

Training Future Entrepreneurs – Developing and Assessing Sustainability
Competencies in Entrepreneurship Education

by

Tamsin Foucrier

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2020 by the
Graduate Supervisory Committee:

Arnim Wiek, Chair
George Basile
Matthias Barth

ARIZONA STATE UNIVERSITY

May 2020

ABSTRACT

Employee-owned businesses, benefit corporations, social enterprises, and other sustainability entrepreneurship innovations are responding to challenges such as climate change, economic inequalities, and unethical business behavior. Academic programs to date, however, often fall short in sufficiently equipping students with competencies in sustainability entrepreneurship – from a coherent set of learning objectives, through effective and engaging pedagogies, to rigorous assessment of learning outcomes. This dissertation contributes to bridging these gaps. The first study proposes a process-oriented and literature-based framework of sustainability entrepreneurship competencies. It offers a general vision for students, faculty, and entrepreneurs, as well as for the design of curricula, courses, and assessments. The second study presents an exploration into the nature of sustainability entrepreneurship courses, with a focus on teaching and learning processes. Using pioneering courses at Arizona State University, the study analyzes and compares the links between learning objectives, pedagogies, and learning outcomes. Based on document analysis and semi-structured interviews with course instructors, the study identifies cognitive apprenticeship from input processing to experimentation, constructive alignment from learning objectives to assessments, and curriculum-level coordination across courses as key success factors of sustainability entrepreneurship education. The result of this study can inform instructors and researchers in applying and further substantiating effective educational models for future entrepreneurs. The third study addresses the key question of competence assessment: what are reliable tools for assessing students' competence in sustainability entrepreneurship? This study developed and tested a novel tool for

assessing students' competence in sustainability entrepreneurship through in-vivo simulated professional situations. The tool was in different settings and evaluated against a set of criteria derived from the literature. To inform educators in business and management programs, this study discusses and concludes under which conditions this assessment tool seems most effective, as well as improvement for future applications of the tool.

DEDICATION

First, I would like to dedicate this dissertation to my loving parents, Carol-Ann and Jeremy. They have always been by my side, cheering me on, and providing whatever support they could. I could not have completed this dissertation while raising two children without you both. I am forever grateful for your love and support.

I also dedicate this dissertation to my three beautiful children: my Rowan and Lily, and my angel above, William. You have all been a light in the dark and have given me hope for a better, more beautiful, and kinder world.

And finally, this dissertation is dedicated , most of all, to the most important person in my life, my husband, without whom I would never have made it through the most difficult six years of my life. He sees me as nothing less than his absolute equal in marriage, in parenthood, in intellect, in ambition, and beyond. He has help me weather my storms, carry me when I could not go on, and pushed me to be a better wife, mother, person, friend, teacher, and researcher. I love you beyond words and time.

ACKNOWLEDGMENTS

First and foremost, I would like to thank my chair, Dr. Arnim Wiek, without whose support and confidence in me have been integral to my success thus far. As someone who constantly doubts herself and her abilities, he has always pushed me to do better because he knows I can achieve great things. To have such support from an incredible visionary in our field is valuable beyond words. I also see him as a close friend who has known my struggles and has always been there in my darkest times. Thank you from the bottom of my heart.

I would also like to thank my committee members, Dr. George Basile and Dr. Matthias Barth. Dr. Basile your guidance on options beyond academic post-graduation, the opportunities you have afforded me, and your valuable feedback have helped shape me as an academic whose passion is beyond just research. Your work and guidance continue inspire me to continue to push myself always. Dr. Barth, thank you for taking a chance on me for the EFCA project. I also would not have been able to complete this project without you and your team. Your team leadership, along with Dr. Wiek, have helped us all produce work that we are immensely proud of.

I would also like to thank my colleagues and support network within the School of Sustainability and beyond: Dr. Braden Kay, Dr. Nigel Forrest, Kimberely Grout, and many, many more. They have been an inspiration and a guide for me as I have worked through my PhD journey and as I navigate these next steps. I consider myself lucky to have all of you in my life.

I would like to thank my EFCA colleagues, Aaron Redman, Jan-Ole Brandt, Theres Konrad, Jodie Birdman, Jana Timm, and Marie Weiss from Arizona State

University (USA) and Leuphana University of Lüneburg (Germany) for support on the research presented in this dissertation, for comments on my manuscripts at various stages, and for emotional support for the last four years. Being a part of a larger research group with such talent and passion for our work has been incredibly inspiring.

I would also like to thank Lauren Kuby, Dr. Braden Kay, Jake Swanson, Dr. Nigel Forrest, Samantha Zah, Dr. Jacob Bethem, and the SE graduate students who participated in the assessment found in this work. I would like to thank Dr. Arnim Wiek, Dr. Nigel Forrest, Dr. George Basile, Nick Shivka, and Jared Byrne for their participation in this research as well. Without their time and effort, this research would not have been possible. Finally, we would like to thank Arina Melkozernova and Jodie Birdman for their efforts in data collection (both written and video/audio). Finally, I would like to thank all instructors interviewed for this study for their willingness to share course material and their time.

This research was funded by the Lower Saxony Ministry of Science and Culture & Volkswagen Foundation through the grant “Educating Future Change Agents – Higher Education as a Motor of the Sustainability Transformation” (A115235) through the program “Science for Sustainable Development”. My deepest gratitude for your financial support during my dissertation journey.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ix
LIST OF FIGURES	xi
CHAPTER	
1 INTRODUCTION	1
Problem Statement.....	1
Research Questions & Research Design	5
Dissertation Structure.....	7
2 STUDY 1: A PROCESS-ORIENTED FRAMEWORK OF COMPETENCIES FOR SUSTAINABILITY ENTREPRENEURSHIP	9
Introduction	9
The Landscape of Competency Frameworks	12
Research Design	15
Results.....	18
Discussion	38
Conclusions	42
3 STUDY 2: EDUCATING STUDENTS AND PROFESSIONALS IN SUSTAINABILITY ENTREPRENEURSHIP – STRENGTHS AND WEAKNESSES OF INNOVATIVE COURSE FORMATS	45
Introduction	45
Research Design.....	48
The Courses	50
Discussion	70

CHAPTER	Page
Conclusions	75
4 STUDY 3: ASSESSING STUDENTS' COMPETENCE IN SUSTAINABILITY ENTREPRENEURSHIP THROUGH IN-VIVO SIMULATED PROFESSIONAL SITUATIONS	77
Introduction	77
Profile of the Graduate Course	80
The Assessment Tool.....	83
The Test Assessments and Assessment Results	87
Research Design	91
Evaluation Results – Validation of the Assessment Tool.....	95
Discussion	105
Conclusions	109
5 CONCLUSIONS	110
Summary of Research	110
Research Limitations and Future Research Needed	112
Overall Findings	115
Contribution of Work.....	130
REFERENCES	132
APPENDIX	
A IRB APPROVAL	147
B STATEMENT OF PERMISSION FOR USE OF CO-AUTHORED ARTICLES	149
C IN-VIVO SIMULATION ASSESSMENT MATERIAL	151

APPENDIX

Page

D	IN-VIVO SIMULATION ASSESSMENT PROTOCOL.....	166
E	EXEMPLARY STUDENT SCORECARD.....	177
F	EXAMPLE OF ANTICIPATED V. ACTUAL PROMPT AND RESPONSE MAPS.....	181

LIST OF TABLES

Table		Page
1.	Tasks of Sustainability Entrepreneurs.....	19
2.	Competencies Relevant for Sustainability Entrepreneurs.....	22
3.	Tasks and Competencies in the Discovery Phase of Sustainability Entrepreneurship.....	27
4.	Tasks and Competencies in the Planning Phase of Sustainability Entrepreneurship.....	29
5.	Tasks and Competencies in the Start-Up Phase of Sustainability Entrepreneurship.....	32
6.	Tasks and Competencies in the Build-Out Phase of Sustainability Entrepreneurship.....	35
7.	Tasks and Competencies in the Consolidation Phase of Sustainability Entrepreneurship.....	38
8.	Main Features of the Sustainability Courses at Arizona State University (ASU).....	67
9.	Key Features of the Two Test Assessment Settings.....	88
10.	Student Performance in the Two Test Assessments.....	90
11.	Criteria for Evaluating (Validating) the In-Vivo Simulation Competence Assessment Tool.....	93
11.	Analytical Procedure of the Tool Evaluation and Corresponding Evaluation Criteria.....	95
12.	Evaluation (Validation) Results for the In-Vivo Simulation Assessment Tool.....	103

Table	Page
13. Proposed Sustainability Entrepreneurship Program.....	117

LIST OF FIGURES

Figure		Page
1.	Architecture of the Research Studies Compiled in this Dissertation...	6
2.	Overview of Research Design (Study #1)	16
3.	Overview of the Iterative Process of Sustainability Entrepreneurship with Main Tasks.....	24
4.	Conceptual Overview of Dimensions, Components and Alignments of the Assessment Tool	92

CHAPTER 1

INTRODUCTION

1. Problem Statement

In 1978, after three years of borrowing money and surviving a devastating flood, John Mackey and Renee Lawson opened a small natural foods store, the first Whole Foods store, among a sea of traditional grocery stores in Austin, Texas. As the years passed, the company began expanding throughout the U.S., offering, for the most part, natural, local, and healthy foods. With this focus came empowerment of small, local farms, providing an outlet beyond traditional brick-and-mortar grocery stores that mostly sourced from large, industrial farms. Whole Foods became a focal figure in the “citizen-consumer” discourse on consumers using their dollars to “vote” for a change in food systems. The company’s focus on “ethical consumption” became the cornerstone of their mission, branding themselves as “America’s Healthiest Grocery Store” (Whole Foods Market History, n.d.).

However, as Whole Foods grew, it gained traction as a competitive, large-scale food retailer. While the focus on local and fair-trade sourcing of healthy foods continued as the centerpiece of the enterprise, Whole Foods became seen as targeting “privileged, conscientious consumers”, rather than pursuing “health, sustainability, and social justice at a global scale” (Johnston, 2008). Fast forward to today, with the recent acquisition of Whole Foods by Amazon, the company’s pressure to maximize profits threatens the small, local farms it once sought to empower. The push to lower prices from Amazon has led to sourcing from farms farther away, at the cost of the Whole Foods’ original mission (Dewey, 2017). Small, local farms and food suppliers now fight for shelf space and in-store visibility while

Whole Foods has sought to centralize purchasing and operations on a large scale (Campbell et al., 2018; Bhattari, 2018; DePillis, 2018).

The business-as-usual growth ideology dominates today's global economy. It has driven other sectors of the economy, too; for example, dairy farming. Once relatively immune to the effects of food system consolidation, i.e., acquiring and merging food companies to reduce competition and control pricing, due to the prevalence of local and regional cooperatives throughout the U.S., small dairy farms are increasingly outcompeted by large dairy firms (Hendrickson et al., 2001). Simultaneously, the rise of large-scale, confinement dairy farming has led to increases in severe environmental impacts such as soil denitrification, phosphorous runoff, and greenhouse gas emissions, among others (Belflower et al., 2012).

In addition, business-as-usual often fails to protect and empower the workforce upon which it relies. From the tech giant employee working 60 hours a week under intense pressure to the working mother who cannot afford to take unpaid leave, the demands to maximize profits as sole success criterion has led to an over-worked and disempowered workforce. A study from New Zealand found that by the age of 32, almost half of all cases of depression and anxiety were attributable to work-related stress (Melchoir et al., 2007), while a National Survey of Mental Health and Wellbeing in Australia estimated 15% of the workforce had a history of depression (LaMontagne et al., 2010). The Center for Workplace Mental Health reports for the U.S. 120,000 deaths annually due to excessive workplace stress and almost \$190 billion in health care costs due to workplace stress (Goh et al., 2015).

Responding to these environmental and social challenges, sustainability entrepreneurship has arisen to spark innovations that provide both social and

environmental benefits, in the food economy (Weber et al., 2019), and beyond. Sustainable business model innovations have been the most transformational efforts (Schaltegger et al., 2012). From social enterprises, benefit corporations, and cooperative businesses, there are better way to do business – from sustainable sourcing of raw material to producing goods in zero-waste facilities, to offering robust employee wellbeing and health programs, to insuring democratic ownership and governance to all employees. Sustainability entrepreneurship is driven by a vision of building an empowered workforce and developing products and services that not only seek to minimize its impact on the social and ecological systems it depends on, but actually improve them. Certified B Corps such as King Arthur Flour provide avenues of empowerment through 100% employee-ownership and employee volunteer programs. Cooperative businesses such as the Grenada Chocolate Company have pioneered community farmer ownership and zero-emission transportation systems using sailboats to export their product world-wide. These enterprises are powered by a vision to fundamentally change the way we do business.

Sustainable business model innovation has grown organically over the past few decades (Geissdoerfer et al., 2018); yet, universities continue to provide very few spaces to educate the next generation of entrepreneurs in these models. From business programs to business incubators and accelerators, the majority of today's support for business development follows business-as-usual paradigms. Teaching environmental and social awareness as requirement for enterprise rather than an addendum has been identified as critical to legitimizing the sustainability agenda for current and future entrepreneurs. In addition, interest in sustainability among

business students has steadily grown (Schaper, 2002), with some sustainability courses and curricula emerging in universities worldwide. More than 70% of the top 50 MBA programs worldwide offer one or more sustainability-related courses (Christensen et al., 2007). However, these sustainability offerings, in large, are offered in the context of making the business case for corporations. In other words, sustainability as a business principle is largely integrated as an add-on rather than a core principle (Alcaraz & Thiruvattal, 2010). A 2011 survey of the top 100 Global MBA Rankings universities revealed that of the top 100 MBA programs, about half of the programs offered courses related to Corporate Sustainability Responsibility and Ethics, and only about one third offered a sustainability business course (Wright & Bennett, 2011). Scholars have advocated for a more transformational approach to business education, anchoring sustainability at the center of the curriculum (Starick & Rands, 2010).

For future entrepreneurs to be able to transform the “rules of doing business” requires training in particular sets of competencies (Barth, 2014). Such key competencies in sustainability (Wiek et al., 2011a; Wiek et al., 2011b) have emerged as cornerstones for sustainability programs around the world. However, many business and management programs and course offerings are not equipping students with these skills. A 2017 survey of sustainability integration into Canadian MBA programs revealed that students were exposed to courses on CSR and value-added sustainability topics, but, ultimately are “not graduating with key competencies for sustainability” (Driscoll et al., 2017).

Development of programs in transformational sustainability entrepreneurship is slow – far too slow to cope with the challenges societies face

around the world. Babson College in Massachusetts boasts a Social Innovation Lab and Women's Entrepreneurial Development Lab focused on incubating social enterprises and elevating the status of marginalized female populations. The University of North Carolina offers an MBA program with a focus in sustainable enterprise offering students the experience of working with local companies and hosting an annual Sustainable Venture Capital Investment Competition for students to win seed money for their sustainable enterprise ideas. About 500 higher education institutions have signed the Talloires Declaration, a commitment to incorporating sustainability in teaching, research, operations and outreach (University Leaders for Sustainable Future, 2013). In addition, over 650 business schools have committed to the Principles for Responsible Management Education (PRME) and to "transform their teaching, research, and thought leadership in support of universal values of sustainability, responsibility, and ethics" (PRME, 2016).

However, assessments of developing sustainability entrepreneurship competencies is missing in most of these programs and courses. Driscoll et al. (2017) identify this gap, calling for an analysis of competency acquisition as well as comparative research on sustainability integration in business education.

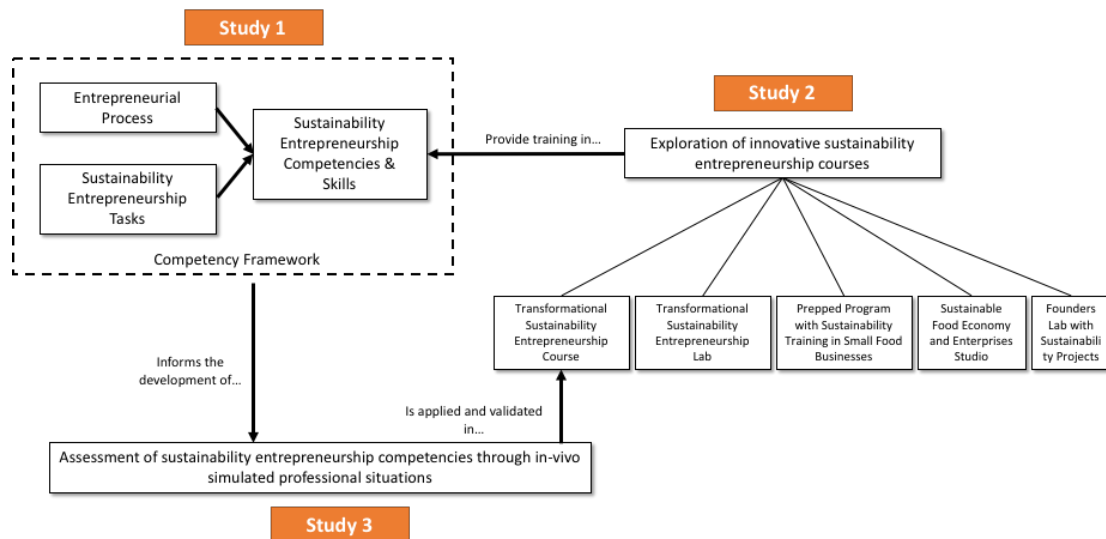
2. Research Questions and Research Design

The aim of this dissertation was to produce insights on how higher education institutions can effectively train sustainability entrepreneurs. Along this objective, the research design focused on the micro-level of teaching and learning in courses for sustainability entrepreneurship.

Research was structured into three studies (Fig. 1). The first study focuses on the development of a detailed competency framework for sustainability entrepreneurship, including specific tasks, knowledge, and skills needed throughout the sustainability entrepreneurial process. Study #2 focuses on an exploration of specific teaching and learning environments for sustainability entrepreneurship, including insights on exemplary learning objectives, applied pedagogies, course content, learning activities, and more. Study #3 uses insights from Study #1 and Study #2 to develop and test an in-vivo simulation assessment tool sustainability entrepreneurship competencies (applied in a graduate course documented and analyzed in Study #2).

Figure 1

Architecture of the Research Studies Compiled in this Dissertation



Study #1 is based on a literature review to develop a process-oriented sustainability entrepreneurship competence framework. Studies #2 and #3 use qualitative case study approaches for in-depth investigation of learning and assessment processes (Yin 1994). Study #2 combines analysis of course syllabi and

documents, and semi-structured instructor interviews to explore a suite of innovative sustainability entrepreneurship courses. Study #3 employs an empirical validation method to test an in-vivo simulation assessment tool.

The studies of this dissertation address the following research questions:

1. Study #1: What key competencies do future entrepreneurs need to successfully start and run sustainable enterprises that contribute to sustainability transformation in society?
2. Study #2: What are strengths and weaknesses of innovative teaching and learning formats for conveying sustainability entrepreneurship competencies?
3. Study #3: What is a reliable tool for assessing students' competence in sustainability entrepreneurship that goes beyond self-assessment or conventional examination tools?

This dissertation is situated within the larger scope of the Educating Future Change Agents project (a collaboration Arizona State University and Leuphana University).

3. Dissertation Structure

The three major chapters in this dissertation (chapters 2, 3 and 4) consist of three distinct, but linked journal articles (manuscripts). The manuscripts correspond to Study #1, #2, and #3 described above. Each study was designed and written as a stand-alone, publishable piece, but with commonalities threaded throughout. The major benefit for such a structure is that the reader can choose to read the study of interest, without needing to review the entire work. Therefore, this dissertation, as a whole, may include a few repetitions, specifically in each chapter's

introduction and background literature. However, research design, results, discussion and conclusions of each chapter are unique.

CHAPTER 2

STUDY 1: A PROCESS-ORIENTED FRAMEWORK OF COMPETENCIES FOR SUSTAINABILITY ENTREPRENEURSHIP

1. Introduction

Employee-owned businesses, benefit corporations, and local living economies counter business-as-usual practices by sourcing ingredients and materials locally, producing goods in zero-waste facilities powered by renewable energy, and by offering robust employee benefits and well-being programs, among others. These practices are examples of comprehensive or transformational sustainability entrepreneurship, driven by the vision of empowering the workforce and community, as well as developing products and services that not only minimize the impacts on the social and ecological systems we depend on, but actually improve them (Wiek et al, 2016; Higley, 2019). Sustainability entrepreneurship fosters business activities that do not exceed critical thresholds while supporting recovery and regeneration in environmental and social systems. Such entrepreneurship also challenge conventional ownership and management structures. For example, the King Arthur Flour Company is a certified B-Corp with a strong environmental performance while providing avenues of empowerment through 100% employee-ownership and employee volunteering programs. Or, the Grenada Chocolate Company empowers organic community farms and pioneers zero-emission distribution systems using solar power and sailboats to export their products.

While sustainability entrepreneurship is on the rise, universities and colleges around the world, however, provide few structures to support this trend. From management programs to business accelerators, the majority of offerings in higher

education reproduce business-as-usual with the well-known flaws and shortcomings (Cornuel & Hommel, 2015; Dyllick, 2015; Jamili et al., 2016; Snelson-Powell et al., 2016, Ferns, 2019). A recent survey of Canadian MBA programs revealed that students get exposed to Corporate Social Responsibility and related topics, but they are “not graduating with key competencies for sustainability” (Driscoll et al., 2017, pp. 93–114). These attempts cover sustainability only as an addendum to conventional business education and perpetuate the “rhetoric” (vs. reality) of responsible management education (Cornuel & Hommel, 2015). Hence, scholars have advocated for comprehensive or transformational approaches that explore the knowledge, skills, and attitudes that entrepreneurs and business practitioners need to develop truly sustainable enterprises (Higley, 2019; Starik & Rands, 2010). As Dyllick (2015) (p. 16) states:

In the light of the pressing economic, social and environmental crises the world is facing, the feeling is spreading that not only business and economics but business schools also need to change fundamentally, if they want to be a provider of solutions to these crises and thereby keep and regain their legitimacy.

In response to these needs, a number of scholars have developed diverse competency frameworks for sustainability entrepreneurship (Hesselbart & Schaltegger, 2014; Lans et al., 2014; Osage et al., 2016; Mindt & Rieckmann, 2017; Ploum et al., 2018; Biberhofer et al., 2018). They all offer valuable options but as a whole, they have two shortcomings. First, none of them links competencies to the actual processes of entrepreneurship (from initial discovery through planning, start-up, and build-out to consolidation and harvesting) (Baron & Shane, 2014; Ardichvili

et al., 2003; Korunka et al., 2003; Choi & Sheperd, 2004; Clarysse & Moray, 2004; Shane & Cable, 2002; DeTienne, 2010); a shortcoming that has been observed about competency frameworks in general (Wilhelmm et al., 2019). Yet, if graduates are to successfully start and run sustainability-oriented enterprises, the real-world entrepreneurship processes should provide the main orientation for training and learning. Second, the ones that are more practically oriented, however, do not rely on and synthesize the competencies already presented in the literature. This has led to competency frameworks guiding curriculum and course development that are somewhat disconnected from the reality of entrepreneurship and/or lack building bridges across the different disciplines related to entrepreneurship.

Against this background, we present the results of a study that addresses the research question: *What competencies, according to a broad range of literature, do entrepreneurs need when starting and running enterprises that contribute to sustainability transformations?* Considering the fairly small but rich sample of relevant literature, we conducted a qualitative review of the literature on competencies for entrepreneurs, sustainability professionals, social entrepreneurs, and sustainability entrepreneurs—then clustered the identified competencies according to conceptual similarities. On this basis, we propose a framework of sustainability entrepreneurship competencies along an entrepreneurial process model, describing each process phase with associated tasks and competencies.

The result of this study is a process-oriented *and* literature-based framework of sustainability entrepreneurship competencies. It is intended to be used as a general vision for students, faculty, and entrepreneurs, as well as for the design of curricula, courses, and assessments.

2. The Landscape of Competency Frameworks

The first relevant body of literature is on *entrepreneurship education*, which has experienced a rise in the last 10 years (Azanza et al., 2017). This literature focuses on enabling entrepreneurs to recognize opportunities for creative destruction, identify and acquire resources, cope with uncertainty, overcome obstacles, launch new ventures, create and maintain strong networks (Morris et al., 2013). However, competencies necessary for *sustainability* entrepreneurship are not sufficiently addressed. Students are predominantly trained to assess opportunity against profits, without considering social and environmental impacts. Value creation as a competency focuses on maximizing returns for shareholders and investors with little explicit consideration of value creation for employees. Entrepreneurship education can equip students with the necessary competencies for “weak sustainability” referring to “profit-normative businesses” that focus on environmental compliance or sustainability as a tool for increasing profits (Upward & Jones, 2016; Basile et al., 2011, pp. 3–28). However, for developing students’ competencies in “strong/transformational” sustainability, i.e., being able to create “positive environmental, social, and economic value” (Wiek et al., 2016, pp. 1–2), “thereby sustaining the possibility that human and other life can flourish on this planet forever” (Upward & Jones, 2016, pp. 97–123), the offered set of competencies needs revisions and expansion.

The second relevant body of literature for developing a literature-based framework for sustainability entrepreneurship competencies is general *sustainability education* literature. This stream of literature rests on the assumption that professionals who deeply address sustainability in their work need to develop

particular sets of competencies that adequately reflect and prepare them for working in an age of transformation (Barth, 2014). Such competencies have been described, independent from any specific disciplinary background, as key competencies in sustainability problem-solving (Barth, 2014; Wiek et al., 2011a; Wiek et al., 2011b; Brundiers et al., 2017; Willard et al., 2010). This framework integrates system thinking, future thinking, value thinking, strategic thinking, and interpersonal/professional skills in order to successfully contribute to sustainability transformations. While these competencies can be used as a base to define skills and knowledge sustainability entrepreneurs need, this framework is not specific enough. Sustainability entrepreneurship competencies should specifically enable entrepreneurs to identify, evaluate, and realize business opportunities that positively contribute to sustainable development (Schaltegger & Wagner, 2011).

The third relevant body of literature is on competencies for *social entrepreneurship*. This stream of literature identifies cognitive skills such as creative thinking, negotiation, leadership, and innovation (Chell et al., 2007) as well as competencies to market the organization, create significant social impact, and communicate with stakeholders as key for social entrepreneurs (Higley, 2019). While this approach to entrepreneurship education moves a student closer to developing their competencies for sustainability entrepreneurship, it often fails to consider the environmental dimension of sustainability in business. While these competencies can be linked to the key competencies in sustainability (for example, stakeholder communication and interpersonal competence, ability to market the organization and strategic competence), social entrepreneurs ought to be able to balance social

value creation with financially driven goals, i.e., the *double* bottom line (Miller et al., 2012).

The fourth relevant body of literature is frameworks for *sustainability entrepreneurship* competencies. Lans et al. (2014) and Ploum et al. (2018) are an exemplary contribution in this category, base their framework on Wiek et al. (2011a), mentioned above. However, this framework, similar to others, is not functionally linked to what sustainability entrepreneurs *do in practice*. Also, if students are to be trained as the next leaders in employee-owned business, benefit corporations, local living economies, and so forth, competencies for sustainability entrepreneurship must focus on transformational knowledge and skills (e.g., knowledge of how to incorporate as an employee-owned business or a benefit corporation, if legislation exists).

The competency frameworks in all four streams of literature constitute a useful pool of skills and knowledge. Yet, they fall short in functionally linking these skills and knowledge sets to what sustainability entrepreneurs actually do when starting and running sustainability-oriented enterprises. In sum, 1) current sustainability competency frameworks need to be specified for sustainability entrepreneurship, 2) current entrepreneurship and social entrepreneurship competency frameworks need to be specified for sustainability entrepreneurship, and 3) current sustainability entrepreneurship competency frameworks need to be a) specified for transformational sustainability entrepreneurship and b) structured along the processes of sustainability entrepreneurship.

While drawing on these bodies of literature, this study provides a process-oriented model that articulates what a sustainability entrepreneur actually does over time and the competencies needed for this.

3. Research Design

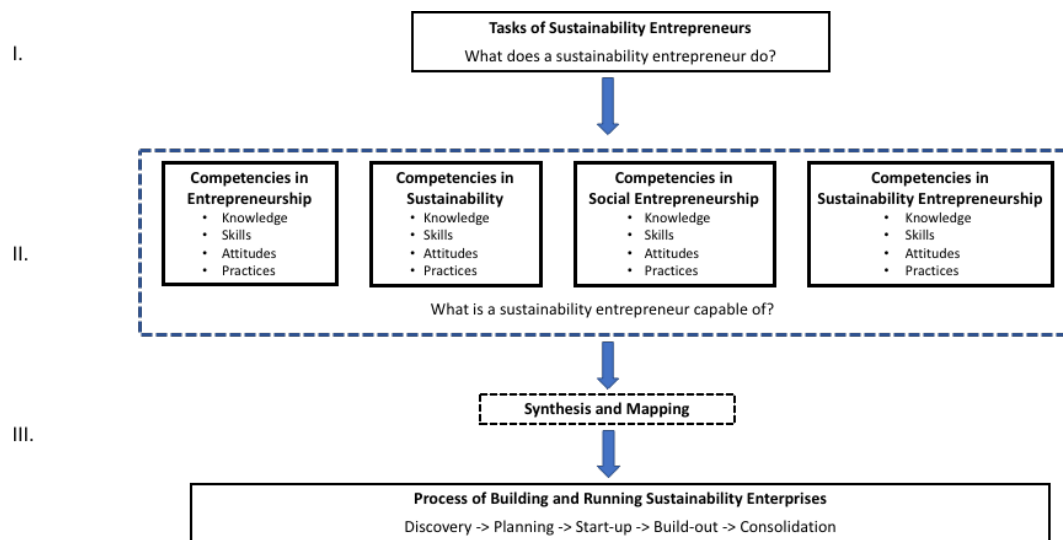
This research is structured into three parts (see Figure 1).

3.1. Qualitative Literature Review of Tasks. We identified, selected, and analyzed peer-reviewed and grey literature (including white papers and reports). Refereed work was identified through Google Scholar (the most extensive database for academic literature to date). In addition, we cross-checked with other databases and did not find any additional sources of relevance. Reports/white papers were identified through *Google* using the terms: “Sustainability”, “Sustainability Entrepreneurship”, “Social Entrepreneurship”, “Social Enterprise”, “Competencies”, “Key Competencies”, “Entrepreneurship”, “Business Competencies”, “Eco-business”, “Corporate Social Responsibility”, “Sustainability-driven Entrepreneurship”, “Sustainability-driven Entrepreneurs”, “Sustainable Entrepreneurship”, “Entrepreneurship Education”. The initial sample was cleaned up and the most relevant sources selected, using the following criteria: competencies sufficiently specified (knowledge/skills/attitudes); addresses competencies to run small-to-medium-sized enterprises (rather than to reform/transform existing enterprises); published in or after 2000 (last two decades); synthesis of exiting literature. The final pool entailed the following peer-reviewed articles and reports/white papers: Wiek et al., 2016 [1], Hesselbart & Schaltegger, 2014 [2], Lans et al., 2014 [3], Osagie et al., 2016 [4], Mindt & Reickmann, 2017 [5], Ploum et al., 2018 [6], Biberhofer et al., 2018 [7], Morris et al., 2013 [8], Wiek et al., 2011a [9], Willard et

al., 2010 [10], Chell et al., 2007 [11], Miller et al., 2012 [12], Fantini et al., 2001 [13], Salgado et al., 2018 [14], Lans et al., 2011 [15], Mitchelmore et al., 2010 [16], Lambrechts et al., 2013 [17], Wu, 2009 [18], Bernhardt et al., 2015 [19], Afshar et al., 2017 [20], Waldron, 2016 [21], Moreau & Mertens, 2013 [22]. Each source was then analyzed, first, regarding entrepreneurial tasks.

Figure 1

Overview of Research Design (Study # 1)



3.2. Qualitative Literature Review of Competencies. Each source was then analyzed with respect to competencies. We clustered the results according to conceptual similarities into four major competency groups: generic entrepreneurship competencies (knowledge, skills, attitudes, practices); generic sustainability competencies; social entrepreneurship competencies; and sustainability entrepreneurship competencies. The first cluster covers competencies that all entrepreneurs should be capable of, and thus, sustainability entrepreneurs, too. The second cluster covers competencies that

all sustainability professionals should possess, and thus, sustainability entrepreneurs, too. The third cluster (social entrepreneurship competencies) was included because sustainability entrepreneurship grew out of the social entrepreneurship movement (Schaltegger & Wagner, 2011). We delineate social entrepreneurship as a separate cluster to allow for identifying similarities and differences (not all social entrepreneurship competencies might be relevant for sustainability entrepreneurs). The final cluster (sustainability entrepreneurship competencies) accounts for literature that specifies sustainability competencies for entrepreneurs. The results were finally scanned for redundancies, cleaned-up, and synthesized.

3.3. Synthesis of Framework. A small set of guidelines was used to design the new competency framework to ensure applicability to curriculum and course design in sustainability entrepreneurship programs. The design guidelines were:

- a) Specifying and standardizing competencies from the literature to avoid generic descriptions or redundancies;
- b) Bridging gaps in the literature (missing or insufficiently developed tasks or competencies);
- c) Using entrepreneurial practice-orientation (mapping out specific tasks and competencies) to avoid “laundry-listing” competencies;
- d) Using the key competencies in the sustainability framework (Wiek et al., 2011a) as a reference to provide a link to the ongoing competency discourse in various fields.

For the practice-orientation, we developed a simple entrepreneurial process model using insights from entrepreneurship literature (Baron & Shane, 2014;

Ardichvili et al., 2003; Korunka et al., 2003; Choi & Sheperd, 2004; Clarysse & Moray, 2004; Shane & Cable, 2002; DeTienne, 2010) and from our literature review. For each phase, exemplary tasks were identified to indicate what an entrepreneur does in each phase. The identified tasks were then associated to competencies identified in the earlier parts.

4. Results

The synthesis of competencies for sustainability entrepreneurship starts off with a detailed look at the tasks sustainability entrepreneurs (ideally) perform (Section 4.1) and the corresponding competencies required to perform these tasks (Section 4.2). This serves as the basis for the new competency framework, which maps the identified tasks and competencies onto an ideal entrepreneurial process, from discovery and consolidation (Section 4.3).

4.1. Tasks—What Sustainability Entrepreneurs Do. The tasks are presented in four clusters (Table 1), as mentioned above (Section 3). At times, the reviewed literature identifies tasks and competencies with minor difference. For example, the task is defined as “marketing” and the competence is defined as “marketing skills”. We tried to disentangle tasks and competencies. Tasks are actions that graduates should be able to perform (at the end of their training), while competencies are the associated knowledge, skills, attitudes, etc. they need to be capable of in order to perform these tasks. We aimed at spelling out this difference to a sufficient extent.

Table 1

Tasks of Sustainability Entrepreneurs

CLUSTER I: ENTREPRENEURIAL TASKS	
An entrepreneur ...	
Morris et al. 2013 [8]	Recognizes and acts on business opportunities
	Formulates business concepts and writes business plans
Lans et al. 2011 [15]	Identifies and acquires financial resources
	Convinces investors
Michelmore et al. 2010 [16]	Leverages venture opportunities
	Relates effectively to potential suppliers and buyers
	Recruits employees
	Launches a venture (and eventually exits the venture)
	Takes business-related initiative and action
	Adjusts business strategies
CLUSTER II: SUSTAINABILITY TASKS	
A sustainability professional ...	
Wiek et al. 2011a [9]	Develops, tests and implements strategies for sustainable development
Willard et al. 2010 [10]	Successfully conducts the change process towards sustainability (problem solving)
	Interacts effectively and appropriately across cultures
Fantini et al. 2001 [13]	Facilitates stakeholder participation in developing collaborative sustainability decisions and interventions
	Inspires and motivates others
Salgado et al. 2018 [14]	Builds collaborative teams
	Engages in political-strategic thinking
	Copes with complexity
	Manages projects and processes
	Conducts sustainability reporting
CLUSTER III: SOCIAL ENTREPRENEURSHIP TASKS	
A social entrepreneur ...	
Chell et al. 2007 [11]	Uses economically-viable, innovative and market-based methods to address social problems and meet the needs of
Miller et al. 2012 [12]	disempowered or disadvantaged communities
	Networks and works with community stakeholders
Waldron et al. 2016 [21]	Navigates legal and organizational issues for social enterprises
	Raises funds through a diversity of funding mechanisms (donations, crowdfunding, etc.) and avoids over-
Moreau & Mertens 2013 [22]	dependence on donors

	Utilizes the scarce financial resources efficiently and effectively
	Recruits and motivates staff, including members with disabilities
	Encourages trust, collaboration, solidarity and well-being of staff
	Develops democratic and participatory management systems
	Carries out marketing and public relations
	Lobbies and advocates for political support of the social economy

CLUSTER IV: SUSTAINABILITY ENTREPRENEURSHIP TASKS

A sustainability entrepreneur ...

Wiek et al. 2016 [1]	Dedicates themselves to sustainable development (triple bottom line)
Hesselbart & Schaltegger 2014 [2]	Effectively implements sustainability strategies/actions in a business context
Lans et al. 2014 [3]	Effectively implements sustainability innovations in sourcing, production, distribution, service, management
Osagie et al. 2016 [4]	Challenges and transforms profit-maximizing ideologies and practices
Mindt & Reickmann 2017 [5]	Manages a business with sustainability in mind using tools and standards
Ploum et al. 2018 [6]	Utilizes democratic business models
Biberhofer et al. 2018 [7]	Anticipates sustainability challenges that might affect the business and its supporting systems
Lambrechts et al. 2013 [17]	Listens to the opinions of others
Wu 2009 [18]	Motivates employees and teams to take responsibility for social and environmental issues both within and beyond the firm
Bernhardt et al. 2015 [19]	Takes on the roles of manager, consultant, leader, expert, team player, catalyst, promoter
Afshar et al. 2017 [20]	Works from a system- and future-oriented perspective
	Builds mechanisms for talent development and supports others
	Understands economic trends using a critical social and environmental perspective
	Effectively communicates about sustainability in business
	Integrates sustainability-values in human resource development by fostering participation, gender equality, inter-generational and transcultural co- working
	Offers rich and diverse education and training to employees (apprenticeship programs, vocational trainings, seminars).

Provides good working conditions (fair salaries, family-friendly working hours, health programs)

Pursues fair-trade agreements

Creates and successfully manages an enterprise/business that is economically viable (not profit-maximizing) *and* positively contributes to community and environment through biodegradable and fairly priced products, closed water/waste/energy systems, equitable and healthy workforce, democratic management and steering process, etc.

Equitably and fairly distributes economic value among all stakeholders

4.2. Competencies—What Sustainability Entrepreneurs Are Capable Of. The competency compilation is presented in four clusters (Table 2), corresponding to the tasks identified above. As mentioned above (Section 4.1), we tried to separate tasks and competencies, without overly intervening in the presented concepts. Most of the reviewed literature pulls from generic sustainability competency frameworks (Wiek et al., 2011a; Wiek et al., 2011b; Fantini et al., 2001), except for literature in Cluster I (entrepreneurs) and Cluster III (social entrepreneurs). Many of the identified competencies across all clusters are similar, for example, systems-thinking competence or teamworking skills (even if terminologies vary). This indicates convergence across streams of literature. For specifying sustainability entrepreneurship competencies, Cluster I provides valuable insights into business-specific competencies, for example, business plan development, financial auditing, accounting, etc.). While useful as a foundation for mapping out what sustainability entrepreneurs need to know and be capable of, the following lists do not integrate the competencies that complex sustainability entrepreneurship processes require. Such a framework is presented in the following section (Section 4.3), synthesizing the competencies listed below.

Table 2

Competencies Relevant for Sustainability Entrepreneurs

CLUSTER I: COMPETENCIES OF ENTREPRENEURS	
An entrepreneur is ...	
Morris et al. 2013 [8]	Alert with respect to business opportunities/possesses entrepreneurial spirit/attitude
Lans et al. 2011 [15]	Able to anticipate and plan (imaginativeness) Skilled in basic math and analytical reasoning
Michelmore et al. 2010 [16]	A leader, value-driven, mission-oriented, convincing A “people person” with teamworking skills, communication skills, motivation skills, commitment skills, delegation skills, coordination skills, ability to compromise A resourceful person with high self-efficacy, self-management skills, perseverance
CLUSTER II: COMPETENCIES OF SUSTAINABILITY PROFESSIONALS	
A sustainability professional possesses ...	
Wiek et al. 2011a [9]	System-thinking competence Future-thinking competence
Willard et al. 2010 [10]	Normative/Value competence Strategic/Action competence
Fantini et al. 2001 [13]	Interpersonal competence (including cultural and intercultural competence) Integration competence
Salgado et al. 2018 [14]	
CLUSTER III: COMPETENCIES OF SOCIAL ENTREPRENEURS	
A social entrepreneur is ...	
Chell et al. 2007 [11]	Aware of and knowledgeable about social problems Driven and inventive to create social impact, both within the enterprise and larger social and political systems
Miller et al. 2012 [12]	Driven by values and criteria
Waldron et al. 2016 [21]	Holding moral imperatives/ethics Committed to a collective purpose Able to lead and develop others
Moreau & Mertens 2013 [22]	Skilled in recruiting people who are motivated to meet society’s needs Skilled in communicating complex messages in accessible ways

	Skilled in resolving conflicts in democratic/participatory work environments Willing to take risks Innovative and creative Skilled in basic math Resourceful Assertive but diplomatic
--	--

CLUSTER IV: COMPETENCIES OF SUSTAINABILITY ENTREPRENEURS

A sustainability entrepreneur is ...

Wiek et al. 2016 [1]	Aware of and knowledgeable about sustainability problems
Hesselbart & Schaltegger 2014 [2]	Able to think in economic systems such as circular economy, nexus of social/economic/environmental in relation to business, local and regional economies, supply chains, etc.
Lans et al. 2014 [3]	Able to think in structured and creative ways about the future of his/her business and the supporting systems with a sense for intergenerational justice and opportunity (e.g., in creating intergenerational co-working spaces)
Osagie et al. 2016 [4]	Able to think strategically and action-oriented by fostering a culture of failing, learning, critical thinking
Mindt & Reickmann 2017 [5]	Skilled in interpersonal competence (cooperative thinking skills, integrative leadership skills)
Ploum et al. 2018 [6]	Socially competent (for building up, fostering, and capitalizing on personal networks, developing talent)
Biberhofer et al. 2018 [7]	“Opportunistic” (in a good way) – being able to search for and pursue opportunities.
Lambrechts et al. 2013 [17]	Able to think and act in structured/standardized ways (for managing, communicating, reporting, evaluating) Reflective (on personal experiences and views as well as broader, collective, reported experiences)
Wu 2009 [18]	Committed to work towards a just world
Bernhardt et al. 2015 [19]	Compassionate and loving
Afshar et al. 2017 [20]	

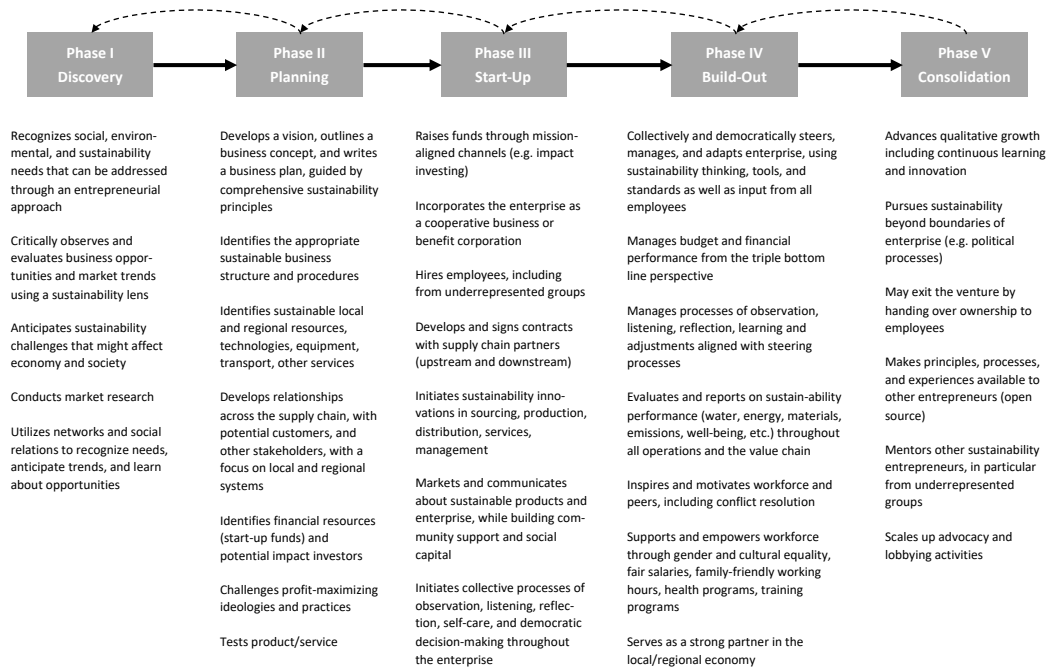
4.3. Process-Oriented Competency Framework for Sustainability

Entrepreneurs. We first identify a generic entrepreneurial process model from key entrepreneurial literature (Baron & Shane, 2014; Ardichvili et al., 2003; Korunka et

al., 2003; Choi & Sheperd, 2004; Clarysse & Moray, 2004; Shane & Cable, 2002; DeTienne, 2010 ; Belz & Binder, 2015; Shane & Ventkataraman, 2000; Corner & Ho, 2010) and the literature analyzed before. This generic and iterative process model is comprised of five entrepreneurship phases (Discovery–Planning–Start-up–Build-out–Consolidation) and serves as the foundation for the competency framework (Figure 2). For each process phase, we identified main tasks and required specific competencies, both cross-referenced with literature sources [#]. If gaps were observed, additions were made and marked [X]. To ensure continuity with the broader sustainability competency discourse, the relevant key competencies in sustainability (Wiek et al., 2011a) were indicated for each phase, too. Differences to conventional entrepreneurship are either more subtle or rather stark, depending on the item. For example, while conventional entrepreneurs might hire employees as qualified and available, sustainability entrepreneurs, driven by broad sustainability values, look to intentionally hire people from underrepresented groups who might need additional training, coaching, and mentoring. Or, while conventional entrepreneurs may be legally incorporated as a limited liability company (LLC), sustainability entrepreneurs, driven by broad sustainability values, look to intentionally be incorporated as a cooperative business or benefit corporation (as legislation permits).

Figure 2

Overview of the Iterative Process of Sustainability Entrepreneurship with Main Tasks



4.3.1. Discovery Phase. The discovery phase starts the process as sustainability entrepreneurs—driven by broad values and moral imperatives as well as personal and professional experiences—explore how to address specific social, environmental, and sustainability problems/needs through entrepreneurship (Table 3). Sustainability entrepreneurs make themselves familiar with these challenges, using system-thinking competence to identify upstream problem drivers and promising intervention points, as well as future-thinking competence to anticipate problems that might emerge in the future. They reflect on sustainability problems they might have encountered in their professional or personal lives using their “experience corridors” Belz & Binder, 2015; Shane & Ventkataraman, 2000; Corner

& Ho, 2010). However, traditional business experience in training or employment might rather hold sustainability entrepreneurs back, while “experience corridors” *with* sustainability orientation—e.g., environmental advocacy experience or sustainable lifestyles— supports opportunity recognition in the discovery phase (Kuckertz & Wagner, 2010).

Problems and needs do not automatically translate into opportunities. Thus, sustainability entrepreneurs use their entrepreneurial alertness and spirit to critically observe and evaluate business opportunities that could be seized to address the identified problems/needs. This requires not only familiarity with the relevant economy sector or branch, but also specific market research to substantiate initial ideas and explorations. Interpersonal competence allows sustainability entrepreneurs to tap into various resources that support the outlined activities in the discovery phase.

Table 3*Tasks and Competencies in the Discovery Phase of Sustainability**Entrepreneurship*

Sustainability Entrepreneurship Tasks	Sustainability Entrepreneurship Competencies (Knowledge / Skills / Attitudes)	Sustainability Competencies
Recognizes social, environmental, and sustainability needs that can be addressed through an entrepreneurial approach from a systems perspective [3,6,8,15,17]	Knowledgeable about social, environmental, and sustainability problems [7,12]	System-thinking competence
Critically observes and evaluates business opportunities and market trends using a sustainability lens [8,12,22]	Knowledgeable about relevant economic sector and its history [3,6,7,16,22]	Value-thinking competence
Anticipates sustainability challenges that might affect economy and society [9,14,16]	Knowledgeable about sustainability-oriented economy and entrepreneurship models [3,6,7,16,22]	Future-thinking competence
Conducts market research [14]	Search skills [7,8,15,19]	Interpersonal competence
Utilizes networks and social relations to recognize needs, anticipates trends, and learn about opportunities [17-19]	Analytical skills [16]	
	Entrepreneurial alertness and spirit [7,8,15,19]	
	Value-driven, mission-oriented [7,12,20,22]	
	Holding moral imperatives/ethics [7,12]	

4.3.2. Planning Phase. During the planning phase, sustainability entrepreneurs develop visions for their enterprises, outline business concepts, and eventually write detailed business plans, guided by the bounded triple-bottom-line

approach (Table 4). Some sustainability entrepreneurs might forgo a lengthy business plan development process and choose to focus on quickly developing and testing their “minimum viable product”, guided by the “Lean Start-up” model (Blank, 2013). In either case, these preparatory tasks require planning, numeracy, and analytical reasoning skills as well as system-thinking competence specific to economic systems (e.g., circular economy, supply chains). During the discovery phase, entrepreneurs may have been introduced to new business forms such as cooperatives, benefit corporations, or social enterprises. During the planning phase, entrepreneurs now intentionally “activate” that knowledge and identify a suitable business structure as well as explore sustainability procedures to be implemented (e.g., sustainability accounting). Business structures such as employee-owned businesses require skills that enable the sustainability entrepreneurs to effectively run and participate in democratically-controlled businesses. Familiarity with overarching frameworks such as the Sustainable Business Model Canvas (Upward & Jones, 2016) or the Framework for Strategic Sustainable Development (Basile et al., 2011) offers the opportunity to take comprehensive and systemic perspectives on the planned businesses. Sustainability entrepreneurs are committed to local and regional economies and thus strive to use sustainable (e.g., renewable) local and regional resources, technologies, equipment, transport, and other service options—which first need to be identified and then further specified together with suppliers, potential customers, and other stakeholders. Sustainable entrepreneurs participate in alternative financing and banking schemes, such as impact investments or the gift economy. In the planning stage, these options need to be identified, evaluated, and eventually selected. During these various activities, sustainability

entrepreneurs need to find constructive ways to challenge profit-maximizing ideologies and practices. Various “people skills” help in navigating this contentious space and allow sustainability entrepreneurs to defend their positions in polite and nonetheless assertive ways, with the ability to compromise (on some issues) being a desirable skill. Sustainability entrepreneurs also adapt their communication strategies to account for differences in intention, target audience, etc. For example, a sustainability entrepreneur who has experience in an economic sector and aims to “innovate” within an existing field (e.g., technological innovation in the renewable energy sector) may present his/her value proposition as an incremental and inevitable progression, supported by a fact-based justification. On the other hand, a sustainability entrepreneur who may lack experience in a particular sector and aims at innovating beyond his/her sector of expertise (e.g., an employee-owned health service provider) may craft a message of a “noteworthy disruption” and may rely on moral arguments when engaging with relevant stakeholders or decision-makers (Waldron, 2016).

Table 4

Tasks and Competencies in the Planning Phase of Sustainability Entrepreneurship

Sustainability Entrepreneurship Tasks	Sustainability Entrepreneurship Competencies (Knowledge / Skills / Attitudes)	Sustainability Competencies
Develops a vision, outlines a business concept and writes a business plan, guided by the bounded triple-bottom-line approach [8, 11, 12, 15]	Knowledge of legal norms for cooperative businesses and benefit corporations (in the U.S.) [1,11] Knowledge of impact investment and other sustainable funding schemes [22] [X]	System-thinking competence Value-thinking competence
Identifies the appropriate	Knowledge of sustainable business frameworks, tools, and procedures,	

sustainable business structure (corporate form) and procedures (e.g., sustainability accounting) [1,11] [X]	e.g., the Sustainable Business Canvas model [1,2,19] [X]	Future-thinking competence
Identifies financial resources (start-up funds) and potential impact investors [8,11]	Able to think in economic systems such as circular economy, nexus of social/economic/environmental systems in relation to business, local and regional economies, supply chains, the enterprise as a system [1,7, 17, 19]	Strategic competence
Identifies sustainable (e.g., renewable) local and regional resources, technologies, equipment, and transport [1,11,12]	Planning skills [15,16] Basic math and analytical reasoning skills [16] Continuous learning skills [9]	Interpersonal competence Integration competence
Develops relationships across the supply chain, with potential customers, and other stakeholders, with a focus on local and regional systems [1,10,19]	Teamworking skills, communication skills, motivation skills, commitment skills, delegation skills, coordination skills, ability to compromise [9, 13, 21]	
Challenges profit-maximizing ideologies and practices [5]	Committed to sharing values and power with appropriate stakeholders and decision-makers [21] Reliable and productive [22]	
Tests product/service [X]		

Note: X refers to an additional task, skill, knowledge, or attitude missing from the relevant literature.

4.3.3. Start-Up Phase. During the start-up phase, sustainability entrepreneurs activate the knowledge base they have built during the previous planning phase with the focus being on launching the enterprise, or, in other words, implementing the business plan (Table 5). This phase is to a large extent about turning know-how of knowledge into know-how-to knowledge with respect to securing financial resources, business incorporation, business procedures, and so forth. For example, in

the previous phase, entrepreneurs have begun to explore alternate social and environmental accounting tools. During this phase, entrepreneurs now use these tools in real-time, continuously learning and adapting to the enterprise's needs. In the planning phase, entrepreneurs have identified potential local or regional suppliers. In the Start-Up phase, entrepreneurs now undertake the task of putting together Memorandums of Understanding (MOUs), contracts that ensure suppliers are contributing positively to social and ecological communities (for example, suppliers that are fair-trade certified) and using additional innovative start-up tools such as the "Lean Start-Up" model (Blank, 2013). These tasks require more than just technical skills and some level of experience; they also call for "soft" entrepreneurship skills such as perseverance and tenacity, in particular when mistakes are being made and plan implementation (partially) fails. These attitudes are most productive in conjunction with "people skills". A key resource for a sustainability entrepreneur is the regional and local economy his/her enterprise is embedded in. Demonstrating good partnership behavior, orientation towards the community, and accessibility are critical tasks for building social capital, and they can, if framed openly and honestly, also support marketing and building a loyal consumer base. This requires continuous learning and innovation skills to understand, adjust to, reform, and transform existing structures and relationships within the local/regional economy. As the enterprise is being built, tools such as stakeholder mapping, supply-chain analysis, and impact assessment can help to establish transparent procedures for determining and reporting on suppliers, material used, environmental footprint, and other important aspects of the enterprise. Building the workforce in a sustainability enterprise starts with

recruitment that looks beyond qualifications and strives for making positive impacts in the life of people with little opportunity and records of marginalization. Yet, recruitment is just the start. It continues with building programs for training and personal advancement, in particular directed towards the unique features of the enterprise such as employee participation, broad value orientation, solidarity, and so forth. Integrative leadership that builds confidence and wellbeing across the workforce is among the many “people skills” (and associated knowledge) that are required during this phase. Last, but not least, the sustainability entrepreneur ought to lead by example also when it comes to self-care and life-work-balance—tasks that require considerable previous and ongoing practice and skill development.

Table 5.

Tasks and Competencies in the Start-up Phase of Sustainability Entrepreneurship.

Sustainability Entrepreneurship Tasks	Sustainability Entrepreneurship Competencies (Knowledge / Skills / Attitudes)	Sustainability Competencies
Raises funds through mission-aligned channels (e.g. impact investing) [11] [X]	Knowledge of start-up tools and procedures, including the “Lean Start-up” model [X]	Strategic competence
Incorporates the enterprise as a cooperative business or benefit corporation and offers related training programs to employees [1,7,8]	Knowledge of innovative incentive policies for employment, remuneration, trust-building and involvement across the workforce [22]	Interpersonal competence
	Knowledge of integrative leadership and confidence-building models [8]	Integration competence
Develops and signs contracts and MOUs with fair-trade or similarly certified supply chain partners (upstream and downstream) [1,11,16,22]	Knowledge of participatory and democratic human-resource tools and processes [22]	Implementation competence [X]

Hires employees, including from underrepresented groups [1,11,16]	Knowledge of fair trade, FSC, and other supplier certification processes [22]
Initiates sustainability innovations in sourcing, production, distribution, services, management [5]	<p>Application skills:</p> <ul style="list-style-type: none"> - How to secure impact investments or other sustainable funding schemes [X] [11] - How to incorporate as a cooperative business or benefit corporation [X] - How to use sustainable business tools and procedures, including LCA, SROI, etc. [4-6,19] - How to contribute to circular economy, sustainable supply chain, etc. [1,19]
Markets and communicates about sustainable products and enterprise, while building community support and social capital [4,11,12,14]	Recruitment skills [11]
Initiates collective processes of observation, listening, reflection, self-care, and democratic decision-making throughout the enterprise [1,5]	Basic math and analytical reasoning skills [16]
	Continuous learning and innovation skills [5,9]
	Leadership skills [11,16]
	Teamworking skills, communication skills, motivation skills, commitment skills, delegation skills, coordination skills, ability to compromise [9,10,12,14]
	Resourcefulness, high self-efficacy, self-management skills, self-care skills [4,8,15]
	Willingness to take risks [11,12]
	Perseverance, tenacity [8]

Sensitivity to employees' concerns and interests through empathy and compassion [22]

Creativity [5,6,22]

'Opportunism' [22]

Note: X refers to an additional tasks, skill, knowledge, or attitude missing from the relevant literature.

4.3.4. Build-Out Phase. During the build-out phase, management and steering processes, harvesting collective intelligence and being based on democratic principles, become routine (Table 6). Processes that seemed novel and inconvenient, at times, in the start-up phase, are now regular procedures. Sustainability thinking, tools (such as sustainability accounting), and standards are applied and referenced in all processes of the enterprise. While the previous stage initialized the cycle of observation, listening, reflection, learning, and adjustments across the enterprise, it is now the “normal” mode of operation. All units support comprehensive sustainability reporting. However, there are additional efforts that might have been postponed or left underdeveloped in the start-up phase. Knowledge of participatory and democratic human resources tools acquired in the start-up phase is now activated. While managing employees may have followed a more conventional approach in the start-up phase (due to time pressure and other constraints), establishing a positive internal culture of empowerment through gender and cultural equality, fair salaries, family-friendly working hours, health programs, and training programs is a key task for sustainability entrepreneurs in this phase. While entrepreneurs continue to respond to employee concerns and interests, the focus shifts towards building an internal community (“solidarity”).

Building out the external relationships with suppliers, customers, and other stakeholders is equally important. All of these processes, even if consolidated in routines, pose challenges and call for a continuous inspiration and motivation, as well as, at times, negotiation and conflict resolution (“people skills”). A key for all of these processes and the enterprise overall to succeed is to avoid drifting into complacency. This is what differentiates start-up entrepreneurs from lasting entrepreneurs—that they preserve and activate their openness to find and cultivate talent from unlikely places, their willingness to learn and take risks, their curiosity and desire to innovate, their leadership that is not afraid of introducing changes as needed, and their perseverance to achieve sustainability goals, even beyond the enterprise. Finally, while entrepreneurs might have been engaged in political advocacy for local business, involvement as a strong partner in the local/regional economy beyond the individual firm (through continuous political efforts and membership in relevant groups) is key in insuring long-term social and economic viability.

Table 6

Tasks and Competencies in the Build-Out Phase of Sustainability Entrepreneurship

Sustainability Entrepreneurship Tasks	Sustainability Entrepreneurship Competencies (Knowledge / Skills / Attitudes)	Sustainability Competencies
Collectively and democratically steers, manages, and adapts enterprise, using sustainability thinking, tools, and standards as well as input from all employees [1]	Expansion of conceptual and procedural knowledge identified in previous phases Application skills: - How to use sustainable business tools and procedures for repor-	Future-thinking competence Strategic competence Interpersonal competence

Manages budget and financial performance from the triple bottom line perspective [1,7,10]	ting, assessment, and accounting [4-6,8,19] - How to use participatory and democratic human resources tools [4,22]	Integration competence
Manages processes of observation, listening, reflection, learning, and adjustments aligned with steering processes [1,7,8,16,22]	- How to contribute to circular economy, sustainable supply chain, etc. [1,19] Recruitment skills [11]	Implementation competence [X]
Evaluates and reports on sustainability performance (water, energy, materials, emissions, well-being, etc.) throughout all operations and the value chain [1,4,7,10,19]	Basic math and analytical reasoning skills [16] Continuous learning and innovation skills [2,9,11,14] Leadership skills [7,16,17]	
Inspires and motivates workforce and peers, including conflict resolution [11,12,14]	Teamworking skills, communication skills, motivation skills, commitment skills, delegation skills, coordination skills, ability to compromise [1,7,9,12,14,19,22]	
Supports and empowers workforce through gender and cultural equality, fair salaries, family-friendly working hours, health programs, training programs [1,22]	Resourcefulness, high self-efficacy, self-management skills, self-care skills [4,8,15]	
Serves as a strong partner in the local/regional economy through political lobbying, advocacy and membership in local/regional business associations and groups [1,7,22]	Willingness to take risks [11,12] Perseverance, tenacity [8] Self-advocacy [22] Solidarity [22]	

Note: X refers to an additional tasks, skill, knowledge, or attitude missing from the relevant literature.

4.3.5. Consolidation Phase. During the consolidation phase, sustainability entrepreneurs continue to pursue qualitative growth of their enterprise, managing a

bounded triple-bottom line and monitoring all processes identified in the previous phases (Table 7). In stark contrast to carefully protected copyrighted and intellectual property, sustainability entrepreneurs open-source their principles, processes, and experiences through accessible e-commerce and publishing platforms, allowing other entrepreneurs to innovate and transform their own enterprises. As entrepreneurs look to exit their venture, they focus on handing ownership over to their employees, rather than selling their firm to the highest bidder. Finally, in addition to continued political advocacy, sustainability entrepreneurs take on mentorship roles, particularly for entrepreneurs from underrepresented groups.

Table 7*Tasks and Competencies in the Consolidation Phase of Sustainability**Entrepreneurship*

Sustainability Entrepreneurship Competencies	Sustainability Entrepreneurship Competencies (Knowledge / Skills / Attitudes)	Sustainability Competencies
Advances qualitative growth including continuous learning and innovation [1]	Expansion of conceptual and procedural knowledge identified in <u>previous phases</u>	System-thinking competence
Pursues sustainability beyond boundaries of enterprise (e.g. political processes) [1]	Continuous learning and innovation skills [2,9,11,14]	Values-thinking competence
May exit the venture by handing over ownership to employees [15]	Leadership skills [7,16,17]	Future-thinking competence
Makes principles, processes, and experiences available to other entrepreneurs through open-source platforms [X]	Teamworking skills, communication skills, motivation skills, commitment skills, delegation skills, coordination skills, ability to compromise [1,7,9,12-14,18]	Strategic competence
Mentors other sustainability entrepreneurs, in particular from underrepresented groups [X]	Resourcefulness, high self-efficacy, self-management skills, self-care skills [4,8,15]	Interpersonal competence
	Attitude of caring and sharing [22]	
	Solidarity [22]	
Scales up advocacy and lobbying activities [22]		

Note: X refers to an additional tasks, skill, knowledge, or attitude missing from the relevant literature.

5. Discussion

As new business models and practices respond to sustainability challenges around the world, scholars, educators, and practitioners call on universities to

educate a new generation of sustainability entrepreneurs (Higley, 2019, pp. 76–82) (Wiek et al., 2016; Hesselbart & Schaltegger, 2014; Lans et al., 2014; Lourenco al., 2013). Yet, there is a lack of cohesion among the many answers to the question of what competencies this new type of entrepreneur should possess. Much of the literature draws on larger corporations/corporate social responsibility (CSR) initiatives or theoretical considerations (Lans et al., 2014; Ploum et al., 2018). This literature gives little or no consideration to the changing sustainability entrepreneurship practice, which calls for new competencies. The (re-)emergence of economic and business models, which depart from profit-maximization and adopt a broad set of guiding values, such as employee-owned businesses, benefit corporations, impact investment, and local living economies, to name a few, require different skills for building and running enterprises. In our literature review, only two of the reviewed sources mention such competencies (Wiek et al., 2016; Biberhofer et al., 2018). While empirical case studies portrait sustainability entrepreneurs and enterprises (Majee & Hoyt, 2009; Basu et al., 2011; Rodger, 2010), the framework presented above attempts to map out the underlying competencies needed.

This framework does not completely start over but re-interprets a good share of conventional business competencies for new practices. For example, human resource management, accounting, and marketing provide starting points for sustainability entrepreneurs (Ulrich et al., 2007; Ulrich et al., 1995), but with very different orientation (Lambrechts et al., 2013). Designing employee benefit systems here adopts a bounded triple-bottom-line perspective as opposed to the conventional single- (or double-) bottom line. This requires innovation such as employee-

ownership programs, paid family leave, paid volunteer time for employees, etc. Conventional interpersonal communication in business (Lewrich et al., 2010) may follow a top-down managerial approach, leaving little space for taking inputs from employees seriously in elicitation and decision making. In sustainability entrepreneurship, democratic governance might face challenges of inefficiency or peer-to-peer conflict resolution, but with appropriate skill development (Brundiers & Wiek, 2017), these challenges can be mastered.

The framework uses a real-world entrepreneurship process model, which allows for both practice-orientation and integration of competencies, which most competency frameworks struggle with (Wilhelm et al., 2019). The process orientation offers insight into how competencies build upon each other over time. For example, during the discovery phase, entrepreneurs need knowledge of sustainable business forms (e.g., structure, function, operations, etc. of employee-owned businesses). As entrepreneurs move on to the planning phase, this knowledge is then activated through best practices (e.g., specific laws governing employee-owned businesses or specific regulations how to legally incorporate as an employee-owned business). Many of the competencies in this framework follow a similar knowledge to the activation pathway along the phases of sustainability entrepreneurship.

While this framework is presented in a linear fashion, sustainability entrepreneurs often move through this process iteratively (as indicated with dashed arrows in Figure 2) and different pathways are viable. Developing a robust business plan in the planning phase might precede securing investments in the start-up phase. However, initial investments might be needed to test products/ services in the planning phase. A sustainability entrepreneur might rely on the “Lean Start-up”

model and develop a “minimum viable product” using seed funds (impact investment or crowdfunding) in the planning phase and/or the start-up phase [50]. The iterative and variable nature of this process does not change the need for specific competencies. Developing a robust business plan for a sustainable enterprise or rapidly testing a “minimum viable product” are two separate tasks. Yet, they require creativity and planning skills, familiarity of a circular economy, and an attitude of reliability and productivity, among others. Building these competencies ensures sustainability entrepreneurs can successfully and agilely complete a diversity of tasks.

This competencies framework can be used for designing integrated, scaffolded learning pathways in educational programs (Collins et al., 1991). On the one hand, courses could focus on one of the phases, and build on each other. For example, an introductory course could focus on the discovery phase and cover the respective tasks and competencies. The next course would use the main tasks of the planning phase as course-level learning objectives and so forth. The detailed lists of related tasks and corresponding competencies help selecting appropriate readings, background material, and hands-on training tools for students. On the other hand, the framework could be used to adopt Brundiers et al.’s (2010) progressive competencies training model, by letting students go through all, or most, of the five phases in four progressive stages: bringing the world in, visiting the world, simulating the world, and engaging with the world. In the first stage, students would do a case study on a successful sustainability entrepreneur/enterprise, reconstructing all five phases, maybe inviting the entrepreneur to class to verify the reconstruction. In the second stage, students would spend time with sustainability entrepreneurs in sustainability

enterprises and experience the five phases—in glimpses because of time constraints. In the third stage, students would simulate building their own sustainability enterprises—going through all five phases in a protected space. In the final stage (e.g., culminating experience), the students would actually attempt to build their own sustainability enterprises—going through the first three to four phases of the model. This application of the framework would intertwine education and practice of sustainability entrepreneurship as close as possible.

Simultaneously, the framework could be used to develop course-specific assessment tools. Advanced assessment tools can test competence development through in vivo simulation that mirror real-world tasks in each phase. Students in courses that focus on the discovery phase might be asked to defend a local living economy development plan against a mock city council. In the simulation, students might be challenged by conventional business perspectives, e.g. economic development that focuses on attracting “big business” to the city, and asked to defend sustainability entrepreneurship, e.g. economic development that fosters local worker cooperatives and social enterprises in the city. This type of simulation would assess students’ knowledge of sustainable business models as well as their skills to challenge profit-maximizing economic development approaches.

6. Conclusions

This study presents a framework of competencies that sustainability entrepreneurs would ideally possess. The framework is based on various strands of literature to link it to the current educational discourses and on a five-phase process model of sustainability entrepreneurship to link it to real-world activities.

The framework is generic and therefore does not capture all context-specific ‘materializations’ of the compiled competencies. For example, benefit corporations and worker cooperatives as legal business designations are only available in certain states or countries; similarly, certain laws governing particular human resources processes such as employment and benefits. This needs to be accounted for when applying this framework to a specific context. Yet, the framework offers generic guidance on all competencies that might need further specification.

The framework also reflects the current state of entrepreneurship theory and practice. Relatively novel entrepreneurial frameworks such as the “Lean Start-up” model are accounted for (Blank, 2013), but only exemplarily. Again, as a generic framework, the compiled competencies are open to incorporating entrepreneurial innovations which will only emerge over the coming years. This might eventually require extensions and modifications of the framework, too.

This framework is intended to guide the design of programs and courses in sustainability entrepreneurship as well as their assessment. As the framework is being adopted and applied, there are several additional advancements to pursue. First, the framework would benefit from empirical validation by currently practicing entrepreneurs who are piloting and pioneering sustainability enterprises (employee-owned businesses, benefit corporations, etc.). Empirical research would need to demonstrate for real-world entrepreneurial practice if these are indeed the competencies that enable sustainability entrepreneurs to do their jobs. Second, the framework needs to be constructively aligned with learning-teaching settings and pedagogies that are most suited to convey the competencies of sustainability entrepreneurship. This should not be limited to formal higher education but extend

towards business incubators and accelerators. Third, the framework could be advanced through empirical studies on programs and courses that have adopted it—how successful are they in building these competencies? This question needs to be answered with respect to real-world sustainability outcomes rather than through students' self-assessments or examinations.

While advancing the robustness of the framework and its applications, progress towards sustainability through entrepreneurs and enterprises depends on many more influential factors. Education plays a role, but so do many other factors. If a sustainability transformation is to unfold, support for cooperative businesses, benefit corporations, impact investment, local living economies, and so forth needs to also come from progressive law makers, politicians, administrators, advocates, community organizers, and, last but not least, conscious consumers (and it does). What we, as educators, can do is be good collaborators and partners in this endeavor.

CHAPTER 3

STUDY 2: EDUCATING STUDENTS AND PROFESSIONALS IN SUSTAINABILITY ENTREPRENEURSHIP – STRENGTHS AND WEAKNESSES OF INNOVATIVE COURSE FORMATS

1. Introduction

The COVID-19 pandemic has created the largest economic threat to the global economy in recent history, with thousands of businesses closing their doors and employment rates rapidly rising. It is becoming increasingly clear that the global economic system, for the most part, is far more vulnerable to such severe risks than expected (Vodenska & Becker, 2019; McKibbin & Fernando 2020). One causal factor is that businesses around the world continue to ignore pressing social and environmental challenges associated with the global economic system including income inequalities, inadequate healthcare, unsafe working conditions, degenerative land use practices, among others (Tsui & Jiang, 2018; D’Amato et al., 2019; Liu et al., 2019).

In response, universities have begun to educate students on sustainability and responsibility in business and entrepreneurship (Wu et al., 2010; Aragon-Correa et al., 2017). Most prominently, the United Nation’s initiative on responsible management education, founded in 2007, has called for business and management schools around the world to prepare students to effectively address challenges of sustainability (Alcaraz et al., 2010; Godemann et al., 2014). Several hundred schools have joined this initiative over the past decade (www.unprme.org). However, the majority of these educational offerings is still tied to business-as-usual models and practices, with sustainability treated as an addendum rather than a foundation

(Cornuel & Hommel, 2015; Dyllick, 2015; Jamili et al., 2016; Snelson-Powell et al., 2016, Ferns, 2019; Høgdal et al., 2019). Hence, scholars and educators have advocated for offerings that train students in transforming the core of business structures and operations through sustainable business model innovation (Choi & Gray, 2008; Starik & Rands, 2010; Schaltegger et al., 2012; Higley, 2019). This requires reform of both learning objectives and pedagogies.

In these reform efforts, the scholarly educational literature has begun to converge on the competencies needed for responsible and sustainable entrepreneurship (Lans et al., 2014; Laasch & Moosmayer, 2015; Ploum et al., 2018; Foucrier & Wiek, 2019) as well as on experiential and project-based pedagogies for sustainable and responsible management education as promising educational approaches (Brower, 2011; Prado et al., 2020). Experiential and project-based learning are well-established pedagogical frameworks, in particular in sustainability education (Brundiars et al., 2013; Wiek et al., 2014, Wiek et al., 2015) and are increasingly used in sustainability entrepreneurship education (Dhliwayo, 2008; Rieckmann, 2017). Providing students with opportunities to experience (semi-) professional situations as well as performing in them allows students to apply the theoretical knowledge acquired in the classroom. A relevant approach of experiential learning is the place-making pedagogy. While it is underexplored in general entrepreneurship education (Jolly et al., 2011), it is a commonly used in social entrepreneurship education (Mair & Noboa, 2006). It helps students understand the complexity of real-world issues by immersing them in the places in which these issues manifest (Elmes et al., 2012). Experiential and project-based learning both well align with other educational approaches such as transformational learning

(Sterling, 2002) allowing students to reframe established assumptions, preferences, and attitudes; as well as cognitive apprenticeship (Collins et al., 1991) allowing students to successively acquire competencies through observation, experience, imitation, and experimenting. Entrepreneurship education has begun to adopt these pedagogical frameworks, to some extent, using professional situations and job-related activities to support competence development (Backus et al., 2010; LaMan, 2015).

However, the majority of business and management schools remain reliant on conventional teaching approaches based on lectures, case studies, internships, and service learning that often lack experiential and project-based pedagogies (McCarthy & McCarthy, 2006; Dyllik, 2015; Aragon-Correa et al., 2017). There are repeated calls for educational innovation through adoption of experiential and project-based learning models, facilitating not only cognitive learning but also development of skills and attitudes (McCarthy & McCarthy, 2006; Shrivastava, 2010; Brunner & Urenje, 2012; Aragon-Correa et al., 2017); in short, such approaches can be considered transformational pedagogies (Sterling, 2002), allowing students to reframe the challenges of sustainability in business and management contexts as well as working on solution that address the core of business structures and operations.

Some universities have begun to offer sustainability entrepreneurship training of such a transformational nature, Arizona State University being one of them. Over the past five years, a number of sustainability entrepreneurship course have been developed that adopt transformational sustainability learning objectives and innovative pedagogical approaches, such as experiential and project-based

learning, as well as an cognitive apprenticeship model. We present here an exploratory study into the nature of these courses, with a focus on the specific teaching and learning processes to convey competencies for sustainability entrepreneurship, addressing the question: What are strengths and weaknesses of innovative teaching and learning formats for conveying sustainability entrepreneurship competencies?

The research design follows a comparative case study approach (Yin, 2001) focused on five courses at a major U.S.-American university (Arizona State University) recognized for its leadership in sustainability education (Wiek et al., 2014). We analyzed each of the courses against a set of 30+ attributes and studied in detail the links between learning objectives, applied pedagogies, and learning outcomes. Data was collected through analysis of course material (course syllabi, material, deliverables, student evaluations) and through five semi-structured interviews with all course instructors.

The findings of this on innovative sustainability entrepreneurship pedagogies can be used by course instructors and program administrators to enhance their course offerings and deliver on the promise of the United Nation initiative on responsible management education.

2. Research Design

We applied a comparative case study approach to extract generalizable insights from contrasting several in-depth investigations of similar phenomena (Yin, 1994), i.e., specific teaching and learning processes and environments in sustainability entrepreneurship courses. Courses in sustainability entrepreneurship education at Arizona State University were selected for reasons of demonstrated

efforts to advance transformational sustainability education at a major U.S.-American university and access to detailed information. The selection criteria were related to course content and course pedagogy:

- Courses that were developed in direct response to shortcomings of conventional entrepreneurship education and incremental sustainability courses (e.g., on corporate social responsibility, environmental management, supply chain optimization); that means, courses that offer training in transforming the core of business structures and operations through sustainable business model innovation and adoption of sustainable business practices
- Courses that apply experiential and/or project-based learning approaches by offering direct experience of or performance opportunities in professional business situations and contexts, often utilizing collaboration with sustainable business experts

We identified five courses that fulfill these criteria at Arizona State University. All courses are offered to students or professionals in various programs across the university, with one of them targeting professionals beyond the student population. Other courses at Arizona State University that fulfill those criteria only partly (e.g., courses on social entrepreneurship or cooperatives) were not included in this study.

For each course, a profile was developed using a set of 30+ attributes, capturing information on course basics, learning objectives, learning outcomes, and pedagogical approach. Data was collected through review of available course material (course syllabus, course material, student evaluations, framing documents),

as well as semi-structured interviews with all course instructors (five). We then explored the links among learning objectives, applied pedagogies, and learning outcomes for each course. We also identified challenges and barriers, as well as promising features of innovation.

Finally, based on the detailed case studies, we compared and contrasted the courses to derive generalizable insights into the nature of transformational sustainability entrepreneurship education and to identify opportunities for future improvements.

3. The Courses

Basic information on the courses is provided in Table 1. Below, we explore specific links between learning objectives, applied pedagogies, and learning outcomes (often over several iterations).

3.1. *The Transformational Sustainability Entrepreneurship Course.* The primary learning objective for the introductory course on Transformational Sustainability Entrepreneurship (TSE) is for students to be able to articulate and justify sustainable business models (social enterprise, benefit corporation/B Corp, cooperative business) and support services (business incubation, social finance, local currencies, regional marketing). The target student population for the TSE Course are students from all graduate programs at Arizona State University who have an aspiration to learn about and, eventually, implement sustainable business models in enterprises – directly in companies, or indirectly through work in government organization or the non-profit sector. 10-30 students from up to seven different graduate programs have completed the TSE Course in each of its four installments (since 2016). The course was developed in response to instructors recognizing a gap

in entrepreneurship and business course offerings lacking in sustainable business model innovation and sustainable business practice adoption. The course content is structured as a continuous exchange between the general concepts of sustainable business models and practices on the one hand, and case studies of real-world enterprises (a number of them local to Arizona) applying these models and practices, on the other hand. The course uses a “flipped classroom” approach (Foster & Stagl, 2018; Buil-Fabregá et al. 2019), with students introduced to course content on before class (through course script, material, and assignments) and course sessions focused on deepening understanding through discussion and group activities. The course offers experiential learning opportunities through guest speakers sharing their direct experience with sustainable business models and practices as well as a full-day field trip to local enterprises in Arizona that have adopted sustainable business models and practices.

Since its inception in fall 2016, the TSE Course has gone through a number of iterations to refine course content and the pedagogical approach. The course is structured into several modules over 15 sessions (weeks). The first module (Sessions 1-3) provides students with an overview of (a) the basic structure of an enterprise; (b) a comprehensive set of principles and practices that sustainable enterprises employ (mapped onto the structure); and (c) the ‘ecosystem’ perspective that links the sustainable enterprise to support services, including business incubators, social finance offerings, alternative legal assistance, networking, and so forth (Wiek et al., 2016). The second module of the course (Sessions 4-9) addresses the concepts and real-world cases of sustainable business models, namely, social enterprises, benefit corporations/B Corps, and cooperative businesses (including sessions with guest

speakers). The third module (Sessions 10-13) addresses the enabling ecosystem of sustainable businesses. The course concludes (Sessions 14-15) with the full-day field trip and with the students presenting their improvement proposals (see below). Over the course of the semester, each student is asked to produce three main deliverables: 1) a presentation that offers results from a comprehensive assessment of an enterprise (student choice) that has adopted a sustainable business model and demonstrates sustainable business practices; 2) a popular report on the same assessment that could be published in a professional or popular research magazine (e.g., Sustainability – The Journal of Record, Stanford Social Innovation Review, YES Magazine); and 3) a proposal with specific recommendations how the assessed enterprise could (significantly) improve its performance as a sustainable enterprise. All deliverables are supposed to be based on students collecting and analyzing primary and secondary data, including data obtained through direct contact with the selected enterprises.

Since its inception, instructors have used different pedagogical approaches to enhance students learning experience. A notable attempt was to use a strong flipped-classroom approach, namely “learning by teaching“, based on carefully designed support for the students. Students were asked to prepare the sessions of course modules 2 and 3 in small teams and direct the respective class session, including input presentation, class discussions, and small-group activities. Student teams were coached by one of the course instructors and by experts on the respective session topic. Student evaluations indicate high self-perceived learning outcomes associated with this learning-by-teaching approach; yet, students also indicated that more class preparation was necessary (above average). While considered an effective

pedagogical approach (although formal assessments indicate differently – see Foucrier & Wiek, 2020), this approach requires significant additional effort from both students and instructors. Because of institutional and political reasons (see below), this model was not viable over the long term. The instructors, therefore, retreated to a more conventional version of the flipped classroom providing a regularly updated course script with general and specific information on the concepts of sustainable business models and support services as well as related case studies. Students are asked to use the script (and additional material) to prepare prior to class, and class time is dedicated to plenary discussions and small-group activities.

In all installments, students reported high satisfaction with the TSE Course, highlighting the unique topic of the course (across the university, including the business school and the management school, no other course is offered on business model innovation), the teaching-by-learning approach (when used), the in-depth discussion of real-world cases (enterprises), guest speakers (in particular, the entrepreneurs), and the full-day field trip. Student performance in the course was fairly strong using conventional assessment approaches such as assignment rubrics for the deliverables described above. However, an assessment using an in-vivo simulation (mock city council session) was tested on a group of students who had taken the course in previous semesters; it revealed major deficits in competence acquisition, and in particular, in retention of knowledge over the mid-term (Foucrier & Wiek, 2020).

As the TSE Course is neither supported by the current curricula priorities (the course is not required in any of the participating graduate programs) nor

through the available resources (e.g., teaching assistance), the strong flipped-classroom model was not viable for several iterations. Instructors shifted to a more conventional model, but complemented it with local case studies, guest speakers, and a full-day field trip that offer effective experiential learning settings. Fairly poor student performance in the in-vivo simulation assessment demonstrates the need to incorporate more simulated professional situations in regular class sessions. This seems to better prepare students in applying the acquired knowledge, even in courses that utilize a self-directed learning pedagogy such as the flipped-classroom approach.

3.2. *The Transformational Sustainability Entrepreneurship Lab.* The primary learning objective of the lab course on Transformational Sustainability Entrepreneurship is for students to be able to apply sustainable business models and support structures to existing or start-up enterprises. The TSE Lab is designed as a follow-up course to the introductory TSE Course that familiarizes students with sustainable business models and support structures (in the previous semester). The target student population of both courses is the same. The TSE Lab uses a project-based learning pedagogy (Wiek et al., 2014) and offers students to work on their own business ideas, start-up support for young entrepreneurs, or broader sustainable business training programs for entrepreneurs.

The TSE Lab has gone through several iterations over the past three years. The first version of the TSE Lab (Spring 2017) was designed as an open-learning, self-directed, exploratory course that offered students the opportunity to develop their own business ideas. However, because students entered the space at different levels of ideation maturity and the course lacked course structure, students were

unable to gain traction over their business ideas. A few, fairly vague business ideas were the results. The second iteration of the TSE Lab (Spring 2018) provided students with an initial project concept, namely, a sustainable business incubator for local entrepreneurs. While students reported satisfaction in the flexibility to explore business model innovations, they were similarly unable to execute on the established learning objective for the course to apply that knowledge to a real-world project. A fairly vague incubator concept paper was the result. The third iteration of the TSE Lab (Spring 2019) was designed as learning this professional practice (applying sustainable business models) by doing it in a real-world context. Students were tasked with designing and delivering a full-day training workshop for entrepreneurs interested in starting and running sustainable cooperative businesses in Arizona. This included for students (a) to gain or deepen their knowledge about sustainable cooperative businesses, and (b) to review and design an effective pedagogical approach for the training. The 10 graduate students from 6 different graduate programs worked in three small teams (3-4 students) to design individual training modules for the workshop, as well as plan and execute the workshop event (with a dry run). Three course instructors guided the teams throughout the semester, acting as project leaders and coaches and providing direction and feedback on the workshop modules. In addition, an external coach and facilitator was hired to support students in training techniques using theater-based improvisation, storytelling, role play, and serious gaming, among others. The full-day workshop was held off-campus (easily accessible community facility) and introduced the 20 entrepreneurial participants to principles, bylaws, decision-making, money

management, member recruitment and other cooperative business elements and practices through role-playing, facilitated group discussion, and simulations.

For the last installment of the TSE Lab, instructors reported that student delivery of the cooperative business training workshop was successful, indicated by the high satisfaction rate of the training participants. The redesign of the lab course to include a clear project structure coupled with a real professional task to be delivered was crucial for the success of the course. In addition, the external coach and facilitator was praised by both instructors and students as an essential asset of the course – offering relief for the instructors, professional development opportunities for the students, and a rewarding experience for the training participants. However, instructors asserted that the course was very demanding and resource-intensive for both instructors and students – suggesting that the overall course goal might have been too ambitious resulting in a misbalance between inputs and outputs. A key reason was a lack of coordination on the curriculum level. The TSE Lab was originally designed with the introductory TSE Course as a prerequisite (previous semester), allowing students to acquire a basic understanding of sustainable business models before applying that knowledge in the TSE Lab. However, due to administrative and enrollment challenges, the majority of students joining this TSE Lab had not taken the prerequisite course. Subsequently, students had to build their knowledge base on sustainable cooperative businesses while at the same time designing a training program to convey that very same content. Students reported that they appreciated the professional opportunity and broad support structure the TSE Lab offered, while stating that they often felt overwhelmed by the tasks and the overall aspiration. Instructors stated that they were not only required

to offer more support than in similar project-based courses, but actually had to produce a good part of the training program themselves.

The iterations of the TSE Lab demonstrate that while more open and loosely structured exploratory settings for sustainability entrepreneurship education may provide spaces for students to challenge their theoretical knowledge and explore their own interests, student delivery and competence development often suffer. Providing a pre-defined project structure in these lab settings may be essential for rich and effective learning experiences. Then again, they come with additional costs, the need for curriculum-level course coordination and significant planning ahead, among others.

3.3. The Sustainable Food Economy & Enterprises Studio. The primary learning objective of the studio course on Sustainable Food Economy and Enterprises (SFEE) is that students learn to apply sustainable business models (e.g. cooperative business model) and practices (e.g., local sourcing, renewable energy supply, workforce development) to existing or start-up food enterprises while learning about basics of the sustainable food economy. The studio was created in response to increasing student interest in the course topic coinciding with the main instructor's shift in research trajectory. The target student population of the course are graduate students and senior undergraduate students from both the sustainability and business programs at Arizona State University who have an aspiration to implement sustainable business models in enterprise, as well as have basic food economy knowledge. The SFEE Studio uses a combination of classroom-based and project-based learning pedagogy (Wiek et al., 2014) offering students to work with local food businesses and support services.

The SFEE studio has gone through several iterations over the past four years. The first version of the studio (Fall 2017) was designed as a project-based graduate course that served as the culminating experience of the project-based learning stream in the dual-degree Global Sustainability Science master program. It offered 12 graduate students the opportunity to design and deliver a capacity-building workshop to support the sustainable development of the local food economy in the Phoenix metropolitan area (Wiek et al. 2018). The workshop engaged 27 stakeholders and decision makers from the food economy to explore possibilities to grow and strengthen the sustainable local food economy, inspired by sustainable food business from around the world (cf. Weber et al., 2019). While a rich experience for everyone involved, the course struggled with a similar challenge as the last installment of the TSE Studio – aspiring to ‘too much, too soon’, and requiring significant resources and support structures. The first iteration of the studio (Spring 2018) used stakeholder input from this workshop (to keep the momentum), and, in a downscaled version, allowed 3 graduate students to develop a business concept for a sustainable local bakery cooperative, specified for Tempe, AZ. Students researched worker cooperatives, transferred insights to develop concept elements, and consulted with professionals in the local food economy. The result was a concept report (Forrest et al., 2018) that identified products, location, customer base, design guidelines, ownership and management structure, budgets, and more for the cooperative bakery. Instructors asserted the high-quality of the business concept, but mentioned as a reason the targeted recruitment of highly motivated and capable graduate students with some experience in the subject matter. Students reported very high satisfaction with this studio highlighting the professional experience,

balance of analytical and creative tasks, and the strong support structure (coaching and mentoring). The second iteration of the studio (Spring 2019) was designed to build upon the previous studio (moving closer to implementation), but extending the offer to a larger number of both graduate and undergraduate students (10-20). Student teams were tasked with elaborating on the bakery cooperative concept – identifying sustainable local suppliers, specifying green operations (e.g., renewable energy, food waste composting), and developing marketing material. This studio combined experiential and project-based offerings including: a site visit of a local artisan bakery; an in-vivo simulation of the bakery's operations (preparing a selection of the bakery's menu items from locally sourced ingredients); and a public event in which student showcased sourcing, operations, and marketing of the cooperative bakery. These course components resonated most with the students. Instructors reported that these course elements allowed students to experience and practice sustainability entrepreneurship first hand by observing local food entrepreneurs at work, connecting with actual suppliers, and testing marketing material with potential customers. However, while students were provided with rich learning experiences, the cooperative bakery concept got less advanced than expected. Instructors also stated misalignment of courses on the curriculum level citing a lack of students' professional skills necessary for parts of the course. The most recent iteration of the studio (Spring 2020) was designed to offer small student groups the opportunity to partner with real-world enterprises, organizations, and a city department on a variety of sustainable food economy solutions. Deliverables include: a local sourcing plan for a local brewery; B-Corp pre-certification for a local brewery; a concept for converting an urban farm into a land trust; an incubation

program for a sustainable local brewing company; and a food economy action plan for city staff. The course uses a similar hybrid course format like the previous installment, combining class-based instruction with experiential and project-based elements.

The iterations of the SFEE Studio demonstrate that while experiential and project-based learning activities are beneficial for students' development of sustainability entrepreneurship competencies, the resulting deliverables might not be readily usable in professional applications. Drawing on the insights from the TSE Lab case study above, it seems that successful sustainability entrepreneurship training using experiential and project-based pedagogies requires a trade-off between providing students with a more manageable task vs. providing them with the opportunity (and burden) of the full professional experience. The number of students as well as their level of competence (previous knowledge on the subject), confidence, and commitment are important factors to consider for this decision on course design. Better curriculum-level coordination among courses (e.g., professional skills training) would make the second option (full profession experience) more feasible.

3.4. The PREPPED Program – Infusing Sustainability into Mobile Food Enterprises. The PREPPED program is a 12-week business acceleration course for entrepreneurs who operate a small mobile (not brick-and-mortar) food enterprise. The primary learning objective is for the food entrepreneurs to be able to apply good business practices and sustainable practices to their enterprises. Participants (12-15 per installment) are non-degree-seeking, early-stage food entrepreneurs, mainly women and/or people from minority groups and with low-income status. Participants

must be interested in healthy food options and sustainable practices. The initial installment of the course (Fall 2016) did not include sessions on sustainability topics. Based on participant interest and institutional partnerships between schools, two sustainability sessions were developed and implemented in Fall 2018. Since then, participants receive specific training in sustainable business models, sustainable sourcing, sustainable operations and marketing of sustainability efforts. The PREPPED course employs a fairly conventional, classroom-based pedagogy. However, because students are food entrepreneurs in business, they have the opportunity to directly apply what is learned in the classroom to their operative businesses. This allows for immediate knowledge transfer, drawing on experiential learning beyond the teaching setting. In general, students engage with lectures, participate in plenary and small-group discussions, receive mentor input, and apply course content in business pitch and food demonstration events for mentors, food critics, and others.

The sustainability sessions of the PREPPED course, for the most part, have stayed the same since their inception. The first session is framed through a normative orientation, with instructors asking students to reflect and articulate their personal values. Students are then invited to explore sustainable business models (mostly cooperative business and benefit corporation/B Corp) and to reflect on the alignment with their values. In the second part, student are provided with background on, best practices of, and local examples for sustainable operations, i.e., renewable energy provision and energy-efficient appliances, water-efficient appliances and practices, sustainable packaging material and practices, and food waste and material composting. Again, alignment with personal values is explored.

The second session starts with background on, best practices of, and local examples for sustainable, i.e., local, seasonal, etc. sourcing of ingredients. The second part of this session focuses on background on, best practices of, and local examples for marketing sustainability efforts. Students engage in breakout groups and plenary discussions throughout the sessions. A focal point of all activities is potential implementation of the learned practice in the enterprises of the participants. Instructors nurture a safe, empathetic, and compassionate space for entrepreneurs to challenge their knowledge and worldviews in a profession that is often highly competitive.

Participants often report high satisfaction with the sustainability sessions responding to their interest and combining basic with practical information for application. Participants reference the sessions for gaining motivation to adopt the learned sustainable practices. Some of the participants have implemented sustainable packaging for their products, sustainable sourcing of ingredients, and explored opportunities for growing their own food for their business and co-founding a purchasing cooperative. No formal assessments have been employed for these sessions; thus, development, application, and retention of sustainability entrepreneurship competencies is unconfirmed at this stage. Responses to a survey that gathered some of these data for all eight PREPPED cohorts are currently being analyzed.

As suggested in the literature (Kurucz et al., 2014), the adopted normative framing has proven to be a powerful tool for training food entrepreneurs in sustainability. It allows participants to become aware and be empowered that sustainable practices in their businesses should and can align with their personal

values. Additionally, while instructors recognize that the PREPPED course employs a limited classroom-based pedagogy, the fact that participants can direct apply knowledge gained in the classroom to their businesses may not require adopting stronger experiential and project-based pedagogies. Finally, instructors stated that while the sustainability sessions increase motivation of entrepreneurs to apply sustainable practices, actual application is lacking. One challenge is that the course in its current form still offers training on business practices such as accounting, pricing, menu planning, etc., with little to no discussion of environmental and social issues. Iterations of the course would benefit from placing sustainability at the core of all sessions (e.g., practicing triple-bottom-line accounting, linking pricing to local sourcing, exploring menu planning with seasonality of produce). This could go hand-in-hand with adoption of stronger experiential and project-based pedagogies including guest visits from sustainable food entrepreneurs as well as site visits and field trips to sustainable food businesses.

3.5. The Founders Lab – Facilitating Development of Social-Purpose

Business Concepts. The Founders Lab is the latest addition to the suite of courses that offer experiential or project-based sustainability entrepreneurship education at Arizona State University. It is a one-semester or year-long thesis project course for undergraduate honors students. The primary learning objective is for students to be able to engage in entrepreneurial endeavors and apply, to some extent, social-purpose business start-up practices. The course does not specify formal learning objectives; in fact, students define their individual learning objectives, in collaboration with the lab director and select faculty members. The course originated from the challenge that undergraduate students are interested in engaging in

entrepreneurial endeavors, but struggle to develop or gain enough traction on their own business ideas. The course offers students the opportunity to collaborate with businesses and organizations on entrepreneurial challenges. For example, local coffee businesses in Arizona have identified an interest in creating a purchasing cooperative for sustainably sourcing coffee (Weber & Wiek, 2020). A team of students has taken on this challenge as their Founders Lab project. The lab uses a project-based pedagogy and offers students either to become a “co-founder” of a project, i.e., developing and executing the project in full; or, to participate as “student specialist” in a project, i.e., providing topic-specific support to teams for part of a project.

The Founders Lab is currently undergoing its first installment (academic year 2019-20). With about 40 students engaged in the lab, twelve students teams work on projects, including a community solar power project and the aforementioned purchasing cooperative project. Prior to the semester, project ideas are assembled by the lab director and associated faculty members, based on input from external stakeholders. Students identify the project they want to be a part of and begin their engagement in one of four stages: 1) developing a customer-validated business concept; 2) developing product/service outlines to gain market traction; 3) validating business concept through proof of concept testing and minimum viable product development; or 4) targeting funding and partnerships to actualize business concept. Students are expected to generate a professional deliverable, e.g., business plan, prototype, professional workshop, or entrepreneurial competition (and a related report).

Student teams are provided with project-specific background material, but work closely with select faculty members and the lab director. They meet at least once a week and spend most of their time working in their teams. Some of the student teams apply social and/or environmental business practices in their projects. While students may be exposed to sustainability topics such as renewable energy or water efficient technologies, the majority of teams do not work with sustainable business models or use sustainable business tools such as the sustainable business model canvas or triple-bottom-line accounting. Student teams do receive some training in conventional business tools, including the business model canvas. However, most engagement with business tools is done without formal training. The teams receive informal feedback over the course of the project, but are not assessed until the completion of the project when they submit a written report and perform in a pitch event attended by the public and business experts. The assessment of the report is based on a rubric that includes content criteria (e.g., sound market identification) and formal criteria (e.g., completeness, accuracy). During the pitching event, business experts challenge the teams on their concepts. The teams receive written feedback from the experts after the event, but this feedback is not factored into the final grade.

The Founders Lab offers students to engage in entrepreneurial endeavors through project-based learning, providing business ideas at some state of maturation. This seems to be an attractive and effective pedagogical setting, particularly when considering the limited number of semesters students have available to acquire sustainability entrepreneurship competence. However, the lab also demonstrates that in project-based entrepreneurship education, students do not

naturally gravitate to sustainable business model innovation and practices. For broader impact on students' sustainability entrepreneurship competence, these concepts and related real-world cases would need to get more explicitly incorporated into the course. Also, including more required input sessions for student teams would mitigate biases associated with students self-directed learning process. Finally, there is a wide range of assessment tools available that could support and provide broader evidence of students' developing sustainability entrepreneurship competence (Foucrier & Wiek, 2020; Redman et al., 2020).

Table 1

Main Features of the Sustainability Entrepreneurship Courses at Arizona State University (ASU)

Course Name	Transformational Sustainability Entrepreneurship Course	Transformational Sustainability Entrepreneurship Lab	Sustainable Food Economy Studio
Lead Unit at ASU	School of Sustainability	School of Sustainability	School of Sustainability
Participating Academic Programs	Sustainability, Business, Management, Creative Enterprise, Social & Cultural Pedagogy, et al.	Sustainability, Business, et al.	Sustainability, Business
Start	Fall 2016	Spring 2017	Fall 2017
Prerequisites	None	None	At least senior level (e.g., completion of basic professional skills training)
Desired Qualifications	None	Completed TSE course Basic professional skills	Basic food economy knowledge
Students	Graduate students	Graduate students	Graduate & undergraduate students
# of Students	10-30	10-15	10-20
# of Student Teams	-	3-5	3-5
Frequency	1 per academic year	1 per academic year	1 per academic year
Course Length	1 semester = 15 weeks	1 semester = 15 weeks	1 semester = 15 weeks
Contact Hours	3	3	3

Additional Hours	6-9	8-9	8-9
Learning Objectives	Being able to articulate and justify sustainable business models, practices, and support services	Being able to apply sustainable business models and practices	Being able to apply sustainable food business models, practices, and support services
Course Content	Sustainable business models, practices, and support services	Sustainable business models, practices, and support services	Sustainable food business models, practices, and support services
Pedagogical Concept	Classroom-based Experiential learning	Project-based (teamwork & stakeholder engagement)	Classroom-based and project-based (teamwork & stakeholder engagement) Experiential learning
Learning Activities	Processing inputs (lectures, guest lectures, discussions), experiencing (field trip)	Applying (project)	Processing inputs (lectures, guest lectures, discussions), experiencing (site visits, field trip), applying (application events, project)
Role of Instructor(s)	Lecturer, discussant	Project leader / coach	Lecturer, project leader / coach
Assignments	Presentations, report, class discussions	Stakeholder workshop and deliverables	Stakeholder workshop and deliverables
Assessment Approach	Assessment of assignments In-vivo simulation assessment	Assessment of assignments (in-vivo & deliverables)	Assessment of assignments (in-vivo & deliverables)
Challenges	Lack of long-term competence retention Lack of institutional support	Resource-intense & demanding Input-output misbalance Lack of curriculum-level	Lack of full professional experience Lack of curriculum-level

	coordination of courses	coordination of courses
Course Name	PREPPED Program	Founders Lab
Lead Unit at ASU	College of Nursing and Health Innovation	School of Business
Participating Academic Programs	[Non-degree]	Business, Sustainability, Engineering, Liberal Arts, Biology
Start	Fall 2016	Fall 2019
Prerequisites	Women or minority; low income; <5 employees; early stage; mobile business	Only for honors students
Desired Qualifications	Motivated, vivid learners, interested in health and sustainability	Motivated students from diverse background, with desire to engage in entrepreneurial endeavors Freshmen, sophomores, juniors
Students	Food entrepreneurs (in business)	Undergraduate students
# of Students	12-15	40
# of Student Teams	-	12
Frequency	2 per academic year	1 per academic year
Course Length	1 semester = 12 weeks	1-2 semesters = 15/30 weeks
Contact Hours	3	1-3
Additional Hours	3-6	8-9
Learning Objectives	Being able to apply good business practices and sustainable practices	Being able to apply social-purpose business start-up practices Student-identified learning objectives
Course Content	Good business practices (pricing, permits, accounting, etc.) Sustainable business models and practices	Conventional business tools Social-purpose business start-up practices Project-specific content

Pedagogical Concept	Classroom-based and applied	Project-based (teamwork & stakeholder engagement) Self-directed learning
Learning Activities	Processing inputs (lectures, discussions, mentor input), applying (demonstration events)	Applying (project)
Role of Instructor(s)	Lecturer, discussant, mentor	Project coach
Assignments	Quizzes, demonstration exams, pitching tasks	Business plans, prototypes, etc. Report Pitching tasks
Assessment Approach	[No formal assessment]	Assessment of final deliverable + pitch
Challenges	Weak experiential pedagogy Lack of formal assessment	Lack of explicit sustainability entrepreneurship content Lack of targeted formal training

4. Discussion

Experiential and project-based courses provide rewarding teaching and learning settings for sustainability entrepreneurship education. While this is asserted in the literature (McCarthy & McCarthy, 2006; Dhliwayo, 2008; Klapper & Farber 2016; Rieckmann, 2017; Lindner, 2018), and even more often acknowledged by academic leaders, course offerings of a more transformational nature are lacking (Dyllick, 2015; Høgdal et al., 2019). In return, there are very few studies that try to unpack and critically reflect on the actual teaching and learning processes in such offerings.

We compiled information on these processes in the sustainability entrepreneurship course offerings at Arizona State University and assessed their

strengths and weaknesses. There are a number of insights that can be derived from comparing and contrasting the five portrayed courses.

First, students often report about transformational learning experiences in these courses, partly due to the innovative, unconventional, and ‘positive’ nature of sustainable business models, practices, and support services; but mostly due to the experiential and project-based course elements. For example, students in the Sustainable Food Economy and Enterprises Studio identified such a transformational learning incident in the shared experience of identifying, procuring, and processing locally sourced ingredients for a professional menu preparation. Another student working on developing a sustainable purchasing cooperative for local coffee businesses in Arizona as part of a Founders Lab project reported about the deep insights and motivation he gained from participating in a stakeholder workshop for these local coffee businesses. Students from the Transformational Sustainability Entrepreneurship Course recalled the field trip as a transformational experience because it offered first-hand (and first-time) observations of pioneering sustainability entrepreneurs in action (e.g., running a multi-stakeholder benefit corporation).

Second, significant learning experiences do not happen automatically by providing course offerings on sustainability entrepreneurship, even if offered with some experiential and project-based elements. There are several pedagogical design decisions that make a difference; an insight that is well documented in project-based learning literature (Brundiers & Wiek, 2013; Wiek et al., 2014). In all three project-based courses (Transformational Sustainability Entrepreneurship Lab, Sustainable Food Economy and Enterprises Studio, Founders Lab), instructors steer away from

leaving project ideation to the students and rather provide project ideas with some level of maturity for student teams to work on. Similarly, balancing self-directed learning, on the one hand, and targeted instruction and facilitation of experience, on the other hand, seems to be an important success factor across the courses (Dhliwayo, 2008). Extra planning efforts from instructors as well as targeted institutional support (e.g., teaching assistance) can significantly enhance students' learning experience. As sustainability entrepreneurship education is still relatively undeveloped at Arizona State University (as at most other universities), students need quite a bit of guidance and coaching support for how to search, navigate, and structure the topic of sustainability entrepreneurship. Regular updates of course material (e.g., course script) are more important for such a highly dynamic topic compared to saturated topics addressed in conventional business and management education.

Third, sustainable business models, practices, and support services (of a transformational nature) are not mainstream in the economy (Schaltegger et al., 2012; Laukkanen & Patala, 2014), and thus call for specific and persistent goal orientation in course design and institutional support (Starik & Rands, 2010; Dyllick, 2015). All instructors assert a 'threat of dilution' – that sustainability entrepreneurship education retreats to incremental or add-on models of sustainability and loses its transformational nature. Key is the identification and training in appropriate business tools – including unconventional ones such as normative framing with personal goals (Kurucz et al., 2014) – that allow students to reveal the structural weaknesses of conventional business models and practices while empowering them to develop alternatives. The Founders Lab director seeks a

better alignment of learning objectives around sustainability and student engagement with business tools as a key task for the first iteration of the course. Similarly, the instructors of the sustainability sessions in the PREPPED Program identify the anchoring of sustainability in the core of all course sessions as the key next step to overcome the add-on model of sustainability entrepreneurship currently adopted in this course.

Fourth, the aforementioned ‘threat of dilution’ corresponds to another one, the ‘threat of marginalization’. In a time of worldwide climate emergencies, extreme wealth and income inequalities, and a highly vulnerable global economy, it is difficult to comprehend that sustainability entrepreneurship courses of the kind portrayed in this study remain at the fringe of business and management education, and even sustainability education. None of the courses portrayed here are mandatory in any curriculum, neither in the School of Sustainability, nor in the School of Business, nor in the School of Management. In a major university like Arizona State University where students are being graduated in the hundreds (Sustainability) or thousands (Business) every academic year, the number of students exposed to sustainability entrepreneurship is negligible. How can that be? As often in educational innovation (Wiek et al., 2011), bureaucracy and existing curriculum structures are key barriers. Many students at Arizona State University who may wish to take one of these courses do not have the credit hours available, or have scheduling conflicts with mandatory courses, or study on a campus where these courses are not offered, and so forth. New courses and course suites can be perceived as challenging existing traditional pedagogies or programs and may be discouraged through various administrative means such as room access or scheduling conflicts;

thus, course visibility and access are diminished. And these challenges pertain to a single course – let alone exploring full programs and curricula in sustainability entrepreneurship. Most of the students take only one of these courses – with the result of limited competence development and retention (e.g., Foucrier & Wiek, 2020). This is not the fault of the students but due to the lack of institutional commitment combined with the lack of clear academic success pathways for students to engage in suites of sustainability entrepreneurship courses. For example, the introductory course in Transformational Sustainability Entrepreneurship focuses on developing sustainability entrepreneurship competencies in the discovery phase such as critically observing and evaluating businesses and trends using a sustainability lens through the evaluation of real-world case studies (Foucrier & Wiek, 2019). Broader competence development and retention depends on broader and coordinated educational offerings through certificates and full academic programs.

Fifth and finally, even among the small portfolio of available courses, better coordination would facilitate enhanced learning experiences. For example, the Transformational Sustainability Entrepreneurship Lab is supposed to build upon the Transformational Sustainability Entrepreneurship Course (the latter should be a prerequisite for the former). Because of administrative and enrollment issues, this does not consistently happen with the result that students who have not taken the introductory course struggle with performing well in the lab. Similarly, the Sustainable Food Economy and Enterprises Studio would benefit from better coordination with the regular course on Professional Skills in Sustainability. Students enrolled in the latter are not sufficiently instructed about the importance

of these skills for successful performance in higher-level undergraduate courses such as the Sustainable Food Economy and Enterprises Studio. Coordination among courses on the curriculum level, however, requires institutional commitment and leadership (Wiek et al., 2011), which is currently underdeveloped at Arizona State University when it comes to anchoring sustainability entrepreneurship in curricula and academic programs.

5. Conclusions

This study presents insights into the strengths and weaknesses of innovative teaching and learning formats for conveying sustainability entrepreneurship competencies. Five course offerings at Arizona State University were described, compared, and contrasted, using a set of 30+ attributes capturing information on course basics, learning objectives, applied pedagogies, and learning outcomes. Findings suggest that case studies on sustainable local businesses, guest lectures by sustainable entrepreneurs, and field trips to sustainable businesses offer valuable experiential learning opportunities for students; that project-based sustainability entrepreneurship training may be most effective when pursuing real-world deliverables appropriate for students' competence level and when paired with professional skills coaching; and that experimental sustainability entrepreneurship training is most effective when students are provided with a pre-structured idea and strong support structure, rather than being tasked to undertake their own business ideation mostly through self-directed efforts; the latter finding may be relaxed in the case of students who are professionals and bring their own real-world, real-time examples to lab or studio courses; and that curriculum-level course coordination, reliant on institutional commitment, facilitate enhanced learning experiences even

among a small portfolio of course offerings. Further work is needed to substantiate these findings beyond this small sample and this particular university. In addition, a more comprehensive empirical research design, including student interviews, direct observations, and focus groups with students and instructors, would help specifying linkages between course content and activities, on the one hand, and resulting learning outcomes, on the other hand (cf. Konrad et al., 2019). In addition, the assessment of competence acquisition through various tools (Redman et al., 2020), including in-vivo professional simulation assessments (Foucrier & Wiek, 2020), would substantiate the actual learning outcomes of sustainability entrepreneurship courses. However, more important than additional research efforts is, in the opinion of the authors, that universities around the world significantly increase institutional commitment and support to deliver on the promise of the United Nation's initiative on responsible management education – only then will course offerings as the ones portrayed in this study make a real difference in advancing sustainability entrepreneurship in the world.

CHAPTER 4

STUDY 3: ASSESSING STUDENTS' COMPETENCE IN SUSTAINABILITY ENTREPRENEURSHIP THROUGH IN-VIVO SIMULATED PROFESSIONAL SITUATIONS

1. Introduction

The United Nation's Sustainable Development Goals (SDGs) identify decent and productive work for all, responsible consumption and production, the reduction of inequality, and inclusive and sustainable industrialization as key targets to building a sustainable economic system (United Nations, 2015). Social enterprises, benefit corporations, and cooperative businesses, and their financial, legal, and educational support systems, seem to be business models that align most closely with these goals. These business models pursue clear social and/or environmental goals, avoid externalization, adopt circular resource management, hold themselves accountable to a broad range of stakeholders, allow for democratic governance and economic participation of their workforce, among others (Stubbs & Cocklin, 2008; Schaltegger et al., 2012; Wells, 2013; Bocken et al., 2014; Evans et al., 2017).

Universities around the globe have started to create programs and courses to educate students on issues of sustainability and responsibility (Wu et al., 2010; Aragon-Correa et al., 2017). The United Nations' Principles for Responsible Management Education (PRME) have been adopted by several hundred educational institutions worldwide, seeking to embed sustainability into management teaching and learning worldwide (Alcaraz et al., 2011; Godemann et al., 2014). In similar cooperative fashion, agreement emerges among scholars and educators on the learning objectives for responsible management education in general, and

sustainability entrepreneurship education in particular. This can be seen in the converging sets of competencies proposed for graduates at the completion of their management education (Lans et al., 2014; Laasch & Moosmayer, 2015; Ploum et al., 2018; Foucrier & Wiek, 2019). Similarly, there seems to be convergence on the promise of real-world pedagogies for sustainable and responsible management education (Brower, 2011; Prado et al., 2020). Aragon-Correa et al. (2017) conclude their study with the assertion that “effective models for teaching sustainability require the inclusion of representative cases, vivid illustrations, and experiential learning” (p. 479). Simulating management situations and asking students to perform within them has been introduced as another pedagogical approach – at times explicitly borrowing from medical and social work education – for advancing students’ learning of competencies, including those related to sustainability and responsibility (LeClair & Ferrell, 2000; Salas et al., 2009; Grossman et al., 2013; Wright et al., 2016; Prado et al., 2020).

However, equally important to agreeing on competencies and pedagogies is the development of tools for assessing to what extent students actually develop these competencies and pedagogies are successful. A variety of assessment tools is used in educational practice, including response-based methods vs. process-based methods, simple assessment tasks vs. complex assessment tasks, written evaluations vs. performance-based tests, etc. (Garfield, 1994; Cioffi, 2001; Frey & Seitz, 2009; Leutner et al., 2017). Conventional assessment tools, however, prevail in sustainability education, with a reliance on traditional examination settings (multiple-choice tests, essays, etc.) or self-assessment by students to demonstrate competence acquisition (Aragon-Correa et al., 2017; Redman et al., 2020).

Educational scholars have identified the shortcomings of such assessment tools more broadly, including inadequacies in assessing performance-based competencies (Frey & Seitz, 2009) and in determining to what extent students actually acquire competencies (Leutner et al., 2017). There is a void of opportunity for students to demonstrate competencies in professional situations they will face after graduation (Redman et al., 2020).

More promising tools for competence assessment simulate the professional practice that students will experience after graduation, or even during their studies, e.g., in internships or project-based courses. Such assessments correspond to simulation-based and performance-based pedagogies, mentioned above (Salas et al. 2009; Grossman et al., 2013; etc.). In-vivo simulation is a particular type of this competence assessment: assessing students' competence through scripted scenarios, enacted by actors or experts, that mimic real-world settings. These assessments ask students to demonstrate skills in observed, semi-controlled settings that also allow for deep learning and personal growth (Cioffi, 2001; Galloway, 2009), while engaging in a relatively risk-free environment (Salas et al., 2009). While novel in sustainability and business education, medical and social work education has a strong base for examining students in simulated, quasi-professional settings that they will be operating in after graduation (Linn et al., 1991; Cook et al., 2014). Simulated assessments are even incorporated into licensing exams because of the authenticity, objectivity, and high validity among students tested (Panzarella et al., 2007). Similarly, social work education is increasingly relying on simulated assessment to evaluate students' competencies (Bogo et al., 2011).

Against this background, the present study addresses the question: What is a reliable tool for assessing students' competence in sustainability entrepreneurship that avoids shortcomings of self-assessment and conventional examination tools?

We present here a novel tool for assessing students' competence in sustainability entrepreneurship through in-vivo simulated professional situations, based on established models in medical and social work education. The study was structured into three phases: (1) tool development, (2) tool application, and (3) tool evaluation against a number of validation criteria including being aligned with course content and realistic regarding professional tasks. The tool was developed for and applied in a graduate course in sustainability entrepreneurship at Arizona State University.

To inform educators in business and management programs, we discuss and conclude under which conditions the assessment tool seems most effective, as well as what potential improvements might be considered for future applications. The empirically tested assessment tool can be replicated and utilized in a variety of educational settings. Analogously, the validation approach presented here could be used for testing other in-vivo simulation competence assessment tools.

2. Profile of the Graduate Course

This study used a full (3 credit hours) semester-long graduate course entitled "Transformational Sustainability Entrepreneurship" at Arizona State University as the application case. We focus here on the course installments offered as electives in fall 2018 and in fall 2019. Students from graduate programs across Arizona State University were eligible to enroll. A total number of 39 graduate students participated in the course over the two different semesters (25 + 14), joining from 11

different graduate programs across Arizona State University. Course instructors were two faculty from the School of Sustainability at Arizona State University.

This course originated in the School of Sustainability and was motivated by the insight that management and entrepreneurship education in the U.S. rarely provides students with the opportunity to familiarize themselves with sustainable business and economy models as well as real cases. Considering the broad and growing discontent with conventional business-as-usual models, it seems that students are more trained for the past than for the future (Tracey & Phillips, 2007). Management scholars, educators, and leaders continue to advocate for more transformational management training on sustainable business model innovation (Kickul et al., 2012; Schaltegger et al., 2012).

The School of Sustainability uses the key competencies in sustainability (Wiek et al., 2011) as the reference framework for all its programs and courses. Accordingly, the learning objectives for this course were formulated in the course syllabus as follows:

1. Systems thinking competence – Being able to articulate enterprises as systems (e.g., inputs, processes, outputs, actors) that are closely linked to their social and environmental surroundings.
2. Values thinking competence – Being able to critically assess enterprises against a comprehensive set of sustainability principles, using a suite of sustainable business models and real cases.
3. Future thinking competence – Being able to use a comprehensive set of sustainability principles to constructively develop visions for truly sustainable enterprises.

4. Strategic thinking competence – Being able to articulate the steps to make such proposals become a reality (considering capacity building, resources needed, assets to leverage, etc.)
5. Interpersonal competence – Being able to effectively communicate sustainable business models, cases, and proposals, collaborate with peers and supervisors, etc.

In a recent publication, Foucrier & Wiek (2019) used the key competencies for sustainability to develop a process-oriented competence framework for sustainability entrepreneurship. This framework identifies specific tasks and related competencies for sustainability entrepreneurship throughout the discovery, planning, start-up, build-out, and consolidation phases of a sustainable enterprise. The course was designed to build competencies for students mostly in the discovery phase, with a few tasks and competencies explored in the start-up phase.

The course combines a number of pedagogical approaches:

1. The course is open to graduate students from all graduate programs across ASU with an interest in sustainable business issues and facilitates interdisciplinary learning among different disciplines.
2. The course adopts the flipped-classroom approach in which students are introduced to the learning material before class, class time is being used for clarifications, discussions, exercises, and students reflect after class on the activities and feedback received to advance their learning.
3. The course exposes students to both sustainable business models and real cases. There is a continuous exchange and dialogue between both.

4. Case studies of sustainability enterprises are discussed with guest speakers and a field trip offers students a close-up look into the practice of sustainability entrepreneurship.

The course was comprised of 15 sessions. The first few sessions provided students with a broad overview of structure and principles of sustainable enterprises, as well as the ‘ecosystem’ perspective that links the sustainable enterprise to support structures, including business incubators, social finance offerings, alternative legal assistance, networking, and so forth (Wiek et al., 2016). The course then transitioned to exploring sustainable business models in more detail, namely, social enterprises, benefit corporations, cooperative businesses, as well as their support structures. Each business model was covered through two sessions – one on the basic features of the model, the other one on real case studies of such enterprises from around the world. As most of the information base is dispersed and still evolving, the course instructors created a course script with basic up-to-date information on these models. The course was completed by a field trip and a session with final presentations. Course assignments included assessment presentation and report on a sustainable enterprise (students were free to pick one), as well as an improvement proposal presentation outlining specific measures for the respective enterprise. The course received very positive student evaluations for both installments (>4 on average on a 5-point scale), with several students acknowledging transformative learning experiences in this course.

3. The Assessment Tool

The in-vivo simulation competence assessment tool is designed to capture student’s competence in sustainability entrepreneurship as it relates to the course

content described in the previous section. We used a set of guiding principles for designing this assessment tool (Redman et al., 2020). The tool ought to:

- Test students' knowledge in direct relation to the course's learning objectives and content
- Test students' knowledge in relation to a broader framework of competence in sustainability entrepreneurship (Foucrier & Wiek, 2019)
- Simulate a professional situation that is recognized as "realistic" by all participants
- Offer all participants appropriate material to prepare for their respective roles
- Engage students in meaningful and interesting activities
- Create a safe and empowering atmosphere
- Use good practices from fields experienced such tools (medical sciences and social work studies)
- Be adaptable to other courses

While all these design principles were of relevance, trade-offs were inevitable.

For example, we needed to balance terminology familiar to students with terminology appropriate for the specific professional setting (here local city government).

These are the key components of the assessment tool:

3.1. Case Description. The students are asked to take on the role of a sustainable enterprise consulting group and respond to a proposal for a local economy stimulation initiative. In this scenario, the proposal for the initiative was previously developed by another consulting group and submitted to city council. City

council is now looking for independent advice on the proposal. The consulting group (students) receives the proposal report ahead of the meeting and is asked at the meeting to work through a series of questions/ prompts with a simulated city council group (actors).

3.2. Background Material. A mock 10-page report “Economic Development Vision for the City of Tempe, Arizona” is provided as background material for both students and the actor panel to review before the assessment event (see Appendix). To make the report realistic, we used city sources, based it on an economic development report from a different city, and let it be vetted by city officials. The report outlines an initiative to stimulate a sustainable local economy in Tempe benefiting all community members through strengthening micro, small, and medium-sized enterprises, as well as the local governments’ capacities to facilitate local economic development. The report includes city history and background on the city’s economy as well as a vision for a local city economy. It is specified for particular sectors of the economy, including manufacturing/business services, healthcare and biotechnology, art/culture, tourism, as well as sports and recreation. Students are not being asked to take ownership over this report as they had no part in its creation (supposedly created by the other consulting firm). Rather, students are asked to critically review and become familiar with the information in the report, applying what they have learned during the course. Actors are also asked to review the report prior to the respective assessment in order to be able to easily move through the assessment protocol and improvise as needed.

3.3. Assessment Protocol with Prompts/Questions. The protocol is composed of five prompt groups, with four to assess individual student responses and the final

one for a team activity (see Appendix). The first one focuses on the local economy, setting students up to think about the context of business development. Students are then asked to explore specific business models, for example, clarifying appropriate structures or laws pertaining to social enterprises, benefit corporations, and/or cooperative businesses (structured in two prompt groups). Students are then asked to explore the role of support services such as business incubators or social finance offerings. A set of prompts for a final group activity conclude the protocol. This prompt group asks the students to collaborate and critically review a list of economic development priorities the City of Tempe has adopted in reality. Students are also asked to defend why the selected priorities should be the primary focus of the city moving forward. All prompts are closely linked with the background material provided, and students are invited to reference, clarify, and challenge parts of the report. When a student's answer is insufficient, the next student is invited to answer the same question.

3.4. Actor Panel. The assessment tool provides instructions for three “actors”, namely, City Council Member #1, a small business advocate; City Council Member #2, a non-profit advocate; and City Council Member #3, a big business advocate. Each actor undergoes a one-hour preparatory session with the assessment facilitator, and are instructed to review the report provided to the students. They are also given a script (assessment protocol) to follow during the simulation. Actors are instructed to use the protocol as a guide, rather than a strict script, and improvise by challenging the students with their designated role. This is done in order support the real-world setting of the assessment and allow actors to bring in additional tacit knowledge, drawing from their professional experiences. The assessment facilitator

plays the role of the “City Clerk”, keeping time, guiding the scope of conversation and answering logistical questions.

3.5. Examiners. Examiners (course instructor and experts familiar with the course content) are provided with an assessment schematic and take notes at the assessment events.

3.6. Assessment Rubric. Using the examiners schematics, examiner notes, and transcripts, examination scorecards are completed for each student. Because students participate in a group setting, each student is not asked every question in the protocol. Also, as per assessment protocol, when a student’s answer is insufficient, the next student is invited to answer the same question. For each student, the overall assessment rubric is tailored (ex-post) to the specific questions he/she was asked at the assessment event. Each response is assessed using the following categories: “exemplary” for >70% of objectives met; “sufficient” for 70%-50% of objectives met; “insufficient” for <50% of objectives met; and “incorrect” for 0% of objectives met. The response scores are then aggregated to determine the overall score for each student, using the following simple equation: $\{1 - [(number\ of\ insufficient\ answers + number\ of\ incorrect\ answers) / number\ of\ questions\ asked]\} * 100$. Each student’s overall performance score is a percentage score, with >50% defined as a passing score. An example of a student scorecard can be found in the Appendix.

4. The Test Assessments and Assessment Results

The assessment tool was applied and tested in two settings (Tab. 1). Both settings used the same assessment material, protocol, and structure. Differences were the composition of the actor panels (professionals vs. graduates), the

assessment location (city hall vs. conference room on campus), and the number of examiners (2 vs. 1) – with implications on validation and reliability, as discussed below.

Table 1

Key Features of the Two Test Assessment Settings

	Test Assessment #1	Test Assessment #2
<i>Date & Duration</i>	April 29, 2019 / 75 minutes	May 6, 2019 / 75 minutes
<i>Location</i>	<ul style="list-style-type: none"> • Conference room at city hall 	<ul style="list-style-type: none"> • Conference room on university campus
<i>Actor Panel</i>	<ul style="list-style-type: none"> • Vice Mayor/City council member • Sustainability manager of city • Sustainability manager of local business association 	<ul style="list-style-type: none"> • Postdoctoral researcher (sustainability and business) • PhD graduate (sustainability) with business background • Master graduate who had taken the course previously
<i>Student Participants</i>	4 participants (3 females, 1 male) <ul style="list-style-type: none"> • Student 1: Master student (sustainability), >6 months after course • Student 2: Master student (business), >6 months after course • Student 3: Master student (non-profit leadership), >6 months after course • Student 4: Master student (cultural & creative business), >6 months after course 	5 participants (2 females, 3 males) <ul style="list-style-type: none"> • Student 5: Master student (sustainability), >6 months after course • Student 6: Master student (business), >6 months after course • Student 7: Master student (sustainability), >12 months after course • Student 8: Master student (social/cultural pedagogy), >6 months after course • Student 9: Master student (entrepreneurship), >12 months after course
<i>Examiners</i>	<ul style="list-style-type: none"> • Course instructor • Postdoctoral researcher (see above) 	<ul style="list-style-type: none"> • Course instructor

<i>Room Set-Up</i>	<ul style="list-style-type: none"> • Portrait set-up with actor panel placed along front of room • 2 students per table, 3 tables in U-shape, 5-10 feet distance from actor panel • Video-recording equipment set-up in front of room, with audio in the middle • Examiners sitting behind students, out of view of students • Moderator sitting at actor panel table (to the side) 	<ul style="list-style-type: none"> • Landscape set-up with students sitting face-to-face across from actor panel • 3-4 feet distance from actor panel • Video-recording equipment set-up behind actor panel, with audio in the middle of the room • Examiners sitting behind/side of panel, in partial view of students • Moderator sitting at side of table, equidistant from students and panel
<i>Financial Cost</i>	Financial costs for both assessments were the same: <ul style="list-style-type: none"> • Rooms, actors, and examiners were obtained and recruited without cost. • Gift cards for students • Food and beverages 	
<i>Preparation</i>	Prior to the assessment, students received instructions to review assessment instructions background material (report – see description in section 3, above)	
<i>Student Accountability</i>	<ul style="list-style-type: none"> • Students participated voluntarily • Students received gift card for participation • Assessment was not linked to course grade (no extra credit was offered) • Students were one or two semesters out from the course 	
<i>Documentation</i>	All recordings, notes, transcripts were secured according to IRB guidelines.	

Overall, student performance in both assessment settings (Tab. 2) was low, with only four of the nine students achieving a passing score (>50%). Students in Test Assessment #1 averaged a score of 43% (N=4), with the highest score of 66% and the lowest score of 21%. Students in Test Assessment #2 performed slightly better, with an average score of 50% (N=5), with the highest score of 93% and the lowest score of 25%. Test Assessment #1 averaged only 2 exemplary responses per student, while Test Assessment #2 averaged 4 exemplary answers per student.

Table 2

Student Performances in the Two Test Assessments

Test Assessment #1 Results				
	Student 1	Student 2	Student 3	Student 4
Questions Asked (42 questions total)*	22	17	18	14
Exemplary Answers (>70% correct)	3	2	2	0
Sufficient Answers (50%-70% correct)	12	7	4	3
Insufficient Answers (<50% correct)	6	7	11	11
Incorrect Answers	1	1	1	0
Overall Percentage Score	68%	53%	33%	21%
Average Score	43%			

Test Assessment #2 Results					
	Student 5	Student 6	Student 7	Student 8	Student 9
Questions Asked (31 questions total)*	14	12	18	15	11
Exemplary Answers (>70% correct)	6	1	5	6	2
Sufficient Answers (50%-70% correct)	7	2	1	5	1
Insufficient Answers (<50% correct)	1	8	11	4	8
Incorrect Answers	0	1	1	0	0
Overall Percentage Score	93%	25%	33%	73%	27%
Average Score	50%				

**Please note: When a student's answer was insufficient, the next student was invited to answer the same question. This is why the sum of the individual questions asked is higher than the total number of questions asked.*

Finally, each question was coded with the corresponding competence and level of competence (Miller, 1990). Overall, students in Test Assessment #1 performed best on “knows” (declarative knowledge) questions. Students in Test Assessment #2 performed similarly well on “knows” questions, but stronger on “knows how” (declarative knowledge) and “shows how” (performance) questions.

5. Research Design

Data was collected through document review, video-recording, observational notetaking by a doctoral researcher; through notetaking during the assessments by the examiners; and through follow-up interviews of students and examiners by a doctoral researcher. Based on these data sets, we conducted a structured evaluation (validation) of the in-vivo simulation competence assessment tool against a set of validity and reliability criteria, mostly derived from the literature (Carmines & Zeller, 1979; Linn et al., 1991; Feinstein & Cannon, 2002; Cook et al., 2014; Lakhal & Sevigny, 2015) and supplemented to fill conceptual gaps. We evaluated the assessment tool in three dimensions.

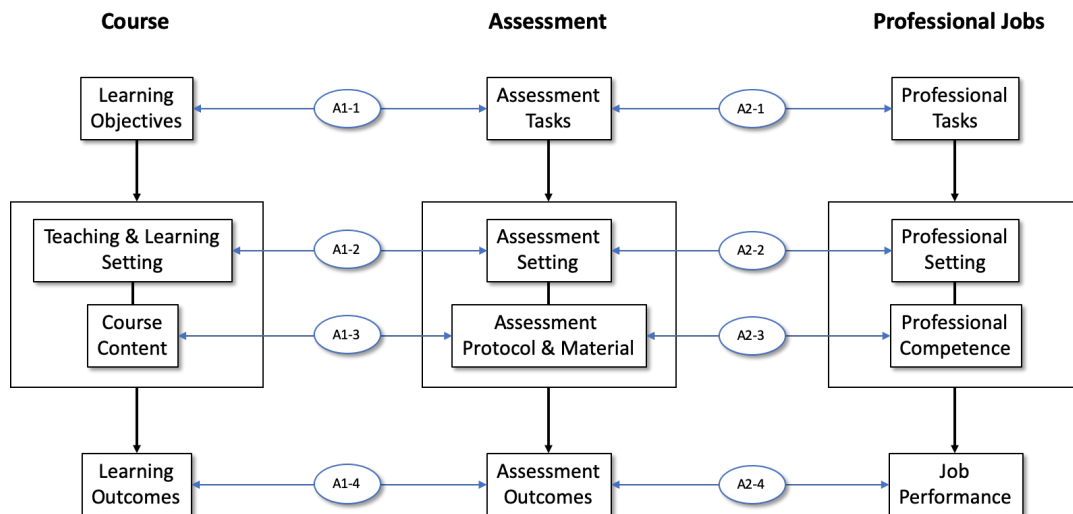
The first two dimensions pertain to the alignment with the course and to the alignment with the professional jobs (Fig. 1). First, an assessment tool ought to assess students’ performance against the course they completed (A1 alignments in Fig. 1). The assessment tool is guided by assessment tasks the students are asked to fulfill, adopts a particular setting, follows an assessment protocol and uses specific assessment material, and eventually yields students’ responses (performance) of a particular quality, i.e. assessment outcomes. All of these components need to be aligned with / correspond to the key components of the course the students completed. The course pursued learning objectives, conveyed course content through

a teaching & learning setting, and resulted in learning outcomes (which are being assessed through this tool).

Second, an assessment tool ought to assess students' performance with respect to the professional jobs the course is intended to prepare them for (A2 alignments in Fig. 1). The tool, therefore, needs to be aligned with / correspond to the components of professional jobs students are being prepared for, namely: professional tasks that graduates will be asked to fulfill, within professional settings in which they need to activate professional competence, to create deliverables which determine their job performance.

Figure 1

Conceptual Overview of Dimensions, Components and Alignments of the Assessment Tool



The third dimension of evaluating the assessment tool pertains to a series of formal criteria, including feasibility, students' accountability, coherence, completeness, etc.

All criteria applied in the evaluation are listed in table 3, below.

Table 3

Criteria for Evaluating (Validating) the In-Vivo Simulation Competence Assessment

Tool

Cluster	No.	Criterion	Definition of Fulfillment
A1-2 / A1-3	1	Familiar Setting	Assessment location and room set-up reflect the course's teaching & learning setting or content
A1-1	2	Familiar Tasks I	Assessment tasks correspond to course's learning objectives and content
A1-1	3	Familiar Tasks II	Assessment tasks reflect the course's teaching & learning setting (form)
A1-2 / A1-3	4	Familiar Process	Assessment structure / process reflect the course's teaching & learning setting or content
A1-2 / A1-3	5	Familiar Material	Assessment material reflect the course's teaching & learning setting (material) and content
A1-3	6	Familiar Content	Assessment calls for activation of content (competence) covered in the course
A1-4	7	Test-Retest Reliability	Assessment results are reproduced across different assessment versions/settings
A2-2	8	Realistic Actors	Assessment actors possess relevant professional experience/expertise
A2-2	9	Realistic Setting	Assessment location and room set-up reflect professional setting
A2-1	10	Realistic Tasks	Assessment tasks reflect professional tasks
A2-2	11	Realistic Process	Assessment structure / process reflect professional setting
A2-2	12	Realistic Material	Assessment material reflect professional setting
A2-3	13	Realistic Competence	Assessment calls for activation of professional competence

A2-4	14	Test-Reality Reliability	Assessment results are reproduced in professional settings
Form1	15	Feasibility	Assessment requires reasonable amount of funds, preparation, time, etc.
Form2	16	Accountability	Assessment is linked to students' grades
Form3	17	Coherence	Assessment material offers a logical sequence of tasks/questions, and assessment followed this sequence
Form4	18	Completeness	Assessment material includes all relevant prompts, and assessment administered most/all of the tasks/questions
Form5	19	Documentation	Assessment deliverables (verbal, material) are all secured
Form6	20	Inter-Rater Reliability	Assessment results are reproduced across different examiners
Form7	21	Confidence Enhancement	Assessment supports students' confidence
Form8	22	Meaningful Learning Activity	Assessment supports students' learning

A number of different approaches was used to analyze the collected data against these criteria. They are summarized in table 4, below.

Table 4*Analytical Procedures of the Tool Evaluation and Corresponding Evaluation Criteria*

Analytical Procedure	Evaluation Criteria
Analysis of assessment settings (location, actor panel, participants, etc.)	Familiar Setting (1) Realistic Actors (8), Realistic Setting (9) Feasibility (15), Accountability (16), Documentation (19)
Analysis of assessment protocol and material (anticipated prompts and students' response pathways maps; competencies framework)	Familiar Tasks I (2), Familiar Tasks II (3), Familiar Process (4), Familiar Material (5), Familiar Content (6) Realistic Tasks (10), Realistic Process (11), Realistic Material (12), Realistic Competence (13) Coherence (17), Completeness (18)
Analysis of use of protocol and material during the assessments	Coherence (17), Completeness (18)
Analysis of students' responses during the assessment (actual students' response pathway maps)	Familiar Tasks I (2), Familiar Tasks II (3), Familiar Process (4), Familiar Material (5), Familiar Content (6)
Comparative analysis of examiners' assessment notes	Inter-Rater Reliability (20)
Analysis of students' responses to follow-up questions after the assessment	Confidence Enhancement (21), Meaningful Learning Activity (22)
Analysis of examiners' responses to follow-up questions after the assessment	Inter-Rater Reliability (20), Confidence Enhancement (21), Meaningful Learning Activity (22)
Comparative analysis across the two test assessments	Test-Retest Reliability (7)

6. Evaluation Results – Validation of the Assessment Tool

Below, we summarize the findings from the evaluation (validation), using a pragmatic scale of “fully met” / “partially met” / “not met”, for each of the criteria

(Tab. 5). Overall, the in-vivo simulation competence assessment tool performs well against the criteria, fully meeting or partially meeting 17 of the 22 criteria.

6.1. Degree of Alignment between Assessment Tool and Course. Regarding alignment between the assessment tool and the course, the assessment tool fully meets three [Familiar Tasks I (Content), Familiar Material, Familiar Content], partially meets two [Familiar Setting, Test-Retest Reliability], and does not meet two [Familiar Tasks II (Form), Familiar Process] of the seven criteria.

For the assessment tasks, the protocol includes mostly prompts that correspond directly to specific course learning objectives and to course activities (tasks) with respect to the content, except for the last/fifth prompt group. During the course, students were not tasked with applying course content to the economic development of a city, a primary task in the assessments [Familiar Tasks I (Content): partially met]. The background material used during the assessment is also modeled after course material, including formatting and terminology [Familiar Material: fully met]. As mentioned above, the course familiarized students with sustainable business models and support structures, as well as real-world cases of those. The assessment protocol follows this structure of the course content – the main prompt groups are designed to first test students’ basic knowledge of sustainable business models and support structures. Students’ responses are then used to further prompt students’ appraisals of real-world cases (often the ones used in the course), city support structures, and economic development opportunities against evaluative criteria introduced and applied in the course. [Familiar Content: fully met]. Fulfillment of these three criteria was achieved by working closely with one of the course instructors on developing the prompts and also by cross-checking

them against the course syllabus and other course material (course script, PPTs). The assessment protocol does not include content that was not covered in the course. However, the expert panels in both test settings were asked to use the protocol as a guide rather than a strict script. Both panels were encouraged to improvise at times, drawing from their real-world experience and expertise. While this improvisation was necessary for making the setting realistic, at times, the experts' improvisations challenged students on content that was not covered in the course, e.g., specific details on a local business incubator, or questions on strategy/policy development for a local economy. As expected, students struggled to answer these questions. However, these instances were limited in number and scope and students were redirected to more relevant prompts by the assessment facilitator/clerk.

Both test assessments utilized the same assessment protocol, city council roles, and background material. Students achieved in both assessments similar average scores. However, variance in students' scores is quite large, with a higher maximum student score and a higher average number of exemplary responses in Test Assessment #2 [Test-Retest Reliability: partially met]. Test Assessment #2 took place in a similar conference room on the university campus as the course. Test Assessment #1 took place off campus at city hall, in a location unfamiliar to students. The rooms in both test assessments were set-up similarly, with students sitting in a close proximity to each other and facing the city council panel, a room set-up similar to that of the course [Familiar Setting: partially met in Test Assessment #1, fully met in Test Assessment #2].

The course followed a fairly traditional classroom-based teaching and learning setting. While the course employed a peer-to-peer learning pedagogy, the

overall process of the assessment , i.e., students role-playing a consultant firm and under scrutiny of a panel of experts, was a novel experience for them, one that was not mirrored in the course [Familiar Process: not met]. Similar to most graduate courses, the main formats of course interactions were inputs and discussions, while the assessments mostly used direct questioning (quiz-like) interactions [Familiar Tasks II (Form): not met].

6.2. Degree of Alignment between Assessment Tool and Professional Jobs.

Regarding alignment between the assessment tool and professional jobs, the assessment tool fully meets four [Realistic Tasks; Realistic Process; Realistic Material; Realistic Competence] and partially meets two [Realistic Actors; Realistic Setting] of the seven criteria, with one criterion not evaluated [Test-Retest Reliability].

The two test assessments differed in both physical setting and actor panel composition. Test Assessment #1 was composed of professionals, including a vice mayor/city council member and the city sustainability manager, and took place at city hall [Realistic Actors and Realistic Setting: fully met]. Test Assessment #2 was composed of graduates from the School of Sustainability (SOS) with background in business and sustainability, but not in professional (public) positions, and was held in a conference room on the university campus [Realistic Actors and Realistic Setting: not met]. Across both assessments, these criteria are partially met.

The assessment tool simulates a realistic public city council session, with expert panel roles similar to actual city council members and a procedure used in actual city council sessions [Realistic Process: fully met]. While the simulated session is closed (not in front of a public audience), the students are asked to inhabit

the role of consultants and the assessment protocol poses questions to the students as if they would be in a real-world consultation with a city council [Realistic Tasks: fully met]. The background material was developed from the economic development vision/plan for another region. The report was tailored to the city in the scenario and was informed by real-world information/examples as well as expert interviews with individuals involved in local economic development in Tempe [Realistic Material: fully met].

The course was intended to convey introductory-level competencies, primarily relevant for the discovery phase of sustainability entrepreneurship (Foucrier & Wiek, 2019). The tool assesses competencies (knowledge, skills, attitudes) related to three out of the five major tasks in the discovery phase. The tool also assesses some competencies relevant for the planning phase of sustainability entrepreneurship, namely, identifying appropriate business structures and resources (financial, legal, etc.). No competencies in the other phases (start-up, build-out, consolidation) are covered by the tool. The assessment protocol assesses three of the four competence levels (Miller, 1990), with a majority of prompts testing “Knows” (declarative knowledge) and “Knows How” (procedural knowledge). Three of the five prompt groups are structured to test the performance level at the end of each prompt group, with students asked to identify areas of strategic opportunity. The closing prompt asks students to collaboratively select priorities for local economic development in Tempe and present/defend those priorities before the mock city council. This prompt also tests for interpersonal competence (team collaboration). All in all, the tool assesses a good suite of competencies (and their facets) relevant for professional sustainability jobs [Realistic Competence: fully met].

The assessment tool was not evaluated against criterion 14 (test-reality reliability) because data collection for this criterion would have required efforts beyond the capacity of these test assessments.

6.3. Degree of Fulfillment of Formal Criteria. Finally, the assessment tool fully meets four [Documentation, Inter-rater Reliability, Confidence Enhancement, Meaningful Learning Activity], partially meets two [Coherence, Completeness], and does not meet two [Feasibility, Accountability] of the eight formal criteria.

All elicited assessment information was secured according to IRB requirements. There were no issues with video capture and sound recording during both simulation events [Documentation: fully met]. Test Assessment #1 had two examiners, while Test Assessment #2 had only one examiner. Although an assessment schematic/rubric template was developed prior to the simulation, examiners reported difficulties following the template during Test Assessment #1. Examiners ended up taking extensive notes during the simulation and the scoring for each student was done post-simulation using a triangulation of examiner notes, partially completed examiner rubrics, and transcripts. Although there were challenges with using the assessment schematic/rubric template, there were no relevant disagreements between both examiners' notes in Test Assessment #1 [Inter-Rater Reliability: fully met].

While students reported a lack of confidence at the beginning of the assessment, they stated higher confidence in their competencies developed in the course as well as in their ability to communicate with professionals after the assessment [Confidence Enhancement: fully met]. Students in both settings as well as experts in Test Assessment #1 reported the assessment as meaningful learning

experience, with many of them stating a desire to see more of such assessments throughout the programs [Meaningful Learning Activity: fully met].

Coherence and completeness criteria are partly met. The assessment protocol follows a logical sequence of tasks/questions [Coherence Facet 1: fully met].

Comparison between anticipated and actual prompt pathways (see Appendix) revealed that they mostly align. However, there were a few instances where the actual sequence of prompts was less coherent [Coherence Facet 2: partially met].

The actor panel in Test Assessment #1 asked all questions as per protocol [Completeness Facet 1: fully met in Test Assessment #1]. The actor panel in Test Assessment #2, however, did not get through all questions in each prompt group [Completeness Facet 1: not met in Test Assessment #2]. Student assessment scores and response maps, however, revealed that the quality of student responses suffered from moving through all questions quite quickly in Test Assessment #1. The actor panel did not sufficiently prompt for clarifications. Thus, many of the anticipated student responses were not given by the students. Interestingly, the actor panel in Test Assessment #2 was more successful at improvising prompts when answers needed clarifications or students needed redirecting. The main reason seems to be that this actor panel was more familiar with the course content and therefore able to improvise relevant prompt questions. In return, this means the assessment protocol was not complete, missing important prompt questions that should have been included to guide the panelists in Test Assessment #1 [Completeness Facet 2: not met]. Across both assessments, the completeness criterion is only partly met.

The two test assessments required participation from students that had taken the course in the past. Yet, neither of the two assessments were linked to a

course grade or a course completion. Instead, students were offered small incentives for participation (gift card, catered buffet dinner). Accountability, however, was fairly low which is indicated by a short-term cancellation and a no-show [Accountability: not met]. If established as the final exam of the course, accountability could be increased and these financial costs would not be incurred. Actor recruitment heavily relied on existing social capital and networks of the main course instructor (A.W.) and actors were offered the same incentives as students. If established as the final exam of the course, actor recruitment and hiring will most likely incur larger financial costs for examination, uncommon for sustainability programs [Feasibility: not met].

Table 2*Evaluation (Validation) Results for the In-Vivo Simulation Assessment Tool*

Cluster	No.	Criterion	Evaluation Results	Specifics
A1-2 / A1-3	1	Familiar Setting	Partially met	Room setup similar to course; location #2 familiar, location #1 unfamiliar
A1-1	2	Familiar Tasks I (Content)	Partially met	Prompts use mostly course content, except in last prompt group
A1-1	3	Familiar Tasks II (Form)	<i>Not met</i>	Prompts do not correspond to discussion-based course format
A1-2 / A1-3	4	Familiar Process	<i>Not met</i>	Unfamiliar review panel setting
A1-2 / A1-3	5	Familiar Material	Fully met	Background material similar to course material
A1-3	6	Familiar Content	Fully met	Assessment protocol focuses on content covered in the course
A1-4	7	Test-Retest Reliability	Partially met	Some variance in students' performance between Assessments #1 & #2
A2-2	8	Realistic Actors	Partially met	Assessment #1 at city hall (realistic), #2 on campus
A2-2	9	Realistic Setting	Partially met	Assessment #1 with professionals (realistic), #2 with graduates from SOS
A2-1	10	Realistic Tasks	Fully met	Prompts vetted by professionals

A2-2	11	Realistic Process	Fully met	Assessment protocol follows actual city council session procedure (vetted)
A2-2	12	Realistic Material	Fully met	Background material modeled after real economic development vision
A2-3	13	Realistic Competence	Fully met	Tests for a number of competencies relevant to sustainability jobs
A2-4	14	Test-Reality Reliability	<i>Not tested</i>	Beyond capacity of test assessments
Form1	15	Feasibility	<i>Not met</i>	Uncommon financial resources needed for hiring actors
Form2	16	Accountability	<i>Not met</i>	Assessment tool currently not linked to final grade or course completion
Form3	17	Coherence	Partially met	Only partial alignment between anticipated and actual response pathways
Form4	18	Completeness	Partially met	Prompts missing in protocol; not all questions asked in Assessment #2
Form5	19	Documentation	Fully met	All assessment information captured
Form6	20	Inter-Rater Reliability	Fully met	High across 2 examiners (Assessment #1)
Form7	21	Confidence Enhancement	Fully met	Confirmed by students afterwards
Form8	22	Meaningful Learning Activity	Fully met	Confirmed by students afterwards

7. Discussion

Management and business programs around the world have begun to offer educational opportunities in sustainable and responsible management to their students. However, numerous questions remain open regarding the demonstration and assessment of responsible management competencies in general and sustainable entrepreneurship in particular. A recent review of the competence assessment practice in sustainability education revealed a variety of weaknesses current assessment tools display (Redman et al., 2020). The in-vivo simulation competence assessment tool presented in this study performed well against a broad set of validation criteria. Most importantly, the tool avoids the major shortcoming of conventional assessment tools, namely, the lack of opportunity for students to demonstrate competencies in (semi-) professional situations. Given the small sample size and the early stage of development, there are a number of critical issues that need further consideration and also point to improvement potential of the tool in its current form.

Students' assessment results reveal interesting insights into the assessment. Student performance across both assessments was fairly poor, with only 4 out of 9 graduate students achieving a passing score. The literature (Garfield, 1994; Cioffi, 2001; Frey & Seitz, 2009; Leutner et al., 2017) and the evaluation findings point to a number of factors that offer explanations. First, one could be the relatively long time between course completion and assessment (6-12 months). Second, the assessment exposed students to tasks, procedures, and other professional aspects, they were not familiar with – which might have negatively influenced their performance. Some students confirmed that they felt a bit intimidated by the setting at the beginning of

the assessment. Third, due to the relatively low accountability for the students (voluntary participation with small incentives), their preparation for the assessment might have been rather superficial. This was confirmed in informal conversations by some students after the assessments. Fourth, while overall student performance was similar, the frequency of exemplary answers was much higher in Test Assessment #2. Based on the pathways analysis, deliberate probing by the panelists was more frequent in Test Assessment #2, allowing students to give more insightful responses. As the actor panel in Test Assessment #2 had intimate knowledge of the course content, one could argue that student performance might also be impacted by panelists' characteristics and preparation.

In short, there are a number of explanations for the poor student performance – some of them suggesting adaptations and trade-offs. The first explanation (long period after course completion), seems to be an argument for the current delivery of the tool. The competencies (supposedly) conveyed in the course ought to be available and demonstrable much longer than just for 6 months after course completion. If anything, this study suggests delaying assessments in order to reveal the long-term learning outcomes of core courses (or program-level exit exams). Applied this way, the tool would be able to stimulate and facilitate substantial review and potential revisions of course formats and pedagogies (cf. Prado et al., 2020). The second explanation (lack of familiarity) also does not suggest a modification of the tool – instead it suggests to incorporate (more) simulated professional situations into the course in order to familiarize students with them. Thereby, instructors can adopt simulation approaches for responsible and sustainable management education documented in the literature (LeClair & Ferrell,

2000; Salas et al., 2009; Grossman et al., 2013; Wright et al., 2016; Prado et al., 2020). There might be a trade-off required between familiarization vs. accounting for inevitable professional uncertainty and the need for being flexible. The third explanation (lack of accountability) points to the use of the assessment tool beyond a voluntary learning experience. If tied to the course grade, the tool could become an official grading instrument and students might therefore devote more time to the exam preparation; and, in return, perform better. However, there seems to be a trade-off required between the usefulness of delaying such assessments (see above) vs. the administrative need for grading at the completion of the course. Finally, the fourth explanation might seem to suggest that actors more familiar with the course content administer the tool in a more enabling and supportive way. Then again, the tool scores highly on the “realistic” criteria (in particular for Test Assessment #1) – the students are getting exposed to a realistically simulated professional situation. Another trade-off seems to be required here, namely, between aligning the tool with the course content vs. aligning it with realistic professional job situations.

The in-vivo simulation competence assessment tool was tested in two different settings to get a sense for respective strengths and weaknesses (Leutner et al., 2017). The evaluation findings suggest that both test assessments offer complementary benefits. While Test Assessment #1 scores higher on criteria of being “realistic” (professionals, location), this comes at a cost, namely, lower feasibility (financial costs) and professionals being less familiar with course content (with implications explained above). On the other hand, while students in Test Assessment #2 performed better, students in Test Assessment #1 reported greater satisfaction with the assessment due to the realistic and opposing roles inhabited by

the actor panel and the opportunity to undergo such an assessment in a real-world environment (at city hall). Training on improvisation and acting techniques could help professionals understand their actor roles more deeply and increase their capacity to probe and challenge students effectively.

At most universities, course instructors are not incentivized to innovate their pedagogies in sustainable and responsible management education, let alone the competencies assessment tools and procedures they are using (Aragon-Correa et al., 2017; Prado et al., 2020). The assessment tool presented in this study might not make a great case for easy adoption. Instructors need to recruit actors, prepare materials for them, create practical grading templates, serve as examiners in complex examination settings, and so forth. However, this tool is one of the few tools that have been developed and tested – with strong indication to comply with the majority of criteria relevant to quality competence assessment. In addition, it is documented, material is available for adoption, and the team of authors is willing to support adoption efforts at other universities.

Finally, the evaluation scheme presented here would benefit from further development. First, while the selected validation criteria are based on literature, there is some room for refined definitions and further operationalization. Second, additional criteria could be considered, such as accounting for language barriers or for training/experience of students outside of course. Third, formal inter-rater reliability testing would enhance validity of future evaluations of this and similar competence assessment tools.

8. Conclusions

This study presents and tests an in-vivo simulation competence assessment tool for responsible management education in general and sustainable entrepreneurship education in particular. Thereby, the study introduces and applies an evaluation (validation) scheme adapted from medical and social work education research where simulation competence assessments are more common. While the tool performed well against the 22 criteria (fully or partially meeting 17 of them), it was only tested with a small number of students (and no re-test). Broader application of the tool, across a number of different courses, is needed to refine and further validate the assessment tool. The evaluation scheme is in need of additional applications and refinements, too. Our study joins a larger call for empirically validated practices of competence assessment in management and sustainability programs. At the same time, it pushes for an assessment practice that tests students in settings much closer to the ones they will encounter after graduation – and thereby providing students with additional formative, if not transformative, learning experiences.

CHAPTER 5

CONCLUSIONS

1. Summary of Research

The focus of this research was to produce insights for higher education institutions (program administrators, instructors, and students) on how to effectively train future sustainability entrepreneurs. The first step in understanding how to best prepare these entrepreneurs is to outline what specific competencies sustainability entrepreneurs need to acquire to be successful over time. From here, course design, delivery and student assessment must be carefully aligned with these competencies, as well as mirror real-world professional settings for students. This dissertation details sustainability entrepreneurship competencies; highlights specific course elements (pedagogy, course content, etc.) for effective teaching and learning these competencies; tests a novel tool for assessing whether these types of courses are successfully equipping students with these competencies.

Study #1 (Chapter 2) proposes such a framework of sustainability entrepreneurship competencies, addressing the question: What key competencies do future entrepreneurs need to successfully start and run sustainable enterprises that contribute to sustainability transformation in society? A qualitative literature review was first conducted on competencies for entrepreneurs, sustainability professionals, social entrepreneurs, and sustainability entrepreneurs. Then, identified competencies were clustered according to conceptual similarities. On this basis, sustainability entrepreneurship competencies are then described along the entrepreneurial process model. The result is a process-oriented and literature-based framework of sustainability entrepreneurship competencies. It is intended to be

used as a general vision for students, faculty, and entrepreneurs, as well as for the design of curricula, courses, and assessments.

Study #2 (Chapter 3) presents an exploratory study on courses that offer training in competencies for sustainability entrepreneurship, with a focus on the specific teaching and learning processes. This study addresses the question: What are strengths and weaknesses of innovative teaching and learning formats for conveying sustainability entrepreneurship competencies? Each of the courses is analyzed against a set of attributes and links among learning objectives, applied pedagogies, and learning outcomes. Data was collected through analysis of course material and semi-structured interviews with all course instructors. Findings suggest the inclusion of local/regional case studies, guest lecturers, and field trips are powerful learning experiences for students. In addition, findings also suggest that a project-based pedagogical approach for sustainability entrepreneurship may be most effective for student learning when paired with real-world deliverables, professional skills training, and guidance in what sustainable business tools to use. More exploratory lab settings are most effective when students are provided a pre-structured idea or concept to engage with, rather than left to their own ideation from the beginning. This study offers insights into the current landscape of innovative sustainability entrepreneurship education and provides guidance for course instructors and program administrators on promising teaching and learning formats.

Study #3 (Chapter 4) presents a novel tool for assessing students' competence in sustainability entrepreneurship, namely, through in-vivo simulated professional situations. This study addresses the question: What is a reliable tool for assessing

students' competence in sustainability entrepreneurship that goes beyond self-assessment or conventional examination tools? The tool was tested in different settings and evaluated against a set of 22 validation criteria derived from the literature. The test results indicate that the tool is valid against the majority of criteria (17 of 22), including being well aligned with course content, being realistic regarding professional tasks, and offering students a meaningful educational experience, among others. The assessment also revealed some weaknesses regarding task and process familiarity, feasibility (cost), and student accountability. To inform educators in business and management programs, this chapter discusses and concludes under which conditions this assessment tool seems most effective and what improvements should be considered for future applications. This study provides an innovative assessment practice that can provide students with additional transformative, learning experiences, through the alignment of test settings that are close to those that they will encounter in their professional careers. The tool and validation protocol are intended to be a guiding framework for instructors and program administrators in sustainability (and in particular, sustainability entrepreneurship) to apply such assessment settings in their own courses and programs.

2. Research Limitations and Future Research Needed

The research presented here has several limitations. The presented sustainability entrepreneurship competency framework in Study #1 is generic and therefore does not capture all context-specific 'materializations' of the compiled competencies, e.g. country-specific legal business designations or human resource laws. Future research on these context-specific differences and their impact on

sustainability entrepreneurship competencies would benefit the continued refinement of this framework. The framework also reflects the current state of entrepreneurship theory and practice. This is a dynamic field, with entrepreneurial innovations that will continue to emerge over the coming years. This framework is designed to be iterative, and emerging innovations will require extensions and modifications of the framework. Finally, the framework did not undergo external validation by real-world entrepreneurs and would benefit from such review in its future refinement.

Further work is needed to explore the teaching and learning pathways in the courses presented in Study #2 in greater detail. Student interviews, classroom observations, and focus groups with students and instructors would help identify the linkages between specific course activities and content, and resulting learning outcomes. In addition, the assessment of actual competency acquisition in all of these courses was beyond the scope of this study. The application of a variety of competency assessment tools, including in-vivo professional simulation assessments (such as the one presented in Study #3), would be needed to assess whether students are actually acquiring the sustainability entrepreneurship competencies that each course claims to develop.

The assessment tool developed and piloted in this research (Study #3) was only tested in in two settings, and in relation to only one of the courses explored in Study #2. Broader application of the tool, across a number of different courses, is needed to refine and further validate the assessment tool. Future applications need to consider more effective grading rubrics, as evaluators struggled to assess students in both settings using the pre-structured rubric. In addition, the assessment was not

piloted with feedback to students on their performance. Future iterations need to carefully consider how results will be disseminated to students, and how the process can encourage “feed-forward” in student-directed learning. These “feed-forward” processes include a future-orientation for assessment, where students are provided with comments that can be used for new tasks in future formative assessments (Barth, 2014). Future applications should also consider how students might be a part of the evaluation process themselves, providing the opportunity to self-assess or peer-assess performance, and therefore using the tool for “assessment as learning” (Lorna, 2003). The evaluation scheme is also in need of additional applications and refinements- particularly in validation criteria that account for a greater number of learner-specific criteria (such as language barriers, additional training outside the course, etc.) and better measures for inter-rater reliability. Future applications and iterations of the tool would support addressing these current limitations. Future research should also focus on a pre- and post-application of the assessment tool, providing a comparative baseline in determining whether students are acquiring the necessary SE competencies during the course. In addition, follow-up studies could look at scaling such an assessment down into smaller simulation activities (as opposed to a summative assessment) and employing these activities as formative assessment over the course of the semester. Employing these formative assessments after specific course modules or activities, and paired with “feed-forward”, would provide an opportunity to more closely explore how these student learning pathways evolve , and help identify when and how students are acquiring specific competencies. This would also require additional qualitative methodological approaches such as student focus groups where students are asked to reflect upon

their learning journey and identify key learning moments, while grounded in their actual assessment performance.

3. Overall Findings

This dissertation provides several key insights. First, the extraction and consolidation of competencies in the existing literature, as well as the mapping of these competencies onto an entrepreneurial process in Study #1 was fairly simple. However, the analysis revealed major gaps in the existing competency literature for transformational SE (only 2 of the sources analyzed mentions worker cooperatives, benefit corporations, etc.). Thus, the framework fills in these gaps by re-directing conventional business competencies for new, transformational sustainability practices. Additionally, instead of offering another “laundry-list” of competencies, the framework offers insights into how competencies are built over time by utilizing a process orientation. This framework is better suited to provide a design orientation for educational pathways that can scaffold teaching and learning experiences around longer-term competency development.

One key insight from Study #2 is that the inclusion of experiential and project-based course elements can provide transformational learning experiences for SE students. However, significant learning experiences do not automatically happen and require specific pedagogical design decisions, including providing pre-ideated projects for students and extra planning efforts from instructors. Additionally, Study #2 reveals that while the integration of SE courses in core curricula and coordination among courses is important, specific goal orientation for course design and institutional support around transformational business approaches and tools

(rather than relying on traditional, business-as-usual approaches and tools) is essential.

Finally, the assessment developed, tested, and validated in Study #3 reveals good performance against a majority of the validation criteria. However, the tool does not meet five of the criteria in its current form and requires, in particular, increased student accountability (e.g. including the assessment in course grading) and better institutional support (e.g. resources for actor recruitment and hiring) for future applications. Additionally, the differences in student performance between both assessment settings reveal a potential trade-off between hiring actors that are more familiar with course content and hiring more realistic actors that can provide a more meaningful learning experience for students. Future iterations will need to consider training on improvisation and acting techniques as well as guided familiarization of course content to increase their capacity to probe students effectively.

In synthesizing the research presented in all three studies, a proposed program design for sustainability entrepreneurship in higher education is presented below (Table 1). This program is outlined over four semesters, with identified exemplary learning objectives, teaching and learning settings, pedagogies, course content, learning activities, assessment approaches, and additional potential resources needed. Finally, special considerations for program administrators, instructors and students are identified.

Table 1.

Proposed Sustainability Entrepreneurship Program

	Semester 1	Semester 2
Exemplary learning objectives: At the end of this semester/year, students should be able to...	<ul style="list-style-type: none"> - Recognize social, environmental, and sustainability needs that can be addressed through an entrepreneurial approach - Critically observe and evaluate business opportunities and market trends using a sustainability lens - Anticipate sustainability challenges that might affect economy and society - Utilize networks and social relations to recognize needs, anticipate trends, and learn about opportunities 	<ul style="list-style-type: none"> - Develop business concepts/plans guided by a triple-bottom approach - Identify appropriate sustainable business structure and procedures - Identify financial resources and potential impact investors - Identify sustainable local and regional resources
Exemplary teaching and learning settings	Classroom-based settings	Classroom-based settings Structured and guided laboratory settings
Exemplary teaching pedagogies	Flipped classroom Place-based Experiential learning	Experiential learning Project-based learning Place-based
Exemplary course content	Alternative business models (social enterprises, cooperatives, benefit corporations), support structures (impact investing, incubation)	Project-specific content Sustainable business frameworks, tools, and procedures Professional skills training
Exemplary learning activities	Exploration of real-world, local or regional case studies Field trips to real-world enterprises	Field trips Research activities Creative, field/topic-specific activities (e.g. making food

	Guest lecturers	from locally-sourced and sustainable ingredients)
	Simulation activities (e.g. role-play or game-based activities)	Sustainable business concept development
		Simulated student-directed training activities
Exemplary assessment approaches	Scaffolded, in-vivo professional simulation assessments (delivered multiple times throughout each course), with an individual professional simulation assessment delivered at the end of the program (as a culminating experience)	
Additional potential resources needed	Logistical + financial support for field trips	Professional skill training support (e.g. facilitation training)
	Networks of local enterprises and entrepreneurs	Identified business concepts (not developed)

	Semester 3	Semester 4
Exemplary learning objectives: At the end of this semester/year, students should be able to...	<ul style="list-style-type: none"> - Identify and initiate sustainability innovations in sourcing, production, distribution, services, and management - Initiate collective processes of observation, listening, reflection, self-care, and democratic decision-making - Market and communicate about sustainable products and enterprise, while building community support and social capital 	<ul style="list-style-type: none"> - Activates/applies knowledge base developed in previous semesters/years - Evaluates and reports on sustainability performance through an enterprise's operations and value chain - Manage budget and financial performance from a triple bottom line perspective - Inspire and motivate peers - Serve as a strong partner/supporter in the local/regional economy through political lobbying, advocacy, and membership in local/regional business associations and groups
Exemplary teaching and learning settings	Classroom-based settings Semi-structured laboratory settings and studios	Team-based studio and laboratory settings Advocacy/lobbying settings

Exemplary teaching pedagogies	Project-based learning	Project-based learning
Exemplary course content	Sustainable business frameworks, tools and procedures Project-specific content	Project-specific content Sustainable business tools and application (accounting tools, sustainable marketing applications, sustainable reporting tools, etc.) Up-to-date content related to local/regional policy/advocacy activities
Exemplary learning activities	Micro-internships or projects with real-world start-up entrepreneurs (for example, see PREPPED program in Study #3) Sustainable business concept refinement (scaffolded from previous module) Real-world Stakeholder engagement + training activities that incorporate collective processes of observation, listening, reflection, and democratic decision-making	Collaborative projects with real-world organizations/enterprises (helping an organization become a benefit corporation, helping a business transition into a worker-owned cooperative that aligns with sustainability principles, working with city officials on policies and strategies for local, sustainable economies) Targeted sustainable business tool training (e.g. how to actually do triple-bottom line accounting) Interaction with advocacy efforts (attending meetings of local business associations, attending relevant city council sessions, etc.)
Exemplary assessment approaches	Scaffolded, in-vivo professional simulation assessments (delivered multiple times throughout each course), with an individual professional simulation assessment delivered at the end of the program (as a culminating experience)	

Additional potential resources needed	Access to real-world partners/entrepreneurs	Access to real-world partners/entrepreneurs
	Actors + necessary training for simulation assessments	Actors + necessary training for simulation assessments
	Logistic and financial support for real-world stakeholder engagement events	Connections to local advocacy/lobbying champions

During semester 1, students are engaged with tasks and associated competencies in the Discovery phase of the sustainability entrepreneurship competencies framework. During this module, students begin to learn about the emerging sustainability entrepreneurship space by challenging personal assumptions and traditional ways of economic thinking and systems. Exemplary learning settings include classroom-based settings that use a flipped classroom approach. Instructors may deliver foundational content or framing during these courses, but students are held accountable for their learning process through peer-to-peer learning, and through exploration of real-world local or regional case studies. In these classroom settings, students learn about alternative business models and support structures and critically explore case studies of transformative enterprises (through information and consultation processes). Students also go on visits to exemplary businesses in their community, and hear/learn from real-world entrepreneurs. Students also are introduced to the structure of a professional simulation assessment by engaging in smaller-scale simulation activities throughout the semester/year, and using student role-play to support a variety of roles during these activities.

During semester 2, students are engaged with tasks and associated competencies in the Planning phase. During this module, students begin to build business concepts under classroom-based and/or structured laboratory settings (for example, given a loose concept idea or structure). Students use peer-to-peer learning, student-centered/student-directed learning, and place-based learning pedagogies. In laboratory setting, students build business concepts/plans for transformative enterprise (as a conceptual exercise) and meet local entrepreneurs and explore local support structures (private and public) for enterprise development, but under a pre-structured framing (for example, an initial, loose concept idea). In addition to research activities, students also engage with creative, topic-specific activities such as making food items from locally-sourced and sustainable ingredients. Students also undergo professional skills training (for example, facilitation training) and are provided opportunities to practice those skills in small-scale simulated stakeholder engagement activities, which are connected to assessment schematics and are used, in part, for grading.

During semester 3, students are engaged with tasks and associated competencies primarily in the Start-Up phase. During this module, students may focus on the continued development of the business concepts/plans they began creating in the previous module, but this development is now paired with real-world stakeholder engagement and/or training activities. These engagement processes also incorporate collective processes of observation, listening, reflection, and democratic decision-making as a way to mimic real-world settings, such as those found in worker-owned cooperatives. In laboratory and studio settings, students are introduced to a range of sustainable business frameworks, tools, and procedures and

may begin to activate this knowledge as well as their professional skills in application to real-world businesses, but in smaller, limited exercises. This occurs through micro-internships or micro-projects with real-world start-up entrepreneurs (for example, the participants of the PREPPED program). Instructors in these laboratory and studio settings still provide some structure and guidance, but with less hands-on direction than the previous module. In addition, assessment of students occurs mainly through full-scale, in-vivo simulation assessments, where actors are trained and hired to engage with students in pre-developed assessment activities.

During semester 4, students are still engaged with tasks and associated competencies in the Start-Up phase, but also move to activate tasks and competencies in the Build-out phase. During this module, students now move to full semester or year-long projects with a single real-world organization or business. They also undergo targeted, and intensive sustainable business tool and framework training (e.g. how to actually do triple-bottom line accounting). Students fully activate this knowledge immediately through application in their collaborative projects, for example, an evaluation of the sustainability performance of a business, or developing new triple-bottom line budgetary framework for a specific business. In addition, during this module, students are engaged with local and regional sustainability entrepreneurship advocacy efforts (attending meetings of local business associations, attending relevant city council sessions, etc.). Finally, student assessment continues to be done through simulation assessment, with a full, individual assessment conducted at the end of the module as a culminating experience.

3.1. Considerations for program administrators. As the presented sustainability entrepreneurship competency shows, sustainability entrepreneurship competencies build upon each other over time, with knowledge being developed and then activated through the application of best practices. Learning pathways for sustainability entrepreneurship education must mirror these activation processes, with scaffolded and interlinked courses. Poor student performance on the assessment in Study #3 reveals that students are struggling to retain this knowledge over the long term, particularly when they have only participated in a single SE course. Coordination and scaffolding among courses in higher education programs are essential for long-term knowledge and skill development and retention because students can continuously apply and build upon these competencies in increasingly collaborative and interactive project-based experiences over course of several semesters (Brundiers et al., 2010). These courses must also be brought into core curriculums. Students have limited opportunities to take elective courses due to credit requirements, and semester-long courses alone cannot prepare students effectively in a suite of sustainability entrepreneurship competencies. Much like the opportunity that in-vivo simulated professional assessments hold for impactful, transformative learning, programs and learning pathways for sustainability entrepreneurship must also link closely to the application of sustainability entrepreneurship in the real world. Thus, designing these programs and pathways to closely align with the process-oriented sustainability entrepreneurship competency framework presented here allows for learning that closely mirrors and prepares students for the real-world.

In addition to supporting course scaffolding, program administrators must also consider how long-term projects and partners can be managed, and what support structures are needed for these types of courses. Insights from Study #2 demonstrate that while engagement with real-world projects is key to engaged and motivated students, these types of project take time and a large amount of resources. Interviews with instructors in Study #2 reveal that instructors often struggle with balancing successful delivery and advancement of real-world projects and managing long-term partnerships with real-world partners with providing sufficient student support and facilitation during a course. Expecting instructors to deliver quality project advancement at the same time as insuring effective learning and competency acquisition for students in a semester-long timeline is unrealistic. For example, despite the successful delivery of the worker cooperative in the TSE Lab, assessment of the course reveals that overall student performance during the course was quite poor. Students struggled with steep learning curves and did not have the skills to teach the content delivered in the workshop. Because of this, instructors had to supplement workshop preparation with many hours of their own work on workshop deliverables and coordination to insure a high quality real-world event. These learning curves for students can be mitigated with coordination between the introductory TSE course and a professional skills course, but not without incentives for students to take all of these courses in succession. In addition, program administrators must provide incentives for instructors to teach these courses without the fear of exhaustive input an support by offering teaching assistance and partner management support and better aligning courses (etc. prerequisite requirements). These strategies can support instructors in focusing on coaching and

guiding students through a phase of an SE project, rather than delivering fully completed projects in their courses.

The application of simulation assessment approaches can be very resource intensive. Faculty must be incentivized to use such innovative approaches in their pedagogical approaches. Logistical and financial support must be provided to faculty teaching these courses including: actors, necessary actor training, planning support, and financial resources. This type of assessment tool is a novel contribution to sustainability and entrepreneurship education, but one that has been recognized by scholars as a necessary contribution to these fields (LeClair & Ferrell, 2000; Salas et al., 2009; Grossman et al., 2013; Wright et al., 2016; Prado et al., 2020). However, because it is relatively new, instructors must also to be carefully trained on how to employ these types of assessment approaches, in addition to logistical and financial support.

Finally, these course must also be brought into core curriculums. Students have limited opportunities to take elective courses due to credit requirements, and semester-long courses alone cannot prepare students effectively in a suite of sustainability entrepreneurship competencies. Much like the opportunity that in-vivo simulated professional assessments hold for impactful, transformative learning, programs and learning pathways for sustainability entrepreneurship must also link closely to the application of sustainability entrepreneurship in the real world. Thus, designing these programs and pathways to closely align with the process-oriented sustainability entrepreneurship competency framework presented here allows for learning that closely mirrors and prepares students for the real-world.

3.2. Considerations for course instructors. The first consideration for sustainability entrepreneurship instructors is that classroom-based learning pedagogies have an important place in sustainability entrepreneurship education. Students need to develop a strong foundational knowledge in social, environmental, and sustainability problems, knowledge about sustainability-oriented economy and entrepreneurship models, and more before they can activate that knowledge through project-based applications. The use of flipped classroom approaches, real-world case studies, field trips, and engagement with real-world entrepreneurs can make for impactful learning, even in traditional settings. Instructors must also provide sufficient structure and guidance during these settings, meeting regularly with students and teams, and directing them to and through important resources and content without relying solely on delivery through instructor-led lecturing.

Another consideration is that open-learning environments with limited structure, where students can “develop their own ideas” do not appear to lead to the most effective teaching and learning settings for sustainability entrepreneurship competency development. Many students struggle to come up with ideas of their own to develop in the sustainability entrepreneurship process. However, students can still be trained as sustainability entrepreneurs, but need structured project concepts to begin with. In addition, project concepts should be built upon over time, so that students can develop sustainability entrepreneurship competencies in meaningful ways each semester, but real-world projects can still continue to advance.

The application and testing of an in-vivo professional simulation assessment in this work suggests that these types of assessments are more engaging and formative for students because they are closely aligned with real-world situations.

One of the real-world professionals who sat on the actor panel in Test Assessment #1 also completed an undergraduate sustainability degree at ASU. This professional identified that if they had participated in several of these types of formative assessments during their educational journey, they would have been far more prepared for their real-world job at the time of graduation, and perhaps would not have struggled with as much “on-the-job” learning. A majority of the students who participated in the assessment in Study #3 identified the experience as one of the most impactful of their educational careers. Students recognized this assessment as one of the only assessments they had undergone that allowed them to test their ability to apply their skills and knowledge in a real-world situation, and reflect upon how well they are actually prepared to complete SE tasks. After the assessment, students identified that given the challenge of the assessment and their poor performance, their perception of their own level of competency acquisition had changed. This insight illustrates the shortcomings of competency assessment approaches such as self-assessments, where students may inaccurately rate and are unable to objectively assess their actual level of competency (Redman et al., 2020). In addition, these insights demonstrate the contribution of such assessment approaches to “assessment as learning”, where students are engaged, critical assessors of their own competency level through actual performance (Earl, 2003). While the tool was piloted as a summative assessment, it is also designed to be used as a formative assessment approach throughout a course and/or program, where students are provided with a real-world tasks and simulate real-world roles in order to gauge their acquisition of real-world competencies several times throughout the course. This assessment approach could provide students with reflective

“checkpoints” in their learning journey, allowing students to orient themselves in an authentic setting, and adapt in response to their performance. This also requires “feed-forward” processes from instructors, where instructors allow students to make mistakes and then provide constructive feedback that is designed to improve student performance in future assessments (Wheatley et al., 2015). Using a real-world orientation, and when paired with “feed-forward”, students can self-correct during their learning journey in order to better perform in future formative assessments, therefore using “assessment for learning” (Barth, 2014). In these assessment settings, students also get the opportunity to employ some of the more abstract SE attitudes identified in the framework, such as creativity, perseverance, and tenacity as well as building on continuous learning and innovation skills. This demonstrates the potential for this tool as a pedagogical approach for transformative learning, rather than merely an assessment tool. This “assessment for learning” approach can also provide instructors with a “compass” for their teaching settings, understanding what students are actually learning, and adapting course plans to enhance future learning (Barth, 2014). However, if instructors want to use this type of tool to enrich experiential learning settings for students, they still face the institutional challenge of having to conform to a traditional letter-grade model, a model that perpetuates the shortcomings of traditional assessment approaches (Maclellan, 2004; Williams, 2014). Thus, a larger shift on the institutional level from the traditional letter-grade model to alternatives that are more aligned to the real-world (such as the assessment approach offered here) is also needed.

Finally, the testing of the tool also reveals that students need to be sufficiently prepared to engage with these types of settings. Thus, students need to

be introduced to these assessments throughout a course or program multiple times. Students should also receive formal professional skill training in sustainability entrepreneurship education, not only to insure effective collaboration with real-world partners and stakeholder engagement, but to prepare them to succeed in these simulated assessments as well.

3.3. Considerations for students. Students should recognize that they need not have their own business idea or a desire to start their own business to benefit from engagement in the entrepreneurial process. An sustainability entrepreneur requires a set of competencies beyond business-specific knowledge and skills such as creativity, holding morals and ethics, resourcefulness, self-management skills, perseverance, self-advocacy, and more. Sustainability, as a field, requires many of these same skills, and sustainability professionals would only benefit from opportunities to develop them. Many of the courses explored in this research are also taken by students in the liberal arts, engineering, biology, cultural studies, and beyond. In addition, many students who participated in these courses did not go on to start their own businesses, but identified that the opportunities and experiences afforded to them in their respective sustainability entrepreneurship course were invaluable in both their learning and personal journeys, regardless of their respective fields. Sustainability entrepreneurship education can benefit a diverse range of students from a variety of disciplines, and help them become reflective, compassionate, and driven pioneers for a just, loving, and sustainable world.

Many of the pedagogical and assessment approaches presented in this research have steep, and at times, uncomfortable learning curves for students. Truly transformative learning is never easy. Increased ownership over learning journeys,

as well as opportunities to test their skills and knowledge in new, dynamic ways can only benefit students in preparing them to succeed in their future professional careers. Students should lean into this discomfort and at times, their failure, if they want to become future change-makers.

Finally, students must also understand that being a sustainability entrepreneur goes beyond engagement on the individual enterprise level. Being a strong partner in their local/regional economy through supporting other sustainability entrepreneurs, advocacy/lobbying, using their dollars to support local business, and active involvement in local/regional business associations, groups, and activities is equally important in building strong, sustainable local economies.

4. Contribution of Work

If sustainable and transformational business alternatives are to provide us with timely solutions to today's unsustainable economic models, the rate at which these enterprises must grow must be matched with structures and pathways to support such growth. This dissertation makes a contribution to this call, by providing a process-oriented competency framework that can be used to structure integrated sustainability entrepreneurship programs, course insights that can be used to design innovative and effective sustainability entrepreneurship courses, and an assessment tool that can be integrated into courses for transformative learning opportunities in any educational institution. It is also the hope that this work can inform the continued development of sustainability entrepreneurship education efforts at Arizona State University, with a vision of a fully developed sustainability entrepreneurship educational pathway available to both undergraduate and graduate students throughout all departments in the university in the near future. As the sustainability

entrepreneurship space continues to evolve and transform, so too must our educational institutions if they are to prepare future pioneers to start, run, and support transformative, sustainable enterprise.

REFERENCES

- Afshar Jahanshahi, A., Brem, A., & Bhattacharjee, A. (2017). Who Takes More Sustainability-Oriented Entrepreneurial Actions? The Role of Entrepreneurs' Values, Beliefs and Orientations. *Sustainability, 9(10)*, 1636. Retrieved from <https://doi.org/10.3390/su9101636>
- Alcaraz, J. & Thiruvattal, E. (2010). The United Nations' principles for responsible management education: A global call for sustainability. *Academy of Management Learning & Education, 9(3)*, 542–550. Retrieved from <https://doi.org/10.5465/amle.9.3.zqr542>
- Alcaraz, J., Marcinkowska, M.W., and Thiruvattal, E. (2011). The UN-principles for responsible management education – sharing (and evaluating) information on progress. *Journal of Global Responsibility, 2(2)*, 151-169. doi: 10.1108/20412561111166021
- Aragon-Correa, J.A., Marcus, A.A., Rivera, J.E., & Kenworthy, A.L. (2017). Sustainability management teaching resources and the challenge of balancing planet, people, and profits. *Academy of Management Learning & Education, 16(3)*, 469-483. Retrieved from <https://doi.org/10.5465/amle.2017.0180>
- Ardichvili, A., Cardozo, R., & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development. *Journal of Business venturing, 18(1)*, 105-123. Retrieved from [https://doi.org/10.1016/S0883-9026\(01\)00068-4](https://doi.org/10.1016/S0883-9026(01)00068-4)
- Azanza, G.; Grama, S.; & Bono, G. (2017). *Entrepreneurship Education in Business Schools: Best Practices and Recommendations*; EQUAL Report; EQUAL: Brussels, Belgium. Retrieved from https://equal.network/wp-content/uploads/2018/10/1.-Entrepreneurship-Education-in-Business-Schools_Project-report-Spain.pdf
- Backus, C., Keegan, K., Gluck, C., & Gulick, L. (2010). Accelerating leadership development via immersive learning and cognitive apprenticeship. *International Journal of Training and Development, 14(2)*, 144-148. Retrieved from <https://doi.org/10.1111/j.1468-2419.2010.00347.x>
- Baron, R.A.; Shane, S.A. (2004). *Entrepreneurship: A Process Perspective*. Cincinnati, OH: Southwest/Thomson.
- Barth, M. (2014). *Implementing Sustainability in Higher Education: Learning in an Age of Transformation*. New York, NY,; Southwest/Thomson.
- Basile, G., Broman, G.I., & Robert, K.H. (2011). A systems-based approach to sustainable enterprise: Requirements, utility and limits. In S.G. McNall, J.C. Hershauer, G. Basile (Eds.), *The Business of Sustainability: Trends, Policies,*

Practices, and Stories of Success, Volume I: Global Challenges and Opportunities (pp. 3–28). Santa Barbara, CA: Prager.

- Basu, A.; Osland, A.; & Solt, M. (2011). A new course on sustainability entrepreneurship. In Proceedings of the VentureWell's OPEN Conference, Pisa, Italy, 3–5 October 2011; National Collegiate Inventors & Innovators Alliance: Hadley, Massachusetts, USA.
- Belflower, J., Bernard, J., Gattie, D., Hancock, D., Risse, L., & Rotz, C.A. (2012). A case study of the potential environmental impacts of different dairy production systems in Georgia. *Agricultural Systems*, *108*, 84-93. Retrieved from <https://doi.org/10.1016/j.agsy.2012.01.005>
- Belz, F. M., & Binder, J. K. (2017). Sustainable entrepreneurship: A convergent process model. *Business Strategy and the Environment*, *26(1)*, 1-17. Retrieved from <https://doi.org/10.1002/bse.1887>
- Bernhardt, J., Elsen, S., Lintner, C., & Boman, J. (2015). *Summary CASE Needs Analysis: Findings on Competencies for Sustainability-driven Entrepreneurship*. Competencies for a Sustainable Socio-Economic Development (CASE) Working Paper. doi:10.13140/RG.2.1.1925.8967
- Bhattari, A. (2018, January 5). Whole Foods places new limits on suppliers, upsetting some small vendors. *The Washington Post*. Retrieved from https://www.washingtonpost.com/business/economy/whole-foods-places-new-limits-on-suppliers-upsetting-some-small-vendors/2018/01/05/7f58b466-f0a1-11e7-b390-a36dc3fa2842_story.html
- Biberhofer, P., Lintner, C., Bernhardt, J., & Rieckmann, M. (2019). Facilitating work performance of sustainability-driven entrepreneurs through higher education: The relevance of competencies, values, worldviews and opportunities. *The International Journal of Entrepreneurship and Innovation*, *20(1)*, 21-38. Retrieved from <https://doi.org/10.1177/1465750318755881>
- Blank, S. (2013, May). Why the lean start-up changes everything. *Harvard Business Review*, *91*, 63–72. Retrieved from <https://hbr.org/2013/05/why-the-lean-start-up-changes-everything>
- Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, *65*, 42-56. Retrieved from <https://doi.org/10.1016/j.jclepro.2013.11.039>
- Bogo, M., Regehr, C., Logie, C., Katz, E., Mylopoulos, M., & Regehr, G. (2011). Adapting objective structured clinical examinations to assess social work

- students' performance and reflections. *Journal of Social Work Education*, 47, 5-18. Retrieved from <https://doi.org/10.5175/JSWE.2011.200900036>
- Brower, H.H. (2011). Sustainable development through service learning – a pedagogical framework and case example in a third world context. *Academy of Management Learning & Education*, 10(1), 58-76. doi: 10.5465/amle.10.1.zqr58.
- Brundiens, K., & Wiek, A. (2013). Do we teach what we preach? An international comparison of problem- and project-based learning courses in sustainability. *Sustainability*, 5(4), 1725-1746. Retrieved from <https://doi.org/10.3390/su5041725>
- Brundiens, K., & Wiek, A. (2017). Beyond interpersonal competence: Teaching and learning professional skills in sustainability. *Education Sciences*, 7(1), 39-57. doi: 10.3390/educsci7010039
- Brundiens, K.; Wiek, A.; & Redman, C. (2010). Real-world learning opportunities in sustainability— From classroom into the real-world. *International Journal of Sustainability in Higher Education*, 11(4), 308–324. Retrieved from <https://doi.org/10.1108/14676371011077540>
- Brunner, W., Urenje, S., & Allen, I. (2012). *The parts and the whole: A holistic approach to environmental and sustainability education*. Visby, Sweden: The Swedish International Centre of Education for Sustainable Development.
- Buil-Fabregá, M., Martínez Casanovas, M., & Ruiz-Munzón, N. (2019). Flipped classroom as an active learning methodology in sustainable development curricula. *Sustainability*, 11(17), 1-15. Retrieved from <https://doi.org/10.3390/su11174577>
- Campbell, D., Sandino, T., Barnett, J., & Snively, C. (2018). *Whole Foods under Amazon*. HBS No. 9-118-074. Boston, MA: Harvard Business School Publishing.
- Carmines, E. G., & Zeller, R. A. (1979). *Reliability and Validity Assessment*. Thousand Oaks, CA: Sage.
- Chell, E., Karatas-Ozkan, M., & Nicolopoulou, K. (2007). Social entrepreneurship education: Policy, core themes and developmental competencies. *International Journal of Entrepreneurship Education*, 5, 282. Retrieved from <https://www.abacademies.org/journals/journal-of-entrepreneurship-education-home.html>
- Choi, D. Y., & Gray, E. R. (2008). Socially responsible entrepreneurs: What do they do to create and build their companies? *Business Horizons*, 51(4), 341-352. Retrieved from <https://doi.org/10.1016/j.bushor.2008.02.010>

- Choi, Y. R., & Shepherd, D. A. (2004). Entrepreneurs' decisions to exploit opportunities. *Journal of management*, *30*(3), 377-395. Retrieved from <https://doi.org/10.1016/j.jm.2003.04.002>
- Christensen, L.J., Peirce, E., Hartman, L.P., Hoffman, W.M., & Carrier, J. (2007). Ethics, CSR, and Sustainability Education in the Financial Times Top 50 Global Business Schools: Baseline Data and Future Research Directions. *Journal of Business Ethics*, *73*, 347-368. Retrieved from <https://doi.org/10.1007/s10551-006-9211-5>
- Cioffi, J. (2001). Clinical simulations – development and validation. *Nurse Education Today*, *21*(6), 477-486. doi:10.1054/nedt.2001.0584
- Clarysse, B., & Moray, N. (2004). A process study of entrepreneurial team formation: the case of a research-based spin-off. *Journal of Business Venturing*, *19*(1), 55-79. Retrieved from [https://doi.org/10.1016/S0883-9026\(02\)00113-1](https://doi.org/10.1016/S0883-9026(02)00113-1)
- Collins, A., Brown, J.S., & Holum, A. (1991). Cognitive apprenticeship—Making thinking visible. *American Educator*, *15*(3), pp. 6–11. Retrieved from https://www.isls.org/images/research_topics/articles/cognitive-apprenticeship.pdf
- Cook, D. A., Zendejas, B., Hamstra, S. J., Hatala, R., & Brydges, R. (2014). What counts as validity evidence? Examples and prevalence in a systematic review of simulation-based assessment. *Advances in Health Sciences Education*, *19*(2), 233-250. doi: 10.1007/s10459-013-9458-4
- Corner, P. D., & Ho, M. (2010). How opportunities develop in social entrepreneurship. *Entrepreneurship Theory and Practice*, *34*(4), 635-659. doi: 10.1111/j.1540-6520.2010.00382.x
- Cornuel, E., & Hommel, U. (2015). Moving beyond the rhetoric of responsible management education. *Journal of Management Development*, *34*(1), 2–15. Retrieved from <https://doi.org/10.1108/JMD-06-2014-0059>
- D'Amato, D., Korhonen, J., & Toppinen, A. (2019). Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts? *Ecological Economics*, *158*, 116-133. Retrieved from <https://doi.org/10.1016/j.ecolecon.2018.12.026>
- DePillis, L. (2018, February 9). As Whole Foods merges with Amazon, local suppliers watch and worry. *CNN Money*. Retrieved from <https://money.cnn.com/2018/02/19/news/economy/amazon-whole-foods/index.html>
- DeTienne, D. R. (2010). Entrepreneurial exit as a critical component of the entrepreneurial process: Theoretical development. *Journal of Business*

- Venturing*, 25(2), 203-215. Retrieved from <https://doi.org/10.1016/j.jbusvent.2008.05.004>
- Dewey, Caitlin (2017, June 30). “The big consequence of the Amazon-Whole Foods deal no-one’s talking about.” *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/wonk/wp/2017/06/30/the-big-consequence-of-the-amazonwhole-foods-deal-no-ones-talking-about/?utm_term=.7bc07e01f006
- Dhliwayo, S. (2008). Experiential learning in entrepreneurship education. *Education+ training*, 50(4), 329-340. Retrieved from <https://doi.org/10.1108/00400910810880560>.
- Driscoll, C., Price, S., McKee, M., & Nicolls, J. (2017). An assessment of sustainability integration and communication in Canadian MBA programs. *Journal of Academic Ethics*, 15(2), 93–114. Retrieved from <https://doi.org/10.1007/s10805-017-9275-0>
- Dyllick, T. (2015). Responsible management education for a sustainable world – the challenges for business schools. *Journal of Management Development*, 34(1), 16–33. doi: 10.1108/JMD-02-2013-0022
- Earl, L. (2003) *Assessment as Learning: Using Classroom Assessment to Maximise Student Learning*. Thousand Oaks, CA, Corwin Press.
- Elmes, M. B., Jiusto, S., Whiteman, G., Hersh, R., & Guthey, G. T. (2012). Teaching social entrepreneurship and innovation from the perspective of place and place making. *Academy of Management Learning & Education*, 11(4), 533-554. Retrieved from <https://doi.org/10.5465/amle.2011.0029>
- Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability – towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment*, 26(5), 597-608. Retrieved from <https://doi.org/10.1002/bse.1939>
- Fantini, A. E., Arias-Galicia, F., & Guay, D. (2001). *Globalization and 21st century competencies: Challenges for North American higher education*. Boulder, CO: Western Interstate Commission for Higher Education.
- Feinstein, A. H., & Cannon, H. M. (2002). Constructs of simulation evaluation. *Simulation & Gaming*, 33(4), 425-440. Retrieved from <https://doi.org/10.1177/1046878102238606>
- Ferns, G. (2019). Thinking globally, teaching sustainability: Embedding sustainability in international business studies and addressing student responses. In K. Amaeshi, J.N. Muthuri, C. Ogbechie, (Eds.), *Incorporating*

Sustainability in Management Education (pp. 83–104). Cham, Switzerland: Palgrave Macmillan.

- Forrest, N., Grant, B., Thompson, I., Zah, S., & Wiek, A. (2018). Concept for a Sustainable Local Bakery Cooperative. Project Report. School of Sustainability, Arizona State University.
- Foster, G., & Stagl, S. (2018). Design, implementation, and evaluation of an inverted (flipped) classroom model economics for sustainable education course. *Journal of Cleaner Production*, *183*, 1323-1336. Retrieved from <https://doi.org/10.1016/j.jclepro.2018.02.177>
- Foucrier, T., & Wiek, A. (2019). A process-oriented framework of competencies for sustainability entrepreneurship. *Sustainability*, *11*(24), 1-18. Retrieved from <https://doi.org/10.3390/su11247250>
- Foucrier, T., & Wiek, A. (2020, in review). Assessing students' competence in sustainability entrepreneurship through in-vivo simulated professional situations. *Academy of Management Learning & Education*.
- Frey, A., & Seitz, N. N. (2009). Multidimensional adaptive testing in educational and psychological measurement – current state and future challenges. *Studies in Educational Evaluation*, *35*(2-3), 89-94. doi: 10.1016/j.stueduc.2009.10.007
- Galloway, S. (2009). Simulation techniques to bridge the gap between novice and competent healthcare professionals. *Online Journal of Issues in Nursing*, *14*(2). doi: 10.3912/OJIN.Vol14No02Man03
- Garfield, J. B. (1994). Beyond testing and grading – using assessment to improve student learning. *Journal of Statistics Education*, *2*(1), 1-11. Retrieved from <https://doi.org/10.1080/10691898.1994.11910462>
- Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation – a review. *Journal of Cleaner Production*, *198*, 401-416. Retrieved from <https://doi.org/10.1016/j.jclepro.2018.06.240>
- Godemann, J., Haertle, J., Herzig, C., & Moon, J. (2014). United Nations supported principles for responsible management education – purpose, progress and prospects. *Journal of Cleaner Production*, *62*, 16-23. Retrieved from <https://doi.org/10.1016/j.jclepro.2013.07.033>
- Goh, J., Pfeffer, J., & Zenios, S. A. (2015). The relationship between workplace stressors and mortality and health costs in the United States. *Management Science*, *62*(2), 608-628. Retrieved from <https://doi.org/10.1287/mnsc.2014.2115>

- Grossman, R., Salas, E., Pavlas, D., & Rosen, M. A. (2013). Using instructional features to enhance demonstration-based training in management education. *Academy of Management Learning & Education*, *12*(2), 219-243. Retrieved from <https://doi.org/10.5465/amle.2011.0527>
- Hendrickson, M., W.D. Heffernan, P.H. Howard, & J.B. Heffernan. (2006). "Consolidation in Food Retailing and Dairy: Implications for Farmers and Consumers in a Global Food System." *The Natural Farmer, Spring*, 17-20. Report to the National Farmers Union, January 8. Retrieved from <http://nofa.org/tnf/2006spring/Consolidation%20in%20Food%20&%20Ag.pdf>
- Hesselbart, C. & Schaltegger, S. (2014). Educating change agents for sustainability—Learnings from the first sustainability management master of business administration. *Journal of Cleaner Production*, *62*, 24–36. doi: 10.1016/j.jclepro.2013.03.042
- Higley, T. (2019). Entrepreneurs and wicked problems. *Solutions*, *10*, 76–82. Retrieved from https://issuu.com/thesolutionsjournaldigital/docs/feature_higley
- Høgdal, C., Rasche, A., Schoeneborn, D., & Scotti, L. (2019). Exploring the hidden curriculum in responsible management education. *Academy of Management Proceedings*, *1*, 12927. Retrieved from <https://doi.org/10.1007/s10551-019-04221-9>
<https://doi.org/10.1017/S0033291707000414>
- Jamali, D., Abdallah, H., & Matar, F. (2018). Opportunities and challenges for CSR mainstreaming in business schools. *Business Education and Ethics: Concepts, Methodologies, Tools, and Applications*, *6*(2), 1–29. doi: 10.4018/978-1-5225-3153-1.ch033
- Johnston, J. (2008). The citizen-consumer hybrid: ideological tensions and the case of Whole Foods Market. *Theory and Society*, *37*(3), 229-270. Retrieved from <https://doi.org/10.1007/s11186-007-9058-5>
- Jolly, F., Whiteman, G., Atkinson, M., & Radu, I. (2011). Managing and educating outside: A Cree hunter's perspective. *Journal of Management Education*, *35*(1), 27-50. Retrieved from <https://doi.org/10.1177/1052562910386112>
- Kickul, J., Terjesen, S., Bacq, S., & Griffiths, M. (2012). Social business education – an interview with Nobel laureate Muhammad Yunus. *Academy of Management Learning & Education*, *11*(3), 453-462. Retrieved from <https://doi.org/10.5465/amle.2011.0500>
- Klapper, R. & Farber, V. (2016). In Alain Gibb's footsteps: Evaluating alternative approaches to sustainable enterprise education. *The International Journal of Management Education*, *14*, 422-439. doi: 10.1108/09534811211239272

- Konrad, T., Wiek, A., & Barth, M. (2019, in press). Embracing conflicts for interpersonal competence development in project-based sustainability courses. *International Journal of Sustainability in Higher Education*.
- Korunka, C., Frank, H., Lueger, M., & Mugler, J. (2003). The entrepreneurial personality in the context of resources, environment, and the startup process—A configurational approach. *Entrepreneurship theory and practice*, *28*(1), 23-42. doi: 10.1111/1540-8520.00030
- Kuckertz, A., & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions—Investigating the role of business experience. *Journal of Business Venturing*, *25*(5), 524-539. Retrieved from <https://doi.org/10.1016/j.jbusvent.2009.09.001>
- Kurucz, E.C., Colbert, B.A., & Marcus, J. (2014). Sustainability as a provocation to rethink management education – building a progressive educative practice. *Management Learning*, *45*(4), 437-457. Retrieved from <https://doi.org/10.1177/1350507613486421>
- Laasch, O., & Moosmayer, D. (2015). *Competences for responsible management education – a structured literature review*. Center for Responsible Management Education (CRME) Working Paper. University of Manchester, UK. Retrieved from https://www.researchgate.net/publication/321327010_Competences_for_responsible_management_A_structured_literature_review
- Lakhal, S. & Sevigny, S. (2015). The AACSB Assurance of Learning process: An assessment of current practices within the perspective of the unified view of validity. *The International Journal of Management Education*, *13*, 1-10. doi: 10.1016/j.ijme.2014.09.006
- LaMan III, A. E. (2015). *The Mentor's Tale: Cognitive Apprenticeship and Entrepreneurial Education-A Narrative Study* (Doctoral dissertation, Northeastern University, Boston, USA). Retrieved from <https://repository.library.northeastern.edu/files/neu:rx917s08v>.
- Lambrechts, W., Mulà, I., Ceulemans, K., Molderez, I., & Gaeremynck, V. (2013). The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. *Journal of Cleaner Production*, *48*, 65-73. Retrieved from <https://doi.org/10.1016/j.jclepro.2011.12.034>
- LaMontagne A.D., Sanderson K., Cocker F. (2010). Estimating the Economic Benefits of Eliminating Job Strain as a Risk Factor for Depression. *Victorian Heath Promotion Foundation (VicHealth)*. Retrieved from <http://www.vichealth.vic.gov.au/jobstrain>

- Lans, T., Blok, V., & Wesselink, R. (2014). Learning apart and together – towards an integrated competence framework for sustainable entrepreneurship in higher education. *Journal of Cleaner Production*, *62*, 37-47. Retrieved from <https://doi.org/10.1016/j.jclepro.2013.03.036>
- Lans, T., Verstegen, J., & Mulder, M. (2011). Analysing, pursuing and networking: Towards a validated three-factor framework for entrepreneurial competence from a small firm perspective. *International Small Business Journal*, *29(6)*, 695-713. Retrieved from <https://doi.org/10.1177/0266242610369737>
- Laukkanen, M. & Patala, S. (2014). Analysing barriers to sustainable business model innovations: Innovation systems approach. ISPIM Conference, Dublin, Ireland, 8-11 June 2014. Manchester, UK: International Society for Professional Innovation Management. Retrieved from <https://www.ispim-innovation.com/>
- LeClair, D. T., & Ferrell, L. (2000). Innovation in experiential business ethics training. *Journal of Business Ethics*, *23(3)*, 313-322. Retrieved from <https://doi.org/10.1023/A:1006266526120>
- Leutner, D., Fleischer, J., Grünkorn, J., & Klieme, E. (2017). *Competence Assessment in Education – Research, Models and Instruments*. Berlin, Hamburg: Springer.
- Lewrich, M., Omar, M., Raeside, R., & Sailer, K. (2010). Education for entrepreneurship and innovation—Management capabilities for sustainable growth and success. *World Journal of Entrepreneurship, Management and Sustainable Development*, *6(1/2)*, 1-18. doi: 10.1108/20425961201000001
- Lindner, J. (2018). Entrepreneurship Education for a Sustainable Future. *Discourse and Communication for Sustainable Education*, *9(1)*, 115-127. doi: 10.2478/dcse-2018-0009.
- Linn, R. L., Baker, E. L., & Dunbar, S. B. (1991). Complex, performance-based assessment – Expectations and validation criteria. *Educational Researcher*, *20(8)*, 15-21. doi: 10.2307/1176232
- Lourenço, F., Jones, O., & Jayawarna, D. (2013). Promoting sustainable development: The role of entrepreneurship education. *International Small Business Journal*, *31(8)*, 841-865. Retrieved from <https://doi.org/10.1177/0266242611435825>
- Maclellan, E. (2004). How convincing is alternative assessment for use in higher education? *Assessment & Evaluation in Higher Education*, *29(3)*, 311-321. Retrieved from <https://doi.org/10.1080/0260293042000188267>
- Mair, J., Robinson, J., & Hockerts, K. (2006). *Social entrepreneurship*. New York, US: Palgrave Macmillan.

- Majee, W., & Hoyt, A. (2009). Building community trust through cooperatives: A case study of a worker-owned homecare cooperative. *Journal of Community Practice, 17(4)*, 444-463. Retrieved from <https://doi.org/10.1080/10705420903299995>
- McCarthy, P. R., & McCarthy, H. M. (2006). When case studies are not enough – integrating experiential learning into business curricula. *Journal of Education for Business, 81(4)*, 201-204. Retrieved from <https://doi.org/10.3200/JOEB.81.4.201-204>
- McKibbin, W. J., & Fernando, R. (2020). *The Global Macroeconomic Impacts of COVID-19: Seven Scenarios* (CAMA Working Paper). Canberra, Australia: Centre for Applied Macroeconomic Analysis. Retrieved from <https://cama.crawford.anu.edu.au/publication/cama-working-paper-series/16221/global-macroeconomic-impacts-covid-19-seven-scenarios>
- Melchior M., Caspi A., Milne B.J., Danese A., Poulton R., Moffitt T.E. (2007). Work stress precipitates depression and anxiety in young, working women and men. *Psychology Medicine, 37(8)*, 1119–1129. doi: 10.1017/S0033291707000414
- Miller, G. E. (1990). The assessment of clinical skills, competence, performance. *Academic Medicine, 65(9)*, 63-67. doi:10.1097/00001888-199009000-00045
- Miller, T. L., Wesley, C. L., & Williams, D. E. (2012). Educating the minds of caring hearts: Comparing the views of practitioners and educators on the importance of social entrepreneurship competencies. *Academy of Management Learning & Education, 11(3)*, 349-370. Retrieved from <https://doi.org/10.5465/amle.2011.0017>
- Mindt, L., & Rieckmann, M. (2017). Developing competencies for sustainability-driven entrepreneurship in higher education: A literature review of teaching and learning methods. *Teoría de la Educación; Revista Interuniversitaria, 29(1)*, 129-159. doi: 10.14201/teoredu2017291129159
- Mitchelmore, S., & Rowley, J. (2010). Entrepreneurial competencies: a literature review and development agenda. *International journal of entrepreneurial Behavior & Research, 16(2)*, 92-111. Retrieved from <https://doi.org/10.1108/13552551011026995>
- Moreau, C., & Mertens, S. (2013). Managers' competences in social enterprises: Which specificities?. *Social Enterprise Journal, 9(2)*, 164–183. Retrieved from <https://doi.org/10.1108/SEJ-01-2013-0005>
- Morris, M. H., Webb, J. W., Fu, J., & Singhal, S. (2013). A competency-based perspective on entrepreneurship education: conceptual and empirical

- insights. *Journal of Small Business Management*, 51(3), 352-369. Retrieved from <https://doi.org/10.1111/jsbm.12023>
- Osagie, E., Wesselink, R., Blok, V., Lans, T., & Mulder, M. (2016). Individual competencies for corporate social responsibility—A literature and practice perspective. *Journal of Business & Ethics*, 135(2), 233–252. doi: 10.1007/s10551-014-2469-0
- Panzarella, K. J., & Manyon, A. T. (2007). A model for integrated assessment of clinical competence. *Journal of Allied Health*, 36(3), 157-164. Retrieved from <http://www.asahp.org/journal-of-allied-health>
- Ploum, L., Blok, V., Lans, T., & Omta, O. (2018). Toward a validated competence framework for sustainable entrepreneurship. *Organization & Environment*, 31(2), 113-132. Retrieved from <https://doi.org/10.1177/1086026617697039>
- Prado, A.M., Arce, R., Lopez, L.E., García, J. & Pearson, A.A. (2020). Simulations versus case studies – effectively teaching the premises of sustainable development in the classroom. *Journal of Business Ethics*, 161, 303–327. Retrieved from <https://doi.org/10.1007/s10551-019-04217-5>
- Principles for Responsible Management Education (2016). Retrieved October 3, 2016 from <http://www.unprme.org/participants/index.php>
- Redman, A., Wiek, A., & Barth, M. (2020, under review). Current practice of assessing students’ sustainability competencies – a review of tools. *Sustainability Science*.
- Reickmann, M. (2017). Key themes in education for sustainable development. In A. Leicht, J. Heiss, & W.J. Byun (Ed.), *Issues and trends in Education for Sustainable Development* (pp.61-86). Paris, France: UNESCO.
- Rodgers, C. (2010). Sustainable entrepreneurship in SMEs: a case study analysis. *Corporate Social Responsibility and Environmental Management*, 17(3), 125-132. Retrieved from <https://doi.org/10.1002/csr.223>
- Salas, E., Wildman, J. L., & Piccolo, R. F. (2009). Using simulation-based training to enhance management education. *Academy of Management Learning & Education*, 8(4), 559-573. doi: 10.5465/amle.8.4.zqr559
- Salgado, F. P., Abbott, D., & Wilson, G. (2018). Dimensions of professional competences for interventions towards sustainability. *Sustainability science*, 13(1), 163-177. doi: 10.1007/s11625-017-0439-z
- Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: categories and interactions. *Business strategy and the environment*, 20(4), 222-237. doi: 10.1002/bse.682

- Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2012). Business cases for sustainability – the role of business model innovation for corporate sustainability. *International Journal of Innovation and Sustainable Development*, 6(2), 95-119. Retrieved from <http://dx.doi.org/10.2139/ssrn.2010506>
- Schaper, M. (2002). The essence of ecopreneurship. *Greener Management International*, 38, 26-30. Retrieved from <https://www.jstor.org/stable/10.2307/greemanainte.38.26>
- Shane, S., & Cable, D. (2002). Network ties, reputation, and the financing of new ventures. *Management science*, 48(3), 364-381. Retrieved from <https://doi.org/10.1287/mnsc.48.3.364.7731>
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226. doi: 10.2307/259271
- Shrivastava, P. (2010). Pedagogy of passion for sustainability. *Academy of Management Learning & Education*, 9(3), 443-455. Retrieved from <https://doi.org/10.5465/amle.9.3.zqr443>.
- Snelson-Powell, A., Grosvold, J., & Millington, A. (2016). Business school legitimacy and the challenge of sustainability: A fuzzy set analysis of institutional decoupling. *Academy of Management & Learning*, 15(4), 703–723. Retrieved from <https://doi.org/10.5465/amle.2015.0307>
- Starik, M., & Rands, G. P. (2010). In search of sustainability in management education. *Academy of Management Learning & Education, Special Issue on Sustainability in Management Education*, 9(3), 377–383. Retrieved from <https://doi.org/10.5465/amle.9.3.zqr377>
- Sterling, S. (2002). *Sustainable Education – Re-visioning Learning and Change*. Devon, UK: Green Books.
- Stubbs, W., & Cocklin, C. (2008). Conceptualizing a “sustainability business model”. *Organization & Environment*, 21(2), 103-127. Retrieved from <https://doi.org/10.1177/1086026608318042>
- Tracey, P., & Phillips, N. (2007). The distinctive challenge of educating social entrepreneurs – a postscript and rejoinder to the special issue on entrepreneurship education. *Academy of Management Learning & Education*, 6(2), 264-271. doi:10.5465/AMLE.2007.25223465
- Tsui, A. S., Enderle, G., & Jiang, K. (2018). Income inequality in the United States: Reflections on the role of corporations. *Academy of Management Review*, 43(1), 156-168. Retrieved from <https://doi.org/10.5465/amr.2016.0527>

- Ulrich, D., Brockbank, W., Yeung, A. K., & Lake, D. G. (1995). Human resource competencies: An empirical assessment. *Human Resource Management, 34(4)*, 473-495. Retrieved from <https://doi.org/10.1002/hrm.3930340402>
- United Nations General Assembly (2015). *Transforming Our World – the 2030 Agenda for Sustainable Development*. New York, New York: United Nations.
- University Leaders for a Sustainable Future (2013). Retrieved March 5, 2016 from <https://www.ulsf.org/>
- Upward, A., & Jones, P. (2016). An ontology for strongly sustainable business models: Defining an enterprise framework compatible with natural and social science. *Organization & Environment, 29(1)*, 97-123. Retrieved from <https://doi.org/10.1177/1086026615592933>
- Vodenska, I., & Becker, A.P. (2019). Interdependence, vulnerability and contagion in financial and economic networks. In: Abergel, F., Chakrabarti, B., Chakraborti, A., DeoKiran Sharma, N. (Eds.) (2019). *New Perspectives and Challenges in Econophysics and Sociophysics* (pp. 101-116).. Berlin, New York: Springer.
- Walck, C. (2003). Using the concept of land to ground the teaching of management and the natural environment. *Journal of Management Education, 27(2)*, 205-219. Retrieved from <https://doi.org/10.1177/1052562903251410>.
- Waldron, T. L., Fisher, G., & Pfarrer, M. (2016). How social entrepreneurs facilitate the adoption of new industry practices. *Journal of Management Studies, 53(5)*, 821-845. Retrieved from <https://doi.org/10.1111/joms.12187>
- Weber, H., & Wiek, A. (2020). Sustainable Coffee Sourcing – A Workshop for Small Coffee Businesses in Arizona. Workshop Report. Sustainable Food Economy Lab, School of Sustainability, Arizona State University, Tempe, Arizona.
- Weber, H., Wiek, A., & Lang, D.J. (2019, in press). Sustainability entrepreneurship to address large distances in international food supply. *Business Strategy and Development*.
- Wells, P. E. (2013). *Business Models for Sustainability*. Cheltenham, UK: Edward Elgar Publishing.
- Wheatley, L., Lord, R., McInch, A., & Fleming, S. (2015). Feeding back to feed forward: Formative assessment as a platform for effective learning. *Kentucky Journal of Higher Education Policy and Practice, 3(2)*, 1-31. Retrieved from <http://bgro.repository.guildhe.ac.uk/id/eprint/298>
- Whole Foods Market History. (n.d.). Retrieved 2 Dec 2017 from <http://www.wholefoodsmarket.com/company-info/whole-foods-market-history>

- Wiek, A., & Kay, B. (2015). Learning while transforming: solution-oriented learning for urban sustainability in Phoenix, Arizona. *Current Opinion in Environmental Sustainability*, 16, 29-36. Retrieved from <https://doi.org/10.1016/j.cosust.2015.07.001>
- Wiek, A., Forrest, N., et al. (2018). Building Implementation Capacity for a Sustainable Local Food Economy through a Mobile Solution Theater. Project Report. Center for Global Sustainability and Cultural Transformation, Arizona State University and Leuphana University of Lüneburg, Germany.
- Wiek, A., Foucrier, T., & Basile, G. (2016). *How to Analyze and Evaluate Enterprises against Principles of Sustainability-Framework and Application*. School of Sustainability, Arizona State University Working Paper.
- Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science*, 6(2), 203-218. Retrieved from <https://doi.org/10.1007/s11625-011-0132-6>
- Wiek, A., Withycombe, L., Redman, C., & Mills, S. B. (2011). Moving forward on competence in sustainability research and problem solving. *Environment*, 53(2), 3-13. Retrieved from <https://doi.org/10.1080/00139157.2011.554496>
- Wiek, A., Xiong, A., Brundiers, K., van der Leeuw, S. (2014). Integrating problem- and project-based learning into sustainability programs – A case study on the School of Sustainability at Arizona State University. *International Journal of Sustainability in Higher Education*, 15(4), 431-449. doi: 10.1108/IJSHE-02-2013-0013.
- Wilhelm, S., Förster, R., & Zimmermann, A. B. (2019). Implementing competence orientation: Towards constructively aligned education for sustainable development in university-level teaching-and-learning. *Sustainability*, 11(7), 1891. Retrieved from <https://doi.org/10.3390/su11071891>
- Willard, M., Wiedmeyer, C., Warren Flint, R., Weedon, J. S., Woodward, R., Feldman, I., & Edwards, M. (2010). The sustainability professional: 2010 competency survey report. *Environmental Quality Management*, 20(1), 49-83. Retrieved from <https://doi.org/10.1002/tqem.20271>
- Williams, P. (2014). Squaring the circle: a new alternative to alternative-assessment. *Teaching in Higher Education*, 19(5), 565-577. Retrieved from <https://doi.org/10.1080/13562517.2014.882894>
- Wright, A. L., Middleton, S., Greenfield, G., Williams, J., & Brazil, V. (2016). Strategies for teaching evidence-based management: What management

- educators can learn from medicine. *Journal of Management Education*, 40(2), 194-219. Retrieved from <https://doi.org/10.1177/1052562915624123>
- Wright, N. S., & Bennett, H. (2011). Business ethics, CSR, sustainability and the MBA. *Journal of Management and Organization*, 17(5), 641-655. doi:10.5172/jmo.2011.643
- Wu, W. W. (2009). A competency-based model for the success of an entrepreneurial start up. *WSEAS transactions on business and economics*, 6(6), 279-291. Retrieved from <http://wseas.org/wseas/cms.action?id=4016>
- Wu, Y. C. J., Huang, S., Kuo, L., & Wu, W. H. (2010). Management education for sustainability – a web-based content analysis. *Academy of Management Learning & Education*, 9(3), 520-531. Retrieved from <https://doi.org/10.5465/amle.9.3.zqr520>
- Yin, Robert. (1994). *Case Study Research: Design and Methods*. London, New Delhi: Sage.

APPENDIX A
IRB APPROVAL

Approved

Entered IRB: 10/20/2016 1:14 PM
Initial approval: 11/28/2016
Initial effective: 11/28/2016
Effective: 11/28/2016
Last updated: 5/21/2019 2:56 PM

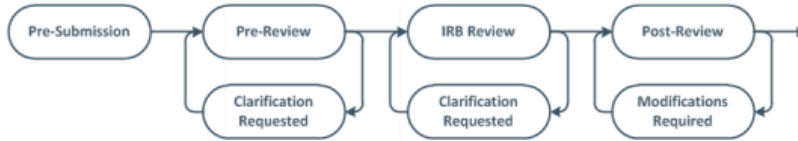
STUDY00005109: Educating Future Change Agents

Principal investigator: Arnim Wiek
Submission type: Initial Study
Primary contact: Aaron Redman
PI proxies:

IRB office: ASU IRB
IRB coordinator: Erik Williams
Letter: [Correspondence_for_STUDY](#)
Regulatory authority: Pre-2018 Requirements

Next Steps

- [View Study](#)
- [Printer Version](#)
- [View Differences](#)
- [Create Modification/CR](#)



[History](#) [Funding](#) [Contacts](#) [Documents](#) [Follow-on Submissions](#) [Reviews](#)

APPENDIX B

STATEMENT OF PERMISSION FOR USE OF CO-AUTHORED ARTICLES

Dr. Arnim Wiek and Dr. George Basile gave permission to publish coauthored work
in this dissertation.

APPENDIX C

IN-VIVO SIMULATION ASSESSMENT MATERIAL



Economic Development Vision for the City of Tempe



Report prepared by

EconConsult

January 2019

Disclaimer

This report is a *mock* report developed by Tamsin Foucrier and Prof. Arnim Wiek from Arizona State University. It has been developed in consultation with Dr. Braden Kay and Jill Buschbacher from the City of Tempe and uses a variety of other city sources (e.g., City of Tempe – A Brief History of Tempe; Key Industries; Arts and Culture; Tempe Tourism Office; Sports and Recreation; Small Business). The structure and some of the content is loosely based on a report written by Laura John (Consultant) for the Caribbean Local Economic Development Project (CARILED) – see John (2016).

EconConsult is a fictitious consultancy.

This mock report was specifically designed only for use in assessing sustainability entrepreneurship competencies of students who completed sustainability entrepreneurship courses at Arizona State University. For this reason, some of the content in this report is deliberately not accurate.

No other use is permitted.

Table of Content

1. Introduction.....	4
1.1 A New Economic Development Vision for the City of Tempe	4
1.2 Local Economic Development.....	4
2. The City of Tempe	5
2.1 History, Geography, and Population	5
2.2 Public Assets	5
2.3 Socio-Demographic Indicators.....	6
3. Local Economy in Tempe.....	7
3.1 Enterprises.....	7
Manufacturing and Business Services.....	7
Healthcare and Biotechnology	7
Technologies	7
Art and Culture.....	7
Tourism	7
Sports and Recreation	8
Small to Medium-Sized Enterprises	8
3.2 Support Services for Small to Medium-Sized Enterprises	8
Tax Credits, Loans, and Grants	8
Location Assistance	8
Business Education and Partnerships	9
Incubators and Co-Working Spaces	9
4. A Vision for a Local, Living Economy in Tempe	10
4.1 City of Tempe Vision and Sustainable & Economic Development Goals	10
4.2 Guiding Principles for a Local, Living Economy in Tempe	10
4.3 Enterprises.....	11
Local Food	11
Manufacturing	12
Healthcare.....	12
Art and Culture.....	12
Tourism	12
4.4 Support Services	12
Financial Support	12
Training and Education	13
Network Support.....	13
City of Tempe Policy Support.....	13
5. From Vision to Strategy Building and Implementation	13
REFERENCES	14

1. Introduction

1.1 A New Economic Development Vision for the City of Tempe

This report presents a vision of a new economic development path for the City of Tempe. The goal of this economic development is to equally benefit all residents and community members in the city, now and in the future. This ought to be achieved through a strong network of micro, small and medium-sized enterprises and increased capacities of the local government to facilitate local economic development. This vision outlines a new approach to economic development that is not driven by big business and central government, but rather centers on local government agencies, local businesses, and local stakeholders.

1.2 Local Economic Development

Local economic development is a process by which public sector, business and civil society work collectively pursue local employment and economic vitality. Its ultimate purpose is to contribute to financial security and good quality of life for all.

“Local” means:

- Includes enterprises, support functions for enterprises (e.g., financial and legal), and all networks among enterprises, supporters, suppliers, and clients with the majority of these components within city boundaries
- Gross Local Product – Overall revenue or profit generated by local enterprises
- Links to the regional, national and global levels

“Economic Development” includes:

- Optimizing use of natural resources in businesses
- Building business capacities
- Supporting adoption of new technologies in businesses
- Building infrastructures in support of businesses
- Supporting businesses in the start-up phase
- Networking across businesses
- Providing financial and legal advice to businesses
- Facilitating market access & providing access to investments
- Promoting of collaboration and partnerships

2. The City of Tempe

2.1 History, Geography, and Population (From City of Tempe – A Brief History of Tempe)

Following the establishment of Fort McDowell on the eastern edge of central Arizona's Salt River Valley in 1865, enterprising farmers moved into the area. They dug out the irrigation canals left by the prehistoric Hohokam people and built new ones to carry Salt River water to their fields. Valley farms soon supplied food to Arizona's military posts and mining towns.

The first settlers to move to the Tempe area, south of the Salt River and east of Phoenix, were Hispanic families from southern Arizona. They helped construct the first two irrigation canals, the Kirkland-McKinney Ditch and the San Francisco Canal, and started small farms to the east and west of Tempe Butte.

Another settlement, known as Hayden's Ferry, developed west of Tempe Butte. Charles Trumbull Hayden, owner of a mercantile and freighting business in Tucson, homesteaded this location in 1870. Within a few years, he had built a store and flourmill, warehouses and blacksmith shops, and a ferry. This community became the trade center for the south side of the Salt River Valley.

Both settlements grew quickly and soon formed one community. The town was named Tempe in 1879. As more farmers came to settle in the Valley and started raising alfalfa and grains for feeding livestock, the Tempe Irrigating Canal Company provided the necessary water. With a network of canals that extended several miles south of the river, irrigation water was carried to more than 20,000 acres of farmland. Crops of wheat, barley, and oats ensured a steady business for the Hayden Mill. The milled flour was hauled to forts and other settlements throughout the territory. By the 1890s, some farmers started growing new cash crops such as dates and citrus fruits.

In 1885, the Arizona legislature selected Tempe as the site for the Territorial Normal School, which trained teachers for Arizona's schools. Soon, other changes in Tempe promoted the development of the small farming community. The Maricopa and Phoenix Railroad, built in 1887, crossed the Salt River at Tempe, linking the town to the nation's growing transportation system. The Tempe Land and Improvement Company was formed to sell lots in the booming town. Tempe became one of the most important business and shipping centers for the surrounding agricultural area.

The completion of Roosevelt Dam in 1911 guaranteed enough water to meet the growing needs of Valley farmers. Tempe was a small agricultural community through most of its history. Prompted by Tempe's centennial in 1971, Mill Avenue was revitalized into an entertainment and shopping district to attract people from throughout the Valley. Today, Tempe is the eighth largest city in Arizona, with an economy based on commerce, tourism, and electronics manufacturing.

2.2 Public Assets

The City of Tempe is equipped with several public assets key to the local economy. Public assets include natural and working landscapes, properties, local institutions, existing infrastructure, social/cultural/recreational facilities, natural resources, health facilities, educational facilities, and transportation systems. Some of Tempe's public assets are listed below:

- Tempe St. Luke’s Hospital
- Arizona State University
- Tempe Town Lake
- Kiwanis Park
- Papago Park
- Phoenix Zoo
- Desert Botanical Gardens
- Elementary Schools
- High Schools
- Health and Wellness Centre
- Mountain Park Health Center
- Mill Ave Downtown Tempe District
- Rio Salado College
- Southwest College of Naturopathic Medicine
- Tempe Public Library
- Tempe Meadows
- Neighborhood Parks
- Neighborhood associations
- Downtown Business Improvement Association
- Public Utilities - SRP, CAP
- Nonprofit Sector
- Tempe Works (“Working to end homelessness”)
- Tempe Community Council

Tempe is also served by auxiliary institutions throughout the Valley of the Sun such as additional Arizona State University campuses, private and public hospitals, and more. In addition, Tempe is home to the Metro Phoenix Light Rail system that follows along Apache Blvd and up through Mill Ave (connecting both to Mesa and Phoenix) and a public bus system. In addition, Tempe is home to a growing system of dedicated bike lanes throughout the city.

2.3 Socio-Demographic Indicators

According to *2018 US Census Bureau Data*, Tempe is home to about 185,000 permanent residents, with approximately 20% of the population under the age of 18, 10% over the age of 65 and 70% between the age of 18 and 65 years old. More than 90% of persons 25 years and older hold a high school diploma and more than 40% of persons 25 years and older hold a bachelor’s degree or higher college degree. Arizona State University awards more than 26,000 degrees each year, with about 28% of Arizona’s workforce holding a degree from Arizona State University (Hoffman & Rex 2016).

Median household income sits around \$51,000/year, with the poverty rate being around 20%. The median value of a home in Tempe from 2013-2017 was \$237,000, with a median monthly mortgage cost of \$1,400 per household. Median gross rent from 2013-2017 was around \$1,000.

About 7% of persons under the age of 65 years live with a disability, and 13% of persons under 65 years live without health insurance. While it is difficult to provide an exact count of people experiencing homelessness in Tempe, a 2015 report showed around 26,000 homeless people in Maricopa County throughout the year (Phoenix Rescue Mission, n.d.). City of Tempe staff and community volunteers conduct an annual Homeless Street Count and typically find between 125–150 homeless individuals living on the streets of Tempe (probably significantly underestimating the actual number). The average homeless person is a male, 30-50 years old, living with serious mental illness or a substance abuse disorder, and has been homeless for over a year. Additionally, about 10% of the homeless population in Tempe is youth (City of Tempe General Plan 2040, 2013).

3. Local Economy in Tempe

Tempe’s economy consists predominantly of the following sectors: Manufacturing and Business Services; Healthcare and Biotechnology; Technologies; Art and Culture; Tourism; Sports and Recreation. (From City of Tempe – Key Industries; Arts and Culture; Tempe Tourism Office; Sports and Recreation; Small Business)

3.1 Enterprises

Manufacturing and Business Services

Tempe houses manufacturing companies and corporate headquarters for a number of industries including aerospace and aviation, medical device, and energy technologies, such as *First Solar* and *Microchip Technology*. Business services include financial, insurance, and information technology services. Companies based in Tempe include *ADP*, *Wells Fargo*, *State Farm*, *Chase*, *Allstate*, *Lifelock*, *Go Daddy*, *Edward Jones*, among others.

Healthcare and Biotechnology

These include *Cigna Healthcare of Arizona*, *Tempe St. Luke’s Hospital*, *Sonora Quest Laboratories*, and *Mountain Park Health Center*.

Technologies

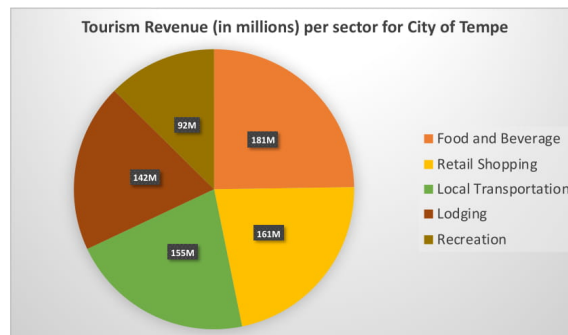
About 20% of the city’s companies and jobs are tech-related. From aerospace to nanotechnology, from solar energy research to software development and manufacturing, technology companies in Tempe include *Microsoft*, *Amazon*, and *Carvana*.

Art and Culture

Local theater, museums, art festivals, local bands, a suite of Broadway productions and contemporary dance companies are all part of Tempe’s arts and cultural scene. They include museums and galleries (e.g. ASU Art Museum), Tempe Center for the Arts, ASU Gammage, Tempe History Museum, AZ Heritage Park at Papago Park, the Annual Tempe Festival of the Arts, and the weekly 6th Street Market (October-April).

Tourism

According to the 2015 Tourism Economics Impact Study, approximately 3.7 million travelers spend \$730 million in Tempe annually. Tourism sustains 1 in 13 jobs in Tempe. The figure below provides a snapshot of tourism revenue (in million \$) per sector:



Sports and Recreation

The City of Tempe houses a variety of facilities and landscapes for boating, hiking, biking, boating and more, including:

- Tempe Diablo Stadium (home to Los Angeles Angels)
- Tempe Town Lake – five miles of shoreline, rentals for kayaks, electric boats, bikes
- Gold-Level Bicycle Community (League of American Bicyclists) – 215 miles of dedicated bike pathways
- Hayden Butte (“A” Mountain in Downtown Tempe), as well as access to South Mountain Park, Papago Park, Piestewa Peak, Camelback Mountain, Superstition Mountains
- Rolling Hills Golf Course, Papago Golf Course, ASU Karsten Golf Course
- Kiwanis Park with tennis courts, 10 batting cages, a splash playground, an indoor heated wave pool (54,000 square foot facility), 125 acres of city park

Small to Medium-Sized Enterprises

Across the aforementioned sectors, micro, small, and medium-sized enterprises contribute significantly to the economy, with more than 16,000 businesses throughout the city (Edelen 2014). These include a host of tap rooms and breweries (e.g., *Yucca Tap Room*, *Pedal Haus Brewery*), bookstores (*Changing Hands*), local restaurants, bike shops, and more.

3.2 Support Services for Small to Medium-Sized Enterprises

Tempe’s business assistance focuses on creation and retention of jobs (City of Tempe General Plan 2040, 2013). The following assistance is available to micro, small, and medium-sized enterprises in Tempe:

Tax Credits, Loans, and Grants

- a. Tax credits provided by the state of Arizona:
 - i. Quality Jobs Tax Credit Program: Businesses can receive up to \$9,000 in tax credit per new job created. Need to have at least \$5M in capital investment and meet quality jobs requirements (pay average wages).
 - ii. Qualified Facility Tax Credit Program: Manufacturing facilities can receive up to 10% of the total business capital investment as a tax credit. Need to spend at least \$250,000 and derive at least 65% of revenue from sales *outside* of Arizona.
- b. Loans
 - i. Arizona Innovation Accelerator Fund: \$50,000 - \$2M for rapidly expanding businesses. Arizona Chamber of Commerce tracks economic benefits.
 - ii. U.S. Small Business Administration guarantees loans and partners with lenders to provide loans to small business owners.
- c. Grants provided by the Arizona Community Foundation for local non-profits through discretionary grants from a Community Impact Loan Fund and Affordable Housing Fund.

Location Assistance

Assistance finding office, business, or manufacturing space is available through the City of Tempe Economic Development staff.

Business Education and Partnerships

- Tempe Chamber of Commerce and Arizona Commerce Authority helps entrepreneurs with navigating business licensing and permit processes, business plan review, and hiring.
- Arizona Technology Council is a network of technology entrepreneurs and businesses that provide seminars, lobbying, and networking events.
- Greater Phoenix Economic Council provides operational cost assessments, wage and related labor market data, and resources for businesses across Phoenix.
- Arizona Small Business Development Center provides one-on-one business counseling and workshops/training for small business owners.
- SCORE Mentoring Program offers mentorship from retired business executives and training workshops.
- Arizona STEP program assists small business owners in entering export markets and expanding into new international markets.

Incubators and Co-Working Spaces

- BRIC provides entrepreneurs and small businesses with co-working and meeting space, mentoring, business classes and networking opportunities.
- FABRIC is a fashion incubator that provides work space for designers, fashion labels, photographers, models, hair and makeup stylists.
- Mac 6 provides workshops, shared resources, individual working spaces and a co-manufacturing commercial space for members.
- Systems Imagination provides data analytics services and AI technology support for businesses.
- University of Advancing Technology + Perimeter 83 provides co-working spaces, equipment, a maker lab, software/digital support for technology entrepreneurs.
- ASU Venture Catalyst (SkySong) provides start-up training, business plan development assistance, mentorship, and networking support for entrepreneurs.
- ASU Venture Devils provides training and support in navigating business funding opportunities for ASU students.
- RISN Incubator provides mentorship, business advising and assessment, and training for entrepreneurs focused on the circular economy.
- Traditional co-working spaces (*The Wayne Smith, AZ Offices, Regus, Industrious*) provide offices/business spaces and networking opportunities for entrepreneurs.

4. A Vision for a Local, Living Economy in Tempe

In consultation with the City of Tempe and Local First Arizona, *EconConsult* hosted two visioning workshops in May 12, 2018. Expert reviews, city council priority goals, and a participatory process were used to craft a vision for a local, living economy in Tempe. We present below the City of Tempe vision and priority goals from the General Plan for 2040; guiding principles for a local living economy from expert consultation; and finally, the specific visions for enterprises and support services (based on the goals and guidelines).

4.1 City of Tempe Vision and Sustainable & Economic Development Goals

Tempe Vision (based on General Plan 2040)

Tempe's vision for itself in 2040 is one of livability: a city with a diverse, active and engaged community; a city that is visually attractive and accessible by multiple modes of transportation, with parks and cultural facilities providing the quality of life attributes that retain and attract residents and businesses; a city comprised of and defined by vibrant mixed-use hubs that not only provide for daily needs, but function as social gathering places for its residents and visitors; a city where authenticity, self-reliance, and sustainability engender productivity and entrepreneurship; and a city with homes of distinctive quality and varied density, revitalized neighborhoods that are walkable, pleasant and safe, and connected within a 20-minute walk, bike or transit ride.

The City of Tempe's General Plan 2040 outlines the following sustainable and economic development goals for the city to secure environmental and economic livability, as well as stimulate a sustainable, diversified and vibrant economy that pulls from a skilled workforce:

- Accelerate renewable energy development
- Enable opportunities for environmental stewardship
- Enhance sustainable land use and mobility practices
- Foster collaboration and communication
- Sustain a business climate that fosters private business investment
- Develop an increased tax base
- Promote a sustained improvement in the standard of living and quality of life for all residents
- Remain flexible in a constantly changing economy
- Attract businesses and employers that provide jobs paying wages at or above the regional average
- Maintain and attract a highly trained workforce

4.2 Guiding Principles for a Local, Living Economy in Tempe

A local living economy is comprised of businesses that have:

- A positive environmental performance by using/adopting renewable energy, closed water system, resource efficiency, local sourcing, etc.

- A positive social performance by offering meaningful employment, opportunities for people living with disabilities, healthy work environments, etc.
- A positive economic performance by generating sufficient revenue, pay fair and livable wages, realize just pay ratios, etc.
- A management and steering culture that is based on democratic principles and processes

With these features in mind, the City of Tempe strives to:

- Create, retain, and support sustainability-oriented businesses
- Market Tempe as an authentic tourist destination
- Preserve the environment (desert ecosystems; natural and built attractions, etc.)
- Build resilience within all sectors of the economy
- Offer decent livelihood opportunities for all
- Develop institutional capacity for self-reliance

4.3 Enterprises

Here, we apply the city goals and the guiding principles to different sectors of the economy to develop a tangible vision of a local, living economy in Tempe.

In 2040, the City of Tempe has seen a rise in micro, small, and medium-sized enterprises that are locally owned. These businesses focus on providing high-quality, biodegradable, and price-accessible products and services to their clients. Most of them rely on renewable energy, closed-loop water systems, resource-efficient equipment, and local or regional material supplies. They provide meaningful employment for all, including marginalized communities and retain a majority of graduates from Arizona State University. Most of them promote a healthy work-life balance for employees, provide continuous learning opportunities, and fund programs to advance the quality of life in the city. They pay living wages and maintain a fair pay ratio between highest and lowest salaries. Most of them are managed, steered, and operated democratically among their employees. They focus on qualitative growth over time and positive contribution to society and the environment.

Local Food

In 2040, the food sector is dominated by worker-owned cooperative businesses throughout the city. Local bakeries, restaurants, café cooperatives provide equitable economic livelihoods to members of the local workforce. Local food processing facilities are available to support food artisans and entrepreneurs in developing value-added food products. The city has adopted an “Urban Farm and Food Tourism” model that supports local food businesses, particularly targeting tourism revenue for local urban farms, food forests, market gardens, and medicinal herbs enterprises. Large public institutions such as a Tempe St. Luke’s Hospital and Arizona State University limit contract bid processes to local food businesses. All residents throughout the city have walking access to a local community food cooperative, where locally grown fruits and vegetables as well as local food products can be purchased. The community-supported agriculture (CSA) model has been expanded to bakeries, breweries, and creameries. New zoning laws support the development of edible landscapes, food forests, community gardens, greenhouses, and related facilities. Neighborhood community cooperatives also provide a year-round market for urban farmers and gardeners to sell produce and food products. The local food sector increasingly recruiting and

retaining college graduates with various skills across the local food economy (link to support services below).

Manufacturing

Small-scale manufacturing of high-quality furniture, kitchen appliances, construction material, and other consumer goods has slowly grown over the past 20 years. Material and energy for the manufacturing processes is predominantly sourced locally. Most of the manufacturing businesses have been incorporated either as worker cooperatives or as benefit corporations (or both). Businesses provide not only jobs but also on-the-job vocational training opportunities, that college graduates are getting more and more interested in. equitable employment opportunities for all. A network of local credit unions and small-business development institutions has tailored their support services to manufacturing businesses.

Healthcare

Mountain Park Health Center is now the leading health care provider in Tempe with four clinics. They have specialized on *preventative* healthcare services. Mountain Park Health Center now partners with Southwest College of Naturopathic Medicine to provide an expanded array of naturopathic medical services such as chiropractic and acupuncture services. Both institutions also partner with locally-owned fitness and wellness centers to provide affordable exercise programs and classes for community members throughout the city. Mountain Park Health Center also supports the local medicinal herb economy, prescribing and connecting patients to local naturopathic apothecaries. Finally, both Mountain Park Health Center and Southwest College of Naturopathic Medicine support local business through long-term supplier and manufacturer contracts.

Art and Culture

FABRIC and BRIC provide augmented spaces for creativity and production in all art sectors, linking artisans and artists to local and regional suppliers as well as supporting local and regional markets. These spaces also offer training and support services for sustainability-oriented entrepreneurs. Year-round and seasonal market spaces have been created by the locally-owned cooperatives and benefit corporations that line the streets throughout the Mill Ave district and the Baseline/Rural corridor. Art and Culture curricula in all public schools are closely integrated with a sustainability-oriented entrepreneurship curriculum, providing students with real-world entrepreneurial training to support future creative and artisan careers.

Tourism

The majority of annual revenue in tourism (Food and Beverage, Retail Shopping, Lodging, and Recreation) is now generated by locally-owned micro, small, and medium-sized enterprises. There are coordinated efforts to brand the local economy with its distinct sustainability features and market it to tourists.

4.4 Support Services

Here, we apply the city goals and the guiding principles to support services for the aforementioned enterprises to develop a tangible vision of a local, living economy in Tempe.

Financial Support

A network of impact investment firms, linked to local credit unions, provides financial support for micro, small, and medium-sized enterprises in Tempe. Loan programs are linked to triple-bottom-line requirements, ensuring that enterprises contribute positively to economy, environment, and

communities. Tax credit programs requirements have now expanded to be fully inclusive of all micro, small, and medium-sized businesses and include social and environmental criteria alongside financial investment criteria for eligibility.

Training and Education

A partnership between the City of Tempe, Arizona State University, Rio Salado College, Local First Arizona, and SEED SPOT provides year-round curricular and extracurricular training in worker cooperatives and benefit corporations for both students and community members. Arizona State University and Rio Salado College offer sustainability entrepreneurship programs on undergraduate and graduate levels as well as internship and mentorship programs with local sustainability entrepreneurs. An introduction to sustainability entrepreneurship has also been implemented for all public K-12 schools. Finally, cooperative incubator spaces (in collaboration with SEED SPOT and RISN) provide training programs and integrative co-working spaces for entrepreneurs and working professionals.

Network Support

Support structures for worker-owned cooperatives and sustainability entrepreneurs are bolstered by Local First Arizona that connects local entrepreneurs to local incubator spaces and impact investors. Long-term supplier contracts for Tempe St. Luke's, Mountain Park Health Center, Arizona State University, Tempe public schools, and Rio Salado College provide financial stability and economic opportunities for local sustainability enterprises. The City of Tempe's Economic Development department works closely with Tempe's Sustainability Director and Sustainability Commission to strengthen support structures and networks for local entrepreneurs.

City of Tempe Policy Support

The City of Tempe's new building code requires all new residential development (e.g. multi-use development) to house local businesses, with a focus on worker cooperatives and benefit corporations. Solar-energy capacity throughout the city provides clean energy for local enterprises, with solar subsidies available for businesses new development requirements. Supportive and transitional housing for disadvantages communities throughout the city work closely with local sustainability business training and employment programs, empowering individuals through meaningful employment. The Tempe Light Rail corridor is a business hotbed for locally owned sustainability enterprises offering mixed-use housing and many employment opportunities.

5. From Vision to Strategy Building and Implementation

This document provides a vision for the local economy of Tempe. There remain a number of gaps within this vision. Bridging them requires further consultation and feedback from stakeholders before moving forward. Visioning is not a static process and therefore this document remains a working document.

Moving from this vision to strategy building and implementation will require mobilizing community buy-in, identifying investment opportunities, establishing partnerships, and effectively utilizing networks and community assets. In addition, specific outcomes and performance standards/targets, specific actions, and implementation partnerships need to be defined and developed.

REFERENCES

- Arizona Commerce Authority (n.d.). Quality Jobs Tax Credit. Retrieved from:
http://www.employmentincentives.com/state_incentives/documents/Arizona/QJTC-Summary1.pdf
- City of Tempe (2013). General Plan 2040. Community Development Department, City of Tempe. Retrieved from: <https://www.tempe.gov/Home/ShowDocument?id=18990>
- City of Tempe (n.d.). A Brief History of Tempe. Retrieved from:
<https://www.tempe.gov/government/community-services/tempe-history-museum/tempe-history/a-brief-history-of-tempe>
- City of Tempe (n.d.). Arts and Culture. Retrieved from: <https://www.tempetourism.com/things-to-do/arts-culture/>
- City of Tempe (n.d.). Business Expansion and Retention. Retrieved from:
<https://www.tempe.gov/government/economic-development/small-business/business-retention-and-expansion>
- City of Tempe (n.d.). FABRIC. Retrieved from:
<https://www.tempe.gov/Home/Components/FacilityDirectory/FacilityDirectory/318/2856?npage=3&sortn=FCName>
- City of Tempe (n.d.). Sports Recreation. Retrieved from: <https://www.tempetourism.com/things-to-do/sports-recreation/>
- City of Tempe (n.d.). Tourism. Retrieved from: <https://www.tempetourism.com/tourism-benefits-tempe/>
- Edelen, A. (Nov 14, 2014). Tempe small businesses thrive through the decades. AZ Central. Retrieved from: <https://www.azcentral.com/story/news/local/tempe/2014/11/14/tempe-small-businesses-survive-decades/1902552/>
- Hoffman, D. & Rex, T. (2016). *The Impact of Arizona State University Graduates Employed in Arizona in 2015*. [White Paper]. Arizona State University: Center for Competitiveness and Prosperity Research.
- Phoenix Rescue Mission (n.d.). Homelessness in the Valley of the Sun. Retrieved from:
<https://phoenixrescuemission.org/homelessness/>
- John, L. (2016). Local Economic Development Strategic Plan for Laborie. Caribbean Local Economic Development Project (CARILED). Retrieved from: <http://cariled.org/about-cariled/project-description-overview/>
- US Census Bureau (2018). Quick Facts: City of Tempe. Retrieved from:
<https://www.census.gov/quickfacts/fact/table/tempecityarizona/PST045217>

APPENDIX D

IN-VIVO SIMULATION ASSESSMENT MATERIAL

Simulation-based Assessment of Sustainability Entrepreneurship Competencies

Assessment Protocol

Case Title: Expert Review of Local Economic Development in Tempe

Case Description: The students are asked to take on the role of a “Sustainability Enterprises Consulting Group” and respond to a proposal for a local economy stimulation initiative. In this scenario, the proposal was previously developed by another consulting group and submitted to city council. City council is looking for independent advice on the proposal from this consulting group. The group is provided with the detailed proposal and asked to work through a series of questions/prompts with a simulated city council group (“actors”).

This simulation is aligned with the competencies framework in Foucrier & Wiek (2019) and linked to the learning objectives and the content of the course the students completed prior to the examination.

Author(s): Tamsin Foucrier, Prof. Arnim Wiek

Date(s) of Development: 11/27/2018-4/29/2019

Target Audience: Graduate students in courses on sustainable enterprises /sustainability entrepreneurship

Adapted from: UC Irvine Medical Education Simulation Center, UC Regents, 2014

Section 1: Preparation

Basics

Location: City of Tempe, City Hall (Public Works Conference Room)

Number of students (per group): 4-5

Number of actors (per group): 3

Number of examiners: 1-2

Number of “city clerk”/facilitator: 1

Number of note-takers: 1

Roles

City Clerk: Timekeeping, scope of conversation (Tamsin Foucrier)

City Council Member #1 “The Small Business Advocate” – Jake Swanson

This (mock) city council member is familiar with traditional business-as-usual entrepreneurship. He draws on his experience from having successfully started and invested in various small businesses. This city council member obtained an MBA degree through ASU’s WP Carey Business School and completed a 4-week incubator program in Silicon Valley.

City Council Member #2 (CCM2) “The Non-Profit Advocate” – Lauren Kuby

This (mock) city council represents a non-profit approach to addressing social needs in the city. She challenges the role of business in addressing social and environmental issues in the city and advocates for resources to be spent on supporting the non-profit sector. This council member has worked for Mountain Park Health Center in the past and is knowledgeable about the nonprofit sector. She holds a Master's degree in Nonprofit Leadership from ASU.

City Council Member #3 (CCM3) “The Big Business Advocate” – Dr. Braden Kay

This (mock) city council member represents the continued investment and expansion of large corporations in Tempe. He argues that with big businesses come tax revenues for the city and good jobs for community members. This council member has held an executive position at Wells Fargo in the past. He has obtained a Master’s degree in Real Estate Development from ASU. This member has sat at the forefront of legislation that has drawn significant big business investment into the city.

Background Document

A mock 10-page report “Economic Development Vision for the City of Tempe, Arizona” is provided as background material for both students and the actor panel to review before the assessment event. To make the report realistic, it is based on an economic development report from a different city, and was vetted by city officials. The report outlines an initiative to stimulate a sustainable local economy in Tempe benefiting all community members through strengthening micro, small, and medium-sized enterprises, as well as the local governments’ capacities to facilitate local economic development. The report includes city history and background on the city’s economy as well as a vision for a local city economy. It is specified for particular sectors of the economy, including manufacturing/business services, healthcare and biotechnology, art/culture, tourism, as well as sports and recreation.

Please see document “Economic Development Vision for the City of Tempe”.

Guidelines on Asking Questions

All questions (except the final question) should be directed to individual students.

If a student does not know the answer, the professionals/actors should move on to the next student.

Assessment Schedule

Time	Primary Activities	Total time
3:30PM-4:00PM	Room Set-up Food Delivery and Set-up Video/Audio-recording Set-up Jodie waits at front door of city hall to direct students to Public Works Conference Room	30 minutes
4:00-4:10PM	All participants, professionals, and assessors fill out IRB/Model Release Opening Remarks City Council Preparation Check-in Preparation (Students re-review materials)	10 minutes
4:10-4:30PM	Prompt Group 1- Lead: Dr. Braden Kay	20 minutes
4:30-4:50PM	Prompt Group 2- Lead: Lauren Kuby	20 minutes
4:50-5:10PM	Prompt Group 3- Lead: Jake Swanson	20 minutes
5:10-5:30	Prompt Group 4- Lead: Lauren Kuby	20 minutes
5:30-5:40	Prompt Group 5- Lead: Dr. Braden Kay	10 minutes
5:40-5:45	Break	5 minutes
5:45-6:00PM	Debrief/Reflection with participants and professionals/actors	15 minutes
6:00PM-7:00PM	Catering	

Section 2: In-Vivo Simulation

Facilitator Introduction

**** facilitator must Insure all IRB paperwork and releases have been filled out.*

Facilitator begins the session with an explanation of the in-vivo simulation:

Hello all and thank you for being here today. Before we begin the simulation, I want to take an opportunity to thank you for your time today. This is an opportunity to explore and reflect upon what you learned last semester as well as challenge your mastery over the concepts and tools you engaged with during the course. This is also meant as a safe space for you to practice your ability to defend and clarify what you have learned thus far. I want to welcome our actors and thank them for their time and participation today.

Before we begin with the main part of the simulation, you will see before you a local economic development vision for the City of Tempe. During this simulation, you will NOT take on the role of the consultation group that drafted this economic vision, but a different consulting group. Your job will be to defend or clarify many of the components in this vision to the Tempe City Council. In order to do so, we would like to give you 10 minutes to re-familiarize yourself with the report. Please let me know if you have any questions during this time.

[Students re-familiarize themselves with the local economic development vision (10 minutes).]

Opening Remarks (City Clerk/Facilitator)

Simulation begins with opening remarks from City Clerk/Facilitator: Explanation of scope of “meeting” (to provide independent review of proposed local economic development vision for the City of Tempe):

Hello everyone and thank you for taking the time to sit down with us today. We have called this session today under two primary circumstances:

1. The local economic development vision for the city of Tempe was initially drafted by a consulting group last month. Unfortunately, due to unforeseen circumstances, we were unable to continue our collaboration with the firm. In spite of this, we would like to move forward on this vision.
2. We have decided that you, the City of Tempe’s Sustainability Committee, would be the next key asset to draw upon in moving forward with this vision. As the city council, we have been given some time to review this consultation report and would like to take the opportunity to review the report in consultation with this committee. We hope you can give us some clarification and future direction/next steps in this process. Shall we begin?

Prompt Group 1: Local, Living Economy - Lead: Dr. Braden Kay

We have significant business investments throughout the city, from Honeywell to State Farm, that provide the largest employment opportunities by percentage. Why should we focus on stimulating the local economy through small and medium-sized enterprises [Report, p. 11] when we have had such success in attracting large corporations and investments?

- What is a local, living economy [Report, p. 10]?
- What is a local, living economy composed of?
- Can you provide us with an example of an inspirational local, living economy in the U.S.?
- As experts, do you think the city’s vision and goals from the General Plan 2040 [Report, p. 10] are sufficient?

Prompt Group 2: Social Enterprises & Impact Investment - Lead: Lauren Kuby

2.1. Social Enterprises

The City of Tempe has a close-knit non-profit community that helps to serve those who are struggling, overcoming crises, need assistance. The non-profit sector is looking for additional investments and resources to meet social and environmental needs that businesses simply cannot. Why should the city invest in supporting business when those resources could perhaps be better spent on our local non-profit organizations [Report, p. 8]?

- What is a social enterprise?
- Can a social enterprise bridge the gap between the non-profit sector and the business sector?
- Are there different types of social enterprises?

- Can you start a social enterprise in Tempe? How?
- Can you give us an example of a social enterprise in the U.S. that could inspire us?
- What opportunities could social enterprises provide given our demographics in our city [Report, p.6]?
- What are potential shortcomings of social enterprises for our city [Report, p. 10- “Guiding Principles for a Local, Living Economy in Tempe”]?

2.2. Impact Investment

If we were to focus on increasing support for social enterprises in our city, we already have financial support services in place, as listed in the report on page 8. Do we really need other or additional ones as recommended on pages 12-13?

- What might be some shortcomings of the support services we have in place [Report, p. 8-9]?
- What different or additional financial support structures would be necessary [Report, p. 8, p. 12-13]?
- What is impact investment [Report, p. 12]?
- How is impact investment different from traditional philanthropy and traditional investment [Report p. 8]?
- Can you give us an example of an impact investment in the U.S. that could inspire us?
- How do we ensure impact investments lead to the desired outcomes?
- What are other mission-oriented funding sources that social enterprises could tap into?
- How was *Sinagua Malt* in the Verde Valley funded?

Prompt Group 3: Cooperative Businesses & Incubators - Lead: Jake Swanson

3.1. Cooperative Businesses

The report mentions cooperatives as a beneficial business model [Report, p. 11]. From my experience, as businesses grow, they are getting more and more complex. The traditional vertical management structure is efficient and avoids transaction costs. Cooperatives, to my knowledge, have rather weak structures for accountability. How do you ensure that every employee is giving 100% effort? And how do you efficiently solve disagreements and conflicts in cooperatives?

- What is a cooperative?
- Are there different types of cooperatives?
- What is the difference between an employee-owned business and a worker cooperative [Report, p. 11]?
- What are accountability structures of cooperatives?
- What are decision processes in cooperatives? How efficient are they?
- Can you give us some examples of cooperatives in Arizona that could inspire us?
- How do they decide and hold employees accountable?
- How could cooperatives help us achieving the city’s goals from the General Plan 2040 [Report, p. 10]?

- How could cooperatives help provide opportunities for our current demographics in the city [Report, p.6]?

3.2. Business Incubators

Many people in our community might not have heard of cooperatives and our current enterprises are run as traditional businesses, most of them large, multinational corporations – see the report, page 7. Even our small and medium-sized enterprises are traditionally structured businesses. What might we need to help people learn about and navigate starting and running cooperatives here in Tempe?

- Can you start a cooperative in Tempe? How?
- What is a sustainability business incubator [Report, p. 13]?
- How is a sustainability business incubator different from a traditional business incubator [Report, p. 9, p. 13]?
- Why are our existing business incubators (such as RISN, BRIC, Mac6, etc.) inadequate [Report p.9]?
- Can you provide us with an example of a business incubator in the U.S. that could inspire us?

Prompt Group 4: Benefit Corporations - Lead: Lauren Kuby

While cooperatives seem to be promising for our city, we also have large portions of our population that may not be able or interested in being an employee-owner. What might be other options for businesses to contribute to sustainability and a local, living economy in Tempe?

- What is a benefit corporation [Report, p. 12]?
- What is the difference between a benefit corporation and a social enterprise?
- I've heard about B-corps. Are these the same as benefit corporations?
- Is there a law for benefit corporations in Arizona? What does it say?
- Could you name 1-2 third-party standards for benefit corporations?
- How can someone start a benefit corporation in Tempe?
- Can you give us an example of a benefit corporation in Arizona that could inspire us?
- How would benefit corporations specifically contribute to a local, living economy in Tempe [Report, p.10 -11]?

Prompt Group 5: City Priorities - Lead: Dr. Braden Kay

Our next steps as a city are to move from this vision into strategy building and implementation. Given everything we discussed today and your expertise, what elements of the vision [Report, p. 11-13] should we as a city prioritize? Why?

Closing Remarks (City Clerk/Facilitator)

Associated script (City Clerk): Thank you all for your help and guidance today. We will take your valuable input and move forward to a future of a local economy for our city.

Section 3: Debriefing & Reflection

Questions for Participants

1. How did you think this simulation activity went?
2. As a participant, were you able to work through it pragmatically?
3. What did you do well?
4. What could you have done better/differently?
5. What were the strengths of this activity?
6. What could be improved?
7. Now that you have completed this simulation as a participant, how will this change your practice?
8. Any key takeaways?

Questions for Professionals/Actors

1. As a professional/actor, how did you think this simulation went?
2. What were the strengths of this activity?
3. What could be improved?
4. What did the students do well?
5. What could the students have done better/differently?
6. Any key takeaways for our students?

APPENDIX E
EXEMPLARY STUDENT SCORECARD

Assessment Scorecard: Participant 1
Test Assessment #1

Scoring Scale

- <50% is insufficient
- 50% - 70% is sufficient
- >70% is exemplary
- Incorrect answer

<i>Local, living economy</i>		
Question Objective	Assessment determination	Objectives met?
BAU v. TSE for LLE	Sufficient	1/2
LLE definition	Not asked	
LLE components	Not asked	
Example of LLE	Insufficient	1/3
Critical appraisal of city's goals/vision	Sufficient	2/3

<i>Social Enterprises</i>		
Question Objective	Assessment determination	Objectives met?
Investing in non-profits v. social enterprises	Not asked	
Social enterprise definition	Exemplary	1/1
Non-profits v. Social enterprises	Sufficient	3/3
Different types of social enterprises	Not asked	
Example of social enterprise	Sufficient	2/3
Demographic opportunities for social enterprises	Not asked	
Critical appraisal of social enterprises	Not asked	

<i>Impact Investment</i>		
Question Objective	Assessment determination	Objectives met?
Critical appraisal of existing financial support structures	Sufficient	2/4
Identification of additional support structures	Not asked	

Definition of impact investment	<i>Exemplary</i>		1/1
Impact investment v. traditional philanthropy/investment	Sufficient for traditional investing	Insufficient for traditional philanthropy	2/4
Example of incubator	Not asked		
Desired outcomes insured from impact investment	Not asked		
Identification of other funding sources	Not asked		
Investment in Sinagua Malt			

<i>Cooperatives</i>		
Question Objective	Assessment determination	Objectives met?
Accountability in cooperatives	Sufficient	3/5
Definition of cooperative	<i>Exemplary</i>	1/1
Different types of cooperatives	Not asked	
Difference between employee-owned business and worker cooperative	Sufficient	2/3
Accountability structures for cooperatives	Not asked	
Decision processes in cooperatives	Not asked	
Example of cooperative	Not asked	
Cooperative opportunities for city goals/vision	Insufficient	1/2
Demographic opportunities for cooperatives	Not asked	
Business transforming into cooperatives	Insufficient	

<i>Incubators</i>		
Question Objective	Assessment determination	Objectives met?
Necessary support structures for incubation of coops	Not asked	3/5
Key steps in creating coop	Insufficient	1/2

Definition of sustainability incubator	Not asked	
Difference between sustainability incubator and traditional incubator	Sufficient	2/3
Critical appraisal of existing incubation efforts	Not asked	
Accountability structures for cooperatives	Not asked	
Decision processes in cooperatives	Not asked	
Example of incubator	Insufficient	1/3

<i>Benefit Corporations</i>		
Question Objective	Assessment determination	Objectives met?
Identification of benefit corporation	Sufficient	3/5
Definition of benefit corporation	Not asked	
Difference between benefit corporation and social enterprise	Sufficient	2/3
B-Corps v. benefit corporation		
Benefit corporation law in AZ	Incorrect	0/1
Identification of third party standards	Not asked	
Key steps in creating benefit corporation	Not asked	
Example of benefit corporation	Insufficient	1/3
Benefit corporation opportunities for a LLE	Sufficient	2/3

Questions asked: 22/47
 Exemplary answers: 3/22
 Sufficient answers: 12/22
 Insufficient answers: 6/22
 Incorrect answers: 1/22

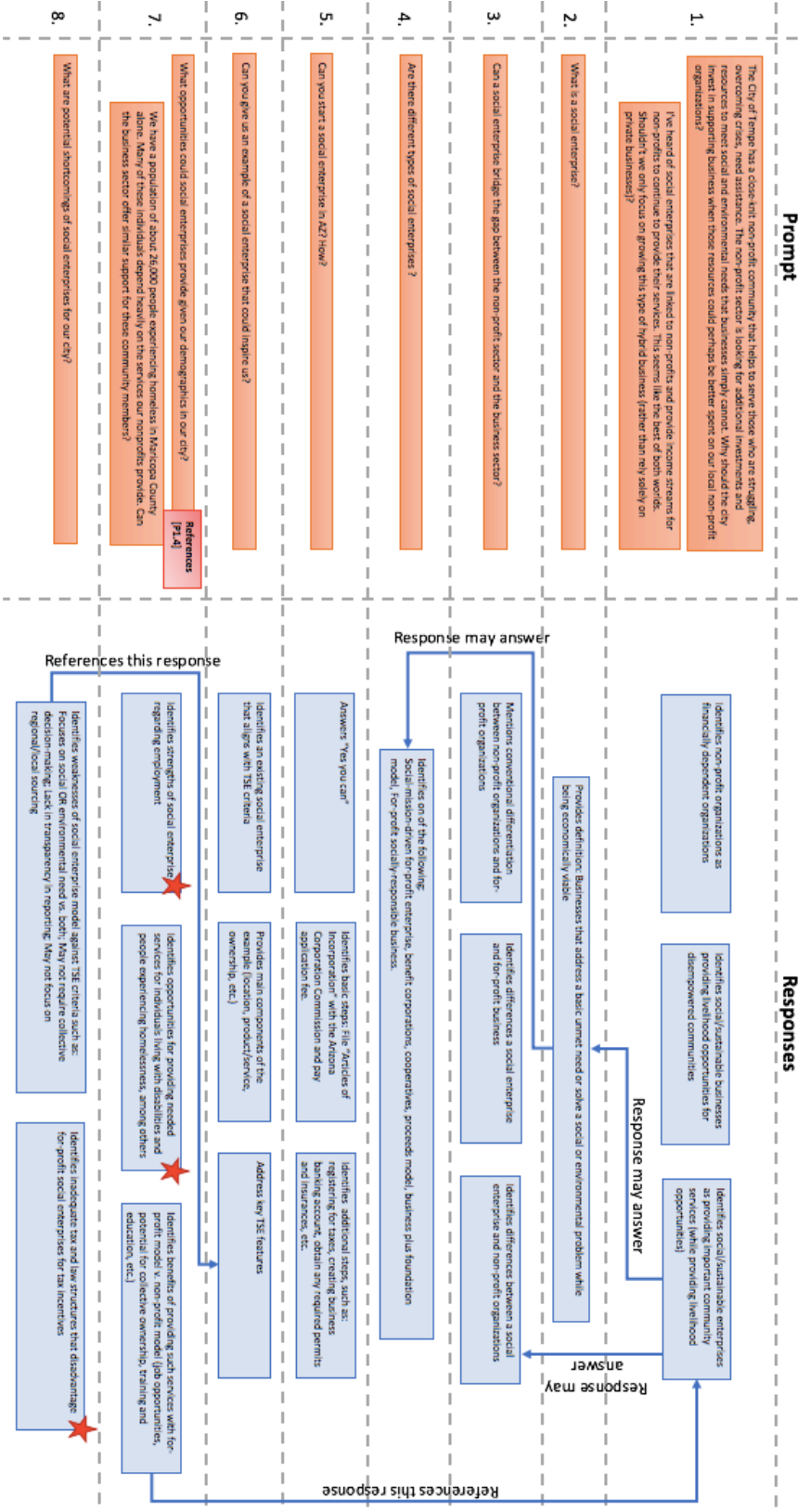
TOTAL SCORE ON ASSESSMENT: 68%

APPENDIX F

EXAMPLE OF ANTICIPATED VS ACTUAL PROMPT AND RESPONSE MAPS

Anticipated Prompt & Response Pathway Map (Prompt Group: Social Enterprises)

★ References assessment material



Test Assessment #2 Actual Prompt & Response Pathway Map (Prompt Group: Social Enterprises)

Prompt	Responses
<p>1. The City of Tampa has a diverse nonprofit community that helps to serve those who are struggling, overcoming crises, need assistance. The nonprofit sector is looking for additional investments and resources to meet social and environmental needs that businesses rarely create. Why should the city invest in supporting businesses when those resources could perhaps be better spent on our local nonprofit organizations?</p> <p>[You heard of social enterprises that are linked to nonprofits and provide income streams for non-profits to continue to provide their services. This seems like the best of both worlds. Shouldn't we only focus on growing this type of hybrid business (where they're getting both types of business)?]</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies social/environmental enterprises as providing important community services (while providing livelihood opportunities) (identifies that businesses can provide non-profit like social services). ✓</p> <p>Identifies social/environmental enterprises as providing livelihood opportunities for those who need additional training, jobs for those who have a conviction. ✓</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Provides definition: Businesses that address a "pressing need or solve a social or environmental problem while being economically viable." ✓</p> <p>Response partially answers</p> <p>Response answers</p>
<p>2. [You're saying that a business can have a social mission as well?]</p> <p>Elizabeth I heard you're suggesting that a B Corp's "matter" if we're making money, as long as we're making the mission matter. That sounds like a reasonable foundation.</p> <p>[I feel you work with a B Corp or social enterprise?]</p>	<p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies different, between a social enterprise and a non-profit organization. ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies different, a social enterprise and a non-profit organization. ✓</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>3. [Can you tell me the difference between a nonprofit and a social enterprise?]</p> <p>Can a social enterprise bridge the gap between the non-profit sector and the business sector?</p> <p>What's that? Nonprofits don't make money? They don't have a goal to make money?</p> <p>Let me just follow up with something you said that wasn't clear between the two of you. You said the social enterprises sort of in a gray area between nonprofit or profit. And then whenever you were talking about starting up one, you said we want to look at options for profit or something like that. Could you just be clear on whether a social enterprise is for profit or not?</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies different, between a social enterprise and a non-profit organization. ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>4. Are there different types of social enterprises?</p>	<p>Identifies one of the following: Social mission driven for-profit enterprise, benefit corporation, cooperative, provision model, business plus foundation model, for-profit socially responsible business. ✓</p> <p>Identifies additional, as regarding for stake, creating business, accounting, potential for required permits and (e.g. etc.). ✗</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>5. Can you give a social enterprise an example?</p> <p>So far we just interpreted "So coming from you, know, identifying the issue is one way but also if you're operating within the logistics of that if your social enterprise?</p> <p>[Think maybe what we're getting at is how are you incorporated? Profit or a social enterprise?]</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>6. Can you give us an example of a social enterprise that could register as?</p> <p>[What opportunities could social enterprises provide? Given our demographic in our city?]</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>7. We have a population of about 26,000 people experiencing homelessness in Manatee County alone. Many of these individuals depend heavily on the services our nonprofits provide. Can the business sector offer similar support for these community members?</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>
<p>8. What are potential shortcomings of social enterprises for our city?</p>	<p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p> <p>Identifies a mix of organizations as financially viable organizations. ✗</p> <p>Identifies benefit corporations + provides definition (clarification of B Corps v. benefit corporations). ✓</p>