in a month when only meeting two days a week for two hours at a time!

Previous Approaches to Short Term Entrepreneurship Classes

Several approaches to short term entrepreneurship classes have been used to provide insights to students and professors on how to develop enterprises. A common approach is the bootcamp approach [7]. This typically comprises offering an intensive one- or two-week class in which the students are asked to find a problem through various techniques such as painstorming, observing trends, etc. Once a problem/need has been identified, the students then typically use brainstorming to propose various possible solutions. After considering various criteria, students then settle on an initial solution that is then used to develop a prototype of the preferred solution. A prototype of this preferred solution is then tested with potential customers and refined based on customer feedback. The short course typically ends with an elevator pitch to investors. There is usually not time for multiple solution iterations or development of marketing plans in such a short course. This type of bootcamp allows the entrepreneurial process to be explored at a basic level and can then serve as the basis for more extensive coursework beyond the introductory level.

The Goals of the Course in Ecuador

The aims of the course delivered in Ecuador was to work with two communities in the areas of Barcelona and Sinchal to improve their economic conditions. Barcelona is known as the Panama hat capital of the world and Sinchal is known for growing and selling limes. Barcelona has limited capability for making Panama hats and the revenue stream from selling limes varies significantly by season. The class of students and professors were challenged to come up with entrepreneurial solutions to increasing the revenues of the two communities. The research question that we explored was how we can provide enough knowledge and time for the students in the class to engage enough with the communities to learn about their existing businesses and the limitations of these businesses, to learn the basic concepts of sustainable development and entrepreneurship, and to develop and prototype solutions with only four hours of class sessions per week over a four-week period!

Background of the Barcelona and Sinchal Businesses

Barcelona

The Barcelona community is located about five miles from the main coastal road through the region. Being set back from the main road through the region, it is somewhat off the main tourist path and so is not frequently accessed by tourists. The process of making the Panama hats starts with growing the grasses that are used for the straw used to make the hats. These grasses are grown in the hills near Barcelona and then are cut down and brought to Barcelona for processing. They are dried in the sun and then boiled to produce the straw from which the Panama hats are made. This straw is then woven into hats by people (mostly women) in the community. The material finish of the Panama hats manufactured in Barcelona are rather rough and hard. To make the hats softer requires an iron that the Barcelona community has not invested in. Thus, the finish of the hats is not as good as in other places where Panama hats are made.

Sinchal

The Sinchal community is known for lime growing. The limes are grown and then picked and those that meet supermarket standards are sold to the supermarket suppliers. However, those limes that do not meet the quality standards are not sold.

The aim of the course was to have the students in the class work in collaboration with the communities to develop entrepreneurial ideas to improve the economic development of these two communities in a sustainable way.

Pre-Course Preparation

In advance of teaching the class, Dr. Singh went to the communities with Prof. Gina Andrade, a professor of Ocean Engineering at ESPOL. Prof. Andrade has been working with these two communities for many years and has developed a strong relationship with the community members. The trip was made in late May 2023 with the course scheduled to be taught during the month of July 2023. In addition to Drs. Singh and Andrade, Dr. Jorge Duque and Prof. Eduardo Castillo, two professors in the mechanical engineering department (where Dr. Singh was based during his Fulbright appointment at ESPOL). Prof. Duque had previously worked on a mechanical engineering project with the Barcelona community and Prof. Castillo had experience with entrepreneurship, having started his own company.

During the visit to the communities, Dr. Singh was introduced to community leaders as well as community members. He was given a tour of the Panama hat processing centers including the places where the grass was dried, the dried grass was boiled and the drying areas for the boiled grass. He also observed the women manufacturing the straw hats and examples of final products. He also got to see the lime crop and was shown good, supermarket grade limes as well as ones that did not meet supermarket standards. The previous engagement with the community and Prof. Gina Andrade was crucial to ensuring the trust that was necessary to effectively work with the two communities. Photographs of the sign of the town of Barcelona (including a large sculpture of a Panama hat), a mural showing a man making a Panama hat, and some of the limes grown in the area are shown in Figure 1.

Course Structure and Schedule

The week-by-week course schedule is presented in Table 1. The course met twice a week on Wednesdays and Fridays for 2-hour sessions (from 10:00 a.m. to 12:00 noon). There were 22 students enrolled in the class including faculty members from several engineering disciplines, including mechanical engineering, electrical engineering, food engineering, ocean and coastal engineering, and economics as well as researchers from the Sustainability research center at ESPOL. A few undergraduate engineering students, primarily mechanical engineering and ocean and coastal engineering students, also enrolled in the course. The gender breakdown was about 40% women/60% men.

The course began with an introduction to sustainable development, innovation, and entrepreneurship. Topics included coverage of the UN Sustainable Development Goals, the STEEP framework for sustainability assessment [8], sources of innovation, particularly within the context of sustainable development. Case study examples of successful technology-based enterprises working in sustainable development such as the super money maker pump, a low-cost treadle pump used for irrigation of crop fields and the bicycle generator and lighting company, Nuru Power, were presented. Finally, the basic concepts of value creation and business models including the business model canvas were covered in the first class. At the end of the first class, the students were divided into four teams of approximately five members each. The teams were set up as inter-disciplinary teams with a gender mix in each team. The second class looked at the entrepreneurial mindset. Since almost all the professors and students attending the classes were engineering faculty, researchers, and students, the KEEN 3C's approach [9] to instilling the entrepreneurial mindset was presented. Following this presentation and some exercises to

exemplify the 3C's framework, Prof. Gina Andrade gave a slide presentation on the two communities of Barcelona and Sinchal, introducing the students to the businesses in the communities and the challenges that they face.



a)



b)



c)

Figure 1. a) The sign at the entrance to Barcelona with a large model of a Panama hat
b) A mural on the community center building showing a man making a Panama hat
c) A crop of limes being sorted for quality before being sold to supermarkets

The third class covered the topics of ideation and rapid prototyping. Students in the class were given some basic guidelines on these topics and were then given specific challenges related to the UN sustainable development goals for which they were asked to develop solutions. The students worked in their teams and using miscellaneous craft construction materials, such as pipe cleaners, cardboard, markers, etc., that was provided to the teams, they were asked to produce prototypes of their solutions. The second class of the third week was focused on community engagement (including ethical considerations around community engagement) and sustainable business model development. On the Saturday following the second week of classes, most of the students went out to the Barcelona and Sinchal communities. These communities are located about two hours from the ESPOL campus and so a bus trip was organized. The visit started with introductions to the community members in a community center followed by a walking tour of the various processing steps in the Panama hat and lime businesses. Following the walking tour, the students and community leaders had lunch together and engaged in conversation to learn more about some of the concerns and challenges that the community members were facing. During the third week of classes, the students brainstormed various conceptual ideas to build new revenue streams for the communities. They gave draft presentations on their business concepts to Dr. Singh, Prof. Gina Andrade, and Profs. Duque and Castillo. During the final week of classes, the students further refined their business models, developed cost/revenue projections, and gave a final dry run presentation that they would plan to make to the communities the following day.

A second trip to the Barcelona/Sinchal communities was made on Saturday July 29th following the last class of the course on Friday July 28th. Four ideas had emerged from the students' efforts, two for the Panama hats business and two for the limes business. The four ideas were:

- 1) Purchase an iron and improve the quality of the Panama hats being manufactured;
- 2) Develop a plan for increasing tourism to the communities;
- 3) Fabricate lime-based teas and sell them in the market;
- 4) Develop oils from the limes and distribute them through cosmetics companies/stores

The four ideas were presented to the community members in the Barcelona community center. Each of these ideas was then discussed by the community members for about an hour during which time the ESPOL students were available to provide any clarification to the community members. Once the discussion had concluded, each idea was voted upon by the community members.

Of the four ideas presented, lime tea, tourist destination development, lime-based cosmetics, and enhanced quality of Panama hats based on purchasing an iron, the two that were voted by the community members that they wished to pursue were the improved tourism to the communities and the lime-based oils for cosmetics.

While the course was officially over after this final visit to the communities, two of the teams decided to pursue these two initiatives. For the tourism project, it was decided to recruit students from the tourism program at ESPOL to help develop a plan to share with the Barcelona community. Every student at ESPOL is required to do a community service project as a part of their graduation requirements and so it was decided that bringing in tourism students to work on this to meet this community service graduation requirement would be a good way to further develop the initiative without requiring additional financial resources.

For the lime-based oil project, Prof. Priscilla Castillo, a professor of Food Engineering and Production Sciences, offered to take the leading in developing the technology to implement the production of the lime-based oils.

	5-Jul-23	7-Jul-23
	Introductions by students and instructors Introduction to Sustainable Development, Innovation and Entrepreneurship Formation of teams	Entrepreneurial Mindset (3C's Framework) Introduction to Community
	12-Jul-23	14-Jul-23
	Ideation Rapid Prototyping	Basics of Community Engagement Sustainable Business Model Development Ethics of Community Engagement
July 15/16	19-Jul-23	21-Jul-23
First trip to community	Sustainable Business Model Refinement	Draft presentations groups 1 and 2
	26-Jul-23	28-Jul-23
	Draft presentations groups 3 and 4	Final presentations to class
July 29/30		
Presentations to community		

Table 1: Week by Week Course Schedule

Course Feedback from the Students

An assessment questionnaire was developed to gauge feedback from the students who took the course. The questionnaire is shown in Figure 2. A total of seven questions were asked of the students covering the pedagogical approach of the course, whether the course was effective given the relatively short length of the course, how the students enjoyed working on a real project with a real community, and whether the fact that the course was taught in English was a barrier to their learning the material. They were also asked if they would like to continue to work on their projects beyond the official end of the course. The responses were based on a five-point Likert scale ranging from strongly disagree to strongly agree. There was also a space included in the questionnaire for students to provide general comments related to the course. The questionnaire was set up using Google forms and the TA, Daniel Aviles, compiled the results so that Dr. Singh only saw anonymized results. Unfortunately, there were only four

Assessment Questions for Sustainable Innovation and Entrepreneurship Class

Q1: I found the class interesting/stimulating?

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q2: I enjoyed working with a real community

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q3: I liked the fast pace of the class

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q4: I liked the interactive pedagogical approach of the class

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q5: The duration of the class was too short to allow for the full development of our proposed business concept

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q6: The fact that the class was in English hindered my learning

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

Q7: I am interested in continuing to work on the project with the community after the class is formally over

Strongly disagree Disagree Neutral Agree Strongly Agree

Comments

General Comments:

What you did like about the course:

What did you not like about the course:

Suggestions for improvement:

Figure 2: Course Assessment Questionnaire

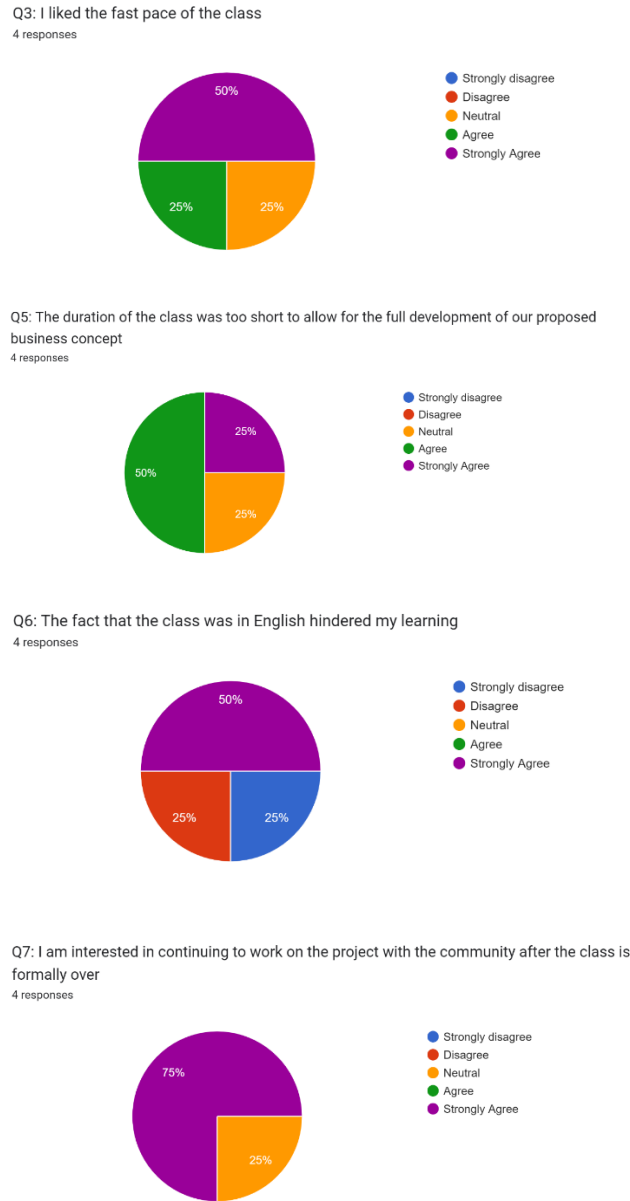


Figure 3: Course Assessment Questionnaire Results for some of the questions

students who provided feedback through the questionnaire. Overall, the course was well received by the students. They liked the pedagogical approach using case studies, hands-on learning, and working with a real community on a real problem. All four students strongly agreed with the first two questions as well

as with question 4. For questions 3, 5, 6 and 7, the results are shown in Figure 3. Most of the respondents liked the fast pace of the course and most of the respondents wanted to continue to work on their projects after the conclusion of the course.

While all the students understood English, several indicated that the English language presentation did impede their learning. The one area where the students had strong negative responses was the length of the course. They found that the course length limited their ability to develop the full business models for their proposed businesses.

The responses to the open-ended question about what the students most enjoyed about the course are transcribed verbatim here:

What you did like about the course:

4 responses

the interaction with our teacher, he has a very natural and fluid way of teaching, in addition to the knowledge imparted.

The topic of the course , the professor is excellent !

I really enjoyed the classes, the overall concept of the course, I think it is a very helpful way to empower communities

La rápida aplicacion de conceptos

For the responses as to what the students didn't like about the course and how it could be improved, they fell into two categories:

- 1) Several students missed class and so it impacted the smooth functioning of the teams; the suggestion was made to make up the teams more carefully and kick out students who were not attending the class regularly.
- 2) Insufficient visits to the community to allow better engagement with the community members. Of course, this was a legitimate concern given the short duration of the course.

One of the professors of food engineering who took the class, Professor Priscilla Castillo, sent me the following text message on February 7th, 2024:

"I have some news about the Barcelona and the lemons project. I had two students that worked in a thesis project related to lemon essential oils. They already finished and we would like to present to you and Gina our results and findings. Tomorrow I will go to Barcelona with the students and Prof. Duque to meet with the lemon farmers association. They have been working along with us these months. .. Our students from this project competed in a five minute speech contest. The idea is to convince the judges of a good idea of projects. My students are now in the final stage. Our project is in the top ten of the best ideas in this semester.

Thank you Dr. Singh for getting me involved in this project. I really enjoy it."

Conclusions and Next Steps

A month-long course on Sustainable Innovation and Entrepreneurship was taught to a multi-disciplinary group of faculty, researchers, and students at ESPOL, a technical university based in Guayaquil, Ecuador. The course was taught over a four-week period, meeting twice a week for two hours per class. The students in the course engaged with two communities in the coastal region of Ecuador engaged in businesses around the manufacturing of Panama hats and growing limes. The goal of the course was to have the students innovate and enhance the value of products in the partner communities. Four ideas were developed and presented to the communities and two of these were voted on as the best ideas to be further pursued. Overall, the course was well received but the students felt they needed more time to fully develop their business models. Since the course concluded, Dr. Singh has met with some of the project leaders on the two projects and they are continuing to be developed. Indeed, the lime oil project was taken up as a senior design project and supervised by the Food Engineering and Production Sciences professor. The improved tourism to the Barcelona community is also being pursued by students in the Tourism program as a service-learning outreach program. Dr. Singh continues to meet with Dr. Andrade and the team leaders for these two projects on a regular basis.

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