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Interdisciplinary Entrepreneurial Leadership Education and the Development of Agricultural Innovators

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Abstract

This article qualitatively explores the potential of entrepreneurial leadership curricula to encourage interdisciplinary interest in agricultural issues and prompt diverse student engagement in agricultural leadership and innovation. The study focuses specifically on the activities and perspectives of 15 undergraduate students who completed an interdisciplinary entrepreneurial leadership course offered at a large land grant university located in the Southwestern region of the United States. The student participants, who worked in teams of two to three to develop innovative solutions to current agricultural challenges, represented 15 different fields of study - 12 of which were outside of the disciplinary scope of agriculture. The potential implications of expanding agricultural leadership education beyond the disciplinary boundaries of the agricultural fields through entrepreneurial leadership curricula are considered. Particular attention is given to the likely implications of interdisciplinary learning on the development of a diverse entrepreneurial workforce that is motivated and equipped to lead in the initiation and implementation of agricultural innovation. The insights generated by the study illuminate the potential benefits associated with the development of interdisciplinary agricultural leadership curricula that supports the training and development of entrepreneurial leaders who can effectively forge and advance agricultural innovation.

Keywords: entrepreneurial leadership; interdisciplinary leadership education; agricultural innovation; agricultural literacy

There is a growing need to train an entrepreneurial workforce that is equipped with the capacity to develop and implement agricultural innovations that are applicable to a wide range of current and forecasted societal problems (e.g., global food insecurity, arid land expansion) (Knudson, Wysocki, Champagne, & Peterson, 2004). Disciplinary silos are not conducive to the development and implementation of such innovations (Bassett-Jones, 2005). Instead, innovation is fostered across interdisciplinary environments that promote the exchange and convergence of diverse ideas and perspectives (Nieto & Santamaria, 2007). The value of interdsiciplinarity has been conveyed through a relatively recent push for increased collaboration between sub-disciplines that comprise the broader field of agricultural education, as well as for increased research partnerships between scholars in the science, engineering, and technology fields and those in agricultural education (Osborne, 2011). Yet, there remains an overall paucity of research that addresses the development and delivery of interdisciplinary agricultural education at the collegiate level. This study responded to this gap in the research by describing a case in which entrepreneurial leadership curricula trained and empowered agriculture and non-agriculture students to become leaders of agricultural innovation.

The most developed line of inquiry specific to agricultural education that involves a level of interdisciplinarity pertains to agricultural literacy. Agricultural literacy research primarily focuses on elementary and secondary education (Hess & Trexler, 2011; Pense, Leising, Portillo,

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& Igo, 2005; Trexler, Hess, & Hayes, 2013). Kovar and Ball (2013) recently called for greater attention to be given to agricultural literacy at the post-secondary level, which is timely considering most college students have been shown to know very little about food and fiber production and consumption (Colbath & Morrish, 2010). Some evidence exists that suggest college student participation in general education courses with agricultural foci can lead to increases in agricultural literacy levels (Birkenholz, Harris, & Pry, 1994). The integration of more diverse perspectives and interdisciplinary interactions into collegiate agricultural education programs has also been positively associated with agricultural literacy development (Parr, Trexler, Khanna, & Battisti, 2007; Trexler, Parr, & Khanna, 2006). In general, however, further research on strategies and models for promoting agricultural literacy at the collegiate level is needed.

The concept of agricultural literacy centers more on knowledge acquisition than on knowledge application. Specifically, agricultural literacy is defined as "possessing knowledge and understanding of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture" (Frick, Kahler, & Miller, 1994, p. 52). Increasing college student acquisition of agricultural knowledge alone would likely fail to meet the growing demand for an entrepreneurial workforce capable of leading in the initiation and implementation of agricultural innovation. Accordingly, interdisciplinary instructional models that provide agriculture and non-agriculture college students with both an agricultural knowledge base and enhanced capacity to lead in the development and application of innovation warrants consideration.

The implementation of innovative processes and products is dependent on the development and execution of entrepreneurial strategies (Mars & Hoskinson, 2013). Entrepreneurial strategy has also been linked to change-oriented leadership styles that include authentic, transformational, and transcendent (Crossan, Vera, & Nanjad, 2008; Jensen & Luthans, 2006; Ling, Simsek, Labatkin, & Veiga, 2008; Hmieleski, Cole, & Baron, 2012; Roomi & Harrison, 2011). Furthermore, leadership has been identified as a critical input to the capacity of entrepreneurs to empower and enable other actors throughout the innovation process (Gupta, MacMillan, & Surie, 2004; Kempster & Cope, 2010). Cogliser and Brigham (2004) describe the primary intersection points of entrepreneurship and leadership as "vision, influence (both of followers and of a larger constituency), leading innovative/creative people, and planning" (p.777). The commonalities and complementary features of entrepreneurship and leadership together frame the conceptual model of entrepreneurial leadership (Bagheri & Pihie, 2010; Roomi & Harrison, 2011).

The respective fields of entrepreneurship and leadership education share a number of similarities. In particular, both are relatively new domains to higher education and each share a common commitment to individual empowerment, as well as to economic and societal development. Interdisciplinary curricula and programs are also highly valued across both fields. For instance, entrepreneurship curricula are commonly offered to both business and non-business students by academic departments located within and outside of business colleges (Kuratko, 2005; Levenburg, Lane, & Schwarz, 2006). Leadership education is also highly diverse and widely dispersed across the instructional domains of higher education (Huber, 2002). Interdisciplinary approaches to entrepreneurship and leadership education have been shown to enhance student acquisition of 21st century workforce competencies, such as cooperation, critical analysis, and problem solving (Bruce & Ricketts, 2008; Scroggs, Sattler, & McMillan, 2009; Wagner, 2012). In general, entrepreneurial leadership curricula and programs have the promise of contributing to the training of an entrepreneurial workforce that is better able to address current and future agricultural challenges.

Purpose

Interdisciplinary entrepreneurial leadership education warrants exploration as an innovative approach to training a diverse workforce that is motivated and equipped to effectively address both current and future agricultural problems (Mars & Torres, 2014). Accordingly, the purpose of this single case study was to qualitatively explore the potential of entrepreneurial leadership education for bringing agriculture and non-agriculture students together to both gain a greater understanding of agricultural issues and develop the leadership skills needed to initiate and implement agricultural innovation. The following two research questions guided the study:

1. How, if at all, does collegiate entrepreneurial leadership education encourage interdisciplinary student understanding of agricultural issues and topics?
2. How, if at all, does collegiate entrepreneurial leadership education encourage interdisciplinary student interest and engagement in agricultural innovation?

Conceptual Framework

The concept of entrepreneurial leadership has emerged as an area of scholarly interest and instructional activity with particular emphasis being directed at the processes and strategies needed to develop and advance innovations of all types (Fernald, Solomon, & Tarabishy, 2005). Gupta, MacMillan, & Surie (2004) define entrepreneurial leadership as, "leadership that creates visionary scenarios that are used to assemble and mobilize a 'supporting cast' of participants who become committed by the vision to discovery and exploitation of strategic value creation" (p. 242). In this regard, entrepreneurial leadership is a relational process that is focused on the facilitation of meaningful change and the creation of economic and/or social value (Roomi & Harrison, 2011). Six constructs frame the general concept of entrepreneurial leadership: vision, influence, creativity, planning, perspective, and interaction. Each construct involves traits that are either common or complementary to both leadership and entrepreneurship.

Vision refers to the capacity of entrepreneurial leaders to inspire and mobilize individuals and stakeholder groups (e.g., investors) through the development and articulation of a desirable future scenario (Cogliser & Brigham, 2004; Gupta, MacMillan, & Surie, 2004). The articulation of an inspirational vision is also a central feature of the charismatic, transformational, and visionary leadership frameworks (Berson, Shamir, Avolio, & Popper, 2001). In the entrepreneurial context, however, vision provides stakeholders with not only clarity and inspiration, but also assurance in the face of risk and uncertainty (Bryant, 2004). Assurance aids in gaining the commitments of followers and contributes to the capacity to marshal the resources necessary to take action despite the risks and uncertainties that are inherent to innovation.

Influence refers to the capacity of entrepreneurial leaders to motivate individuals and groups to collectively act in support of a common goal (Cogliser and Brigham, 2004; Garud, Schildt, & Lant, 2014; Hogg, 2010). On one hand, entrepreneurial leaders must be able to motivate those directly involved in the development and execution of an initiative. On the other hand, the entrepreneurial leaders must be able to compel outside stakeholders who have access to financial, intellectual, social, and/or technological resources to invest in a proposed initiative (Chen, Yao, & Kotha, 2009).

Creativity is a critical input to innovation (Alves, Marques, Saur, & Marques, 2007). Innovation is also the inherent centerpiece of entrepreneurship (Drucker, 1993). Accordingly, the capacity of entrepreneurial leaders to initiate and facilitate the development and execution of innovative strategies demands a strong sense of creativity (Cogliser & Brigham, 2004).

Planning involves entrepreneurial leaders designing, implementing, and revising strategies for the controlled deployment of resources and careful facilitation of processes within and across organizational settings and environments (Cogliser & Brigham, 2004; Sirmon & Hitt, 2009). Entrepreneurial planning is not a uniform process. The risks and uncertainties that are

inherent to innovation require entrepreneurial leaders to plan for multiple scenarios and react to and learn from unexpected events and circumstances (Brinckmann, Grichnik, & Kapsa, 2010).

Perspective refers to the productive convergence of diverse ideas, attitudes, and worldviews during the development and application of innovative solutions and entrepreneurial strategies. Entrepreneurial leaders must be able to operate within contemporary environments that are more diverse, complex, and fluid than ever before (Garud, Gehman, & Giuliani, 2014; Roomi & Harrison, 2011). Access to diverse, cross-disciplinary perspectives provides entrepreneurial leaders with an enhanced capacity to successfully account for and in some cases leverage the complexities that are inherent to contemporary environments.

Interaction with diverse, assorted actors that range from highly influential figures to day-to-day colleagues to the constituents to be served through a proposed initiative provide entrepreneurial leaders with insights on the multiple needs, demands, and motives of relevant actors and groups (Brown & Moshavi, 2005; Kempster, 2009). Accordingly, entrepreneurial leaders are challenged to promote and advance innovation within and between cross-disciplinary learning networks and across social systems that are composed of diverse actors and constituencies (Kempster & Cope, 2010). In general, diverse and multiple interactions, which can be either planned or spontaneous, help to expand the perspectives and improve the skills and knowledge bases of entrepreneurial leaders.

As will be described in the following methods section, the centerpiece of the current study was an undergraduate entrepreneurial leadership course offered to both agriculture and non-agriculture students. The course was structured to equip students with the knowledge and skills associated with each of the six preceding constructs. Thus, the constructs guided my exploration of how entrepreneurial leadership curricula can encourage and equip agriculture and non-agriculture undergraduate students to engage in agricultural content and innovation.

Methods

General Design

I relied on a qualitative, single case study design to conduct the current research. Single case study design allows for the exploration of a phenomenon, in this case interdisciplinary entrepreneurial leadership education, within its relevant context and through a variety of lenses (Creswell, 2009). More specifically, exploratory case study design accommodates multiple perspectives and encourages the discovery of important subtleties and nuances that would otherwise be overlooked during the application of more rigid methodological approaches (Yin, 2003). The flexibility provided by the exploratory design was important to the current study considering interdisciplinary entrepreneurial leadership education has not previously been examined in the context of collegiate agricultural education. The design and methodology was reviewed and approved by the Institutional Review Board of the university at which the study was conducted.

Setting and Population

Qualitative researchers rely heavily on purposeful sampling strategies to bring richness and depth to the cases being explored (Patton, 2002). Two purposeful sampling strategies were used in the current study: theoretical-based and homogenous sampling. Theoretical-based sampling allows researchers to focus specifically on participants and/or conditions that directly reflect the theoretical and/or conceptual constructs that bring focus to a study (Onweuegbuzie & Leech, 2007). Consistent with the premises of theoretical-based sampling, an interdisciplinary entrepreneurial leadership course taught during the 2014 summer term at a large land grant university located in the Southwestern region of the United States (US), which is referred to as "Land Grant University" (LGU), served as the focal point of the current study. The previously

outlined six entrepreneurial leadership constructs that guided this study also framed the interdisciplinary entrepreneurial leadership course. Twenty-eight students were enrolled in the course. Only three of the 28 students were pursuing degree programs housed within a college of agriculture (agri-business, animal sciences, nutritional sciences). The remaining 25 students were pursuing degrees in 19 different fields of study, which ranged from anthropology to marine biology. The overarching goal of the course was to equip the students with the knowledge and skills to lead entrepreneurial change within professional and/or community settings. Toward this end, the curriculum was grounded in an experiential-based learning model that required teams of two to three students to develop an entrepreneurial strategy for addressing a current economic, ecological, or social issue. Hence, the course was conceptually appropriate to the study by being directly anchored in the six concepts of entrepreneurial leadership, interdisciplinary in nature, and oriented toward both the acquisition and application of knowledge and skills.

Homogenous sampling involves the selection of a participant sample using a narrow set of criteria that directly matches the purpose of a particular study (Onweuegbuzie & Leech, 2007). In the current study, six of the 12 course projects involved some degree of agricultural innovation. Consistent with homogenous sampling and the purpose of the current research, I chose to include only the 15 students involved with the six projects as participants in the study. Table 1 lists each of the six teams by a pseudonym and identifies the agriculturally related issue each sought to address through the development of an innovative solution and entrepreneurial leadership strategy. Each member of each team was also assigned a pseudonym in order to ensure individual anonymity.

Table 1.

Entrepreneurial Leadership Teams

Team Name	Area of Focus and Solution-Type
Team Co-op	Preservation of Hawaiian culture through co-operative housing and community gardening.
Team Poaching	Reduction in the poaching rates of endangered species through the development of agricultural economies in the Central African Republic.
Team Hobby Farming	Preservation of family-owned agricultural enterprise through a hybrid model of non-formal agricultural education and agri-tourism.
Team Healthy Truck	Promotion of nutritious diets among college student populations through highly accessible food trucks with healthy, locally sourced menus.
Team Methane	Reduction in air-born methane produced by cattle herds through the development and implementation of zeolite technologies.
Team Hemp	Promotion of hemp-based ventures through the formation of an entrepreneurial incubator to exclusively hemp growers and manufacturers.

The students independently formed their teams based on common interests and complementary skill sets and backgrounds. The disciplinary fields being pursued by the 15 participants included in the study were: agri-business, anthropology, architecture, business management, chemistry, civil engineering, creative writing, economics, electrical engineering, environmental studies, global health, marine biology, nutritional sciences, political science, and veterinary science. Recall that the students majoring in agri-business, nutritional sciences, and veterinary sciences were the only students in the entire class who were enrolled in a college of agriculture degree program. In short, the participant sample was diverse not only based on disciplinary background, but also in terms of professional interests and personal passions.

Data Collection

Data were collected through focus groups, individual interviews, and observations (Creswell, 2009, Merriam, 2009). The protocols for both the interviews and focus groups were directly informed by the six conceptual constructs of entrepreneurial leadership. The interviews and focus groups were audio recorded, transcribed, and summarized. Summaries of the focus groups were shared with the members of each corresponding team, while a summary of each interview was shared with the corresponding participant. Participant feedback and clarification on the summaries was requested in an effort to enhance the trustworthiness of the data.

An initial focus group was held with each team at the beginning of the course and another was conducted with each team at the completion of the course. The focus groups elicited input on the students' understanding, interpretation, and acquisition of entrepreneurial leadership skills and knowledge, probed the benefits and tradeoffs of working in interdisciplinary teams, uncovered commonalities and differences in experiences and perspectives, and explored the implications of the project and course on the levels of student interest in agriculture.

Semi-structured interviews with 14 of the 15 participants were conducted within one month of the course concluding. The fifteenth participant was unavailable for a follow-up interview due to having left the country for a study abroad experience immediately following the course conclusion. The interviews were designed to capture greater insight on how the participation in interdisciplinary entrepreneurial leadership education influenced student concern over and/or enthusiasm for agricultural and agricultural-related challenges and opportunities.

Lastly, as the course instructor, I observed the students within a range of formal and non-formal learning settings (i.e., classroom lectures and guest speaker sessions, field trips, team meetings, final project presentations). I routinely recorded in writing detailed observations and kept daily field notes throughout the duration of the course. In general, garnering data through the preceding three collection strategies provided triangulation across data sources and allowed the phenomenon to be explored from multiple vantage points (Berg & Lane, 2014).

Data Analysis

Analysis was conducted using both deductive and inductive approaches. Deductively, I performed axial coding using a structured coding framework (Miles & Huberman, 1994) that was reflective of the six constructs of entrepreneurial leadership. The coding framework was applied at the idiopathic level to reveal patterns and trends specific to individual informants and teams, as well as at the nomothetic level to reveal patterns and trends common across individuals and teams (Gelo, Braakmann, & Benetka, 2008). The structured framework allowed for analysis specific to the manifestation of the principles and concepts of entrepreneurial leadership in an interdisciplinary learning context. Also, the same framework was useful in revealing the implications of interdisciplinary entrepreneurial leadership education on student concern over and/or enthusiasm for agricultural and agricultural-related challenges and opportunities. The data were also inductively analyzed independent of the structured framework using an open coding

strategy (Locke, 2001). Inductive analysis allowed for the illumination of any relevant patterns or trends not directly reflective of the conceptual framework that guided the study.

Positionality, Trustworthiness, and Limitations

The qualitative researcher is the primary instrument for making sense of the phenomenon being studied. As such, my knowledge, experience, and perspective became primary tools throughout the data collection, analysis, and interpretation processes (Chavez, 2008). In particular, I brought a deep knowledge and rich perspective to the study based on having nearly ten years of experience developing and teaching collegiate-level entrepreneurship courses to students from a wide range of disciplinary backgrounds. I have also developed and taught on multiple occasions an undergraduate agricultural innovation course to agriculture and non-agriculture students. Moreover, I developed and taught the entrepreneurial leadership course that is at the center of the study. Thus, I brought an intimate understanding of how the previously described six entrepreneurial leadership constructs that guided this study influenced the structure, delivery, and anticipated outcomes of the course. By spending extended periods of time with the students across multiple learning settings (i.e., the formal classroom, field trips, team and individual meetings), I was able to observe and record notes pertaining to the students' individual and collective acquisition and processing of the course content. I also have an established and ongoing publication record in the areas of interdisciplinary entrepreneurship education. Thus, my extensive instructional and scholarly experience relevant to interdisciplinary entrepreneurship and agricultural education, as well as my well-established relevant knowledge base, uniquely positioned me to be conduct the study.

While my positionality provided me with a unique and relevant lens through which to conduct the study, the same positioning invited bias. Accordingly, steps were taken to counter the threat of bias and enhance the overall trustworthiness of the analysis and interpretation of the data. Credibility was developed through the triangulation of data gathered from multiple sources (focus groups, individual interviews, observations) (Berg & Lane, 2014), as well as through the prolonged engagement with and persistent observation of the participants (Lincoln & Guba, 1985). Member checking, which involved sharing the interview and focus group summaries with corresponding participants and soliciting their feedback, was also conducted (Creswell & Miller, 2000). Furthermore, credibility was enhanced through the identification of patterns and trends at the individual informant and team levels (idiographic analysis), as well as across all individuals and teams (nomothetic analysis) (Gelo, et al., 2008). Dependability and conformability were addressed through the development of an audit trail, which involved the systematic organization of notes throughout the course of the study on instrument development, raw data collection, and analytical procedures and processes (Lincoln & Guba, 1985).

As with all qualitative research, the findings of the current study are not generalizable (Creswell, 2009). However, the unprecedented insights into the implications of interdisciplinary entrepreneurial leadership education on the development of agricultural innovators outweigh the inability to generalize the findings. More specifically, the insights generated were especially impactful considering the paucity of agricultural education research specific to interdisciplinary agricultural leadership and innovation curricula at the post-secondary level. The purposeful selection strategy also limited the scope of participant perspective to those students who were engaged in entrepreneurial leadership training through a single, unique course. This limitation was countered by the depth and specificity gained through theoretical-based and homogeneous sampling.

Findings

The entrepreneurial leadership course engaged students in all six of the entrepreneurial leadership constructs. Due to the curricular design and experiential structure of the course, the student engagement in the constructs was consistent with my expectations. More importantly, however, was that all of the students indicated the skills linked to each of the constructs were believed to be directly relevant to their primary fields of study. The overarching relevancy of the constructs provided a common platform from which the students could productively merge their diverse academic backgrounds under a common pursuit of agricultural innovation. Furthermore, the data provided indication of how collegiate entrepreneurial leadership education could be used to promote the development of agricultural leaders across the many disciplinary fields that comprise colleges and universities. Four themes emerged from the analysis that bring greater context to the overall findings. These themes are: individual passion, diversity of perspective, sophistication and validation, and agency.

Individual Passion

The three of the 15 participants who were enrolled in a college of agriculture degree program did not force agriculturally related projects on the other members of their teams. Instead, the interests and passions of the individual students on each team converged and led to consensus to pursue entrepreneurial strategies aimed at creating agricultural change. Accordingly, student interest in agriculture and agricultural innovation was observed to be interdisciplinary in nature. The entrepreneurial leadership course provided these students with the opportunity to actively explore and develop their interests in and passions for agriculture.

All but two of the participants described some family history in agriculture. Familial backgrounds in agriculture were diverse and ranged from dairy farming in the Northeastern US to corn and wheat growing in the Midwestern US to sugar harvesting and production on the Hawaiian Islands. In some cases, the students were raised on a farm or ranch. In other cases, students were one to two generations removed from family involvement in agriculture (e.g., a grandparent farmed or ranched).

The students were generally proud of the agricultural chapters in their family histories. The pride sustained participant interest in, passion for, and in some cases concern over contemporary agricultural issues. Carla, a member of Team Hobby Farm, was raised on a Southwestern ranch and was majoring in business management and pre-law. She described her concern over the fate of agricultural land as younger generations lose interest in operating family-owned ranches. This concern was directly relevant to her and her family. Carla stated:

> My dad and uncle are getting older and none of their children are interested in taking the business [ranch] over. That leads to the problem. How can agriculture land be repurposed in a way that supports rather than harms agriculture and the environment?

Carla was among the children in her family choosing to abandon the ranch. However, she was hopeful to pursue a business or legal career that would "somehow help small ranchers and farmers." She followed up this statement by saying, "I just have been unclear how. I feel guilty about this, but I know I will be able to contribute to agriculture somehow in the future." Carla has not lost her agricultural identity or commitment to the agricultural sector despite having no interest in assuming leadership over her family ranch or pursuing an academic path that directly involves agriculture. Family roots in agriculture provided study participants such as Carla with strong motivation to pursue entrepreneurial leadership projects aimed at addressing agricultural challenges. Thus, entrepreneurial leadership education was revealed to be a curricular bridge capable of connecting students such as Carla who reside in academic departments outside of colleges of agriculture with agricultural education and career pathways.

Students sometimes came to view agricultural innovation as a relevant lever for

influencing change in topical areas not directly related to agriculture. For example, Team Co-op aspired to create a strategy for preserving Hawaiian culture and indigenous ways of life through an alternative housing model. Initially, the students proposed a strategy that would replicate community education centers that already existed within many island communities. Through primary and secondary research, the students concluded such centers are rarely successful in enhancing the awareness and preservation of the traditional values and practices of the Hawaiian people. Following several brainstorming sessions, the students proposed the development of a co-housing model that would be designed to deeply immerse residents in the Hawaiian culture and internalize a sustained commitment to both retaining an indigenous identity and developing greater self-reliance. The model included the creation and maintenance of communal garden plots and the development of a farmers' market. The garden plots and farmers' market would be intended to serve as tangible examples of how Hawaiian dependency on imported goods could be reduced through alternative housing and local food production strategies. Tamarah, a member of Team Co-op, stated:

> There is a strong push in Hawaii towards conservation and dependency. I have not heard agriculture included in the push. After this project and talking with students, professors, and leaders with agricultural backgrounds and knowledge, my partner and I see agriculture as an innovative approach to conserving both the island environment and culture.

Team Co-opt did not aim to create agricultural change. Instead, the team turned to agricultural innovation to support the preservation and viability of the Hawaiian culture, as well as the self-reliance of its people.

Similar to Team Co-opt, none of the Team Hemp members were pursuing agricultural careers or were directly interested in leading agricultural change. However, the members shared a common interest in generating public awareness of the promise of hemp as an ecologically sustainable resource and facilitating the plant's use in the manufacturing of products as diverse as clothing and building materials. Julia, a member of Team Help, stated,

> Hemp has so much potential as a renewable resource that can be used to make many, many different things. I feel describing it as a legitimate agricultural crop rather than as marijuana will go a long way in opening up minds.

The entrepreneurial logic and strategies described by Teams Co-opt and Hemp illustrated the potential for non-agriculture students to derive from interdisciplinary agricultural leadership education an appreciation for the practical and strategic relevancy of agriculture to their individual interests and passions.

Diversity of Perspective

The interactions of students with diverse disciplinary backgrounds and perspectives on agriculture had a strong influence on how the teams approached and engaged the entrepreneurial leadership process. When individually asked what agricultural issues most concerned them, the students reported general concern over water scarcity, food insecurity linked to population growth and climate change, and economic conditions that discouraged small family-run, locally based agricultural enterprises. However, nuances in how each student understood such general challenges and interpreted more specific agricultural issues based on distinct academic perspectives and individual worldviews enhanced the creativity and vision that shaped each team project. Such diversity in perspective was observed during a Team Poaching meeting. One student with a political science background expressed concern over the inclusion of a genetically modified seed distribution strategy in the team's solution. The student believed this introduction would create long-term dependencies of Central African Republic (CAR) farmers on global agribusiness. Another Team Poaching member with an economics background responded with the argument that genetically modified seeds will likely become a necessity in CAR as lands in

this region become increasingly inhospitable to natural seeds. Thus, the early introduction of modified seeds would be of strategic importance to the development of a more sustainable agricultural economy in CAR. The students productively exchanged points and counter-points for over an hour. Eventually, agreement over a strategy that would incorporate GMO technologies in ways that sought to protect the economic autonomy of CAR farmers was reached. The likelihood of the success or failure of this particular strategy remains unclear. Regardless, the discussion and negotiation of different disciplinary perspectives and worldviews provided the students with an opportunity to consider their particular agricultural challenge through a more expansive lens, as well as to negotiate a more robust strategy that aligned with their individual and collective interests, values, and commitments.

The value of applying different disciplinary perspectives to a shared agricultural challenge was also illustrated through the evolution of Team Hemp's project. At the outset, the team wanted to focus solely on hemp production. However, the students quickly discovered a number of economic and technological barriers to small-scale hemp production. The team initially considered abandoning the "hemp space" altogether. However, Julia, an architecture student on the team, introduced the other two members (a creative writing student and engineering student) to the growing trend of using hemp as an alternative building material. She stated,

> The other guys had no idea about hempcrete, which can be used as insulation in buildings. Once I told them, a whole new discussion started about just how versatile the plant is. That then sparked the idea for the need for an incubator that would target hemp entrepreneurs from all different backgrounds. It was really exciting!

The creativity and productivity achieved through the convergence of otherwise disconnected disciplinary perspectives, such at that described by Julia from Team Hemp, was consistently observed across all the student teams. Also, the application of multiple lenses to the same problem made the agricultural challenges more relevant and accessible to the individual students.

The diverse perspectives encountered by the students extended beyond the formal classroom. Specifically, each team conducted primary research involving interviews with multiple community and professional leaders. The diverse input achieved through these interviews enriched the project outcomes. More importantly, the students learned the strategic value of capturing expertise beyond the immediate boundaries of their individual fields of interest. For example, Edgar indicated the impetus for including a social media marketing platform as a core feature of Team Healthy Truck came from an interview with a university administrator. Edgar stated:

> Putting ourselves and our ideas out there to professionals and leaders with and without nutritional expertise increased our confidence and broadened the ways we were thinking about both the problem and solution. We would have never thought of using social media technology had we not talked to Dr. Smith and heard about how he used Twitter [social media technology] to identify food deserts within cities.

Edgar's recount was one of the many examples in which engagement with experts and leaders across various areas of expertise enhanced student appreciation for seeking out and incorporating diverse ideas and perspectives within entrepreneurial leadership initiatives involving agricultural innovation.

Similarly, student interaction with those outside of the agricultural fields revealed potential limits to the appeal of solutions and strategies to relevant stakeholder groups. Angie, a member of Team Methane, stated, "many people we shared our solution with did not believe methane produced by cattle could be captured from the air. We realized that we were talking to them too scientifically and gradually learned to boil down our scientific explanations." Also, Tiffany, the second member of Team Methane, described initial difficulties conveying the logic behind why farmers and ranchers would find the value proposition of their solution compelling. According to Tiffany:

> Those who do not own cattle did not realize that methane production can be costly and dangerous to farmers and ranchers. We eventually described a methane tax proposal that would charge cattle owners a per head fee and told a true story of a barn blowing up due to excess methane in order to better get our points across to audience members with no background in agriculture. This was important because we know many of our investors would not be in agriculture.

Overall, the diversity of perspectives captured by the students both within and beyond the formal classroom setting enhanced the entrepreneurial leadership experiences of the students, as well as enriched their agricultural mindsets.

Sophistication and Validation

The convergence of diverse academic backgrounds and personal and professional experiences contributed layers of sophistication to the solutions and strategies developed by each team. In some cases, the diversity of the entire class helped to enhance the robustness of individual team solutions and strategies. For example, Team Poaching consisted of students pursuing degree programs in economics, international relations, and marine biology. These three students initially approached the problem of elephant poaching in Africa through a solution centered on lobbying for global economic policy reform. The team determined this initial solution to be too abstract and overall infeasible. During an in-class brainstorming session, a student outside of the team, which was one of the three agriculture majors enrolled in the course, suggested that a solution anchored in agriculture should be explored considering many local and regional African economies are agriculturally based. A member of Team Poaching stated,

> A solution to boost agricultural productivity within African communities in order to give poachers another way to feed their families was a natural strategy. Although, I do not think we [the team] could have come up with the connection between increased agriculture and decreased poaching on our own. I was surprised about how much I didn't know about agricultural development coming into the course and project considering we talk a lot about agriculture in economics.

Other similar instances demonstrated how the exchange of assorted ideas and perspectives provided greater depth to the agricultural solutions and entrepreneurial strategies being developed by the six student teams. The exchange of ideas across diverse audiences within the formal classroom, during field trips, and throughout primary research in some cases validated the students' work and in other cases revealed minor to significant problems with the proposed solutions and strategies. Thus, the interdisciplinary design of the entrepreneurial course brought greater rigor, realness, and feasibility to the proposed innovative solutions and entrepreneurial strategies.

The three agricultural students in the course also recognized the value of bringing diversity of thought and perspective to agricultural innovation. Alice, a member of Team Hobby Farm, stated,

> The outside [non-agricultural] perspective that Chris brought to our project was so important. If it had just been three agriculture majors working on the project, I don't think we would have been successful. I think we would have been way to narrow and rigid with our focus.

This comment pointed to the value of diverse collaboration during the development of innovative solutions and entrepreneurial strategies that target agricultural transformation. The same comment also illustrated the benefits of interdisciplinary learning on the leadership development of students who are enrolled in colleges of agriculture.

Agency

Through research and analysis, the students developed a relatively deep understanding of the economic, social, and technological issues that underpin the agricultural challenges that were individually addressed through the entrepreneurial leadership projects. For example, Chris, a member of Team Hobby Farm and a civil engineering major, stated,

> I have a deep passion for water resource management. We rarely discuss how water resource technology fits in with agriculture. I now find that surprising. My work on this project has given me a greater appreciation for how important it is to develop better engineering strategies for efficient water usage of farms and ranches.

Chris's comment illustrated how the research needed to creatively develop, analytically validate, and effectively convey an entrepreneurial vision inherently pushed the students to become more knowledgeable about agriculture (i.e., more agriculturally literate).

In addition to gaining an increased understanding of some of the agricultural challenges facing society, the students also emerged from the course with the self-confidence and empowerment needed to lead in the initiation and implementation of innovation. For instance, Lenny, a member of Team Hemp and creative writing major, stated

> I never thought of myself as an entrepreneur or even a person who could actually create some kind of positive change. Now I think I could definitely do both. I see entrepreneurship not about making money but rather a process for creating impact and solving problems. I can really see myself doing that!

This identification with the tenants of entrepreneurial leadership, which was described to some degree by nearly all of the students, transferred into individual agency as recognized by the capacity of individuals to effectively act in autonomous ways (Emirbayer & Mishe,1998). Specifically, the students regularly indicated having acquired through the course the ability and confidence to identify and act on opportunities for change, as well as the intrinsic motivation to actually do so in the future. In this regard, the learning outcomes of the entrepreneurial leadership experience transcended the acquisition of agricultural awareness to involve the development of the skills, confidence, and motivation to lead in the development and advancement of agricultural innovation.

Conclusions and Implications

The cross-disciplinary relevancy of the knowledge and skills linked to each of the six entrepreneurial leadership constructs that structured the course and guided my analysis served as a common platform from which students with diverse academic backgrounds and professional aspirations could work together in pursuit of agricultural innovation. The interdisciplinary bridge created through the entrepreneurial leadership course provided the non-agriculture students with the opportunity to actively consider agricultural conditions and challenges through their respective disciplinary-based lenses and personal worldviews, as well as those of others. Moreover, the same bridge spurred agriculture students to consider issues of food and fiber production and consumption through the viewpoints of peers with little to no formal agricultural background or training. Accordingly, the promise of entrepreneurial leadership education as a model for engaging students both within and outside of colleges of agriculture in the interdisciplinary exploration of agricultural topics, issues, and challenges has been illustrated.

The synergy between interdisciplinarity and entrepreneurial leadership is powerful both in terms of student learning and the empowerment and expansion of a diverse workforce that is equipped with the skills, knowledge, and confidence required to confront the many complex agriculturally oriented problems and issues that continually challenge society. Accordingly, collegiate agricultural educators are encouraged to develop and implement entrepreneurial leadership curricula that simultaneously appeal to students within and outside of colleges of

agriculture. The study supported this proposition and illustrated the promise of entrepreneurial leadership as an interdisciplinary framework aimed at preparing a diverse agricultural workforce equipped with the skills to lead in the initiation and implementation of agricultural innovation.

In closing, the insights generated from the study pointed to entrepreneurial leadership as an effective framework for exposing students from across the disciplinary landscape of colleges and universities to agricultural issues, as well as engaging them in agricultural leadership and innovation. Agricultural education scholars and practitioners are encouraged to explore methods for infusing entrepreneurial leadership concepts and principles into existing leadership curricula and to use such curricula to develop feasible channels through which students outside of colleges of agriculture can engage in agricultural leadership education. Quantitative examination of learning outcomes should be conducted throughout the development and implementation of interdisciplinary entrepreneurial leadership programs by agricultural education and leadership departments. Student acquisition of the skills associated with each of the six entrepreneurial leadership constructs that guided the study should be included in such learning outcome assessments. Lastly, follow along studies designed to assess the capacity of students with entrepreneurial leadership training to effectively lead in the initiation and implementation of agricultural innovation following degree completion should also be maintained.

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