

Interdisciplinary Communities of Practice:
A Blended Learning in Higher Education Model

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Word Count: 17,755

Thesis submitted in partial fulfillment of the requirements for the degree of
Master of Science in Higher Education

"Your planet is very beautiful," [said the little prince]. "Has it any oceans?"

"I couldn't tell you," said the geographer...

"But you are a geographer!"

"Exactly", the geographer said, "But I am not an explorer. I haven't a single explorer on my planet. It is not the geographer who goes out to count the towns, the rivers, the mountains, the seas, the oceans, and the deserts. The geographer is much too important to go loafing about. He does not leave his desk."

- Antoine de Saint-Exupéry (The Little Prince, 1943, p. 63-64)

Acknowledgements

Within the education department, I would like to thank my supervisor Dr Ian Finlay and course advisor Dr Hubert Ertl for their help and guidance throughout my dissertation process. At the Environmental Change Institute, I would like to thank the IFSTAL team for allowing me to complete my dissertation about IFSTAL and its influence on students' interdisciplinary learning. In particular, a special thank you to Dr Rebecca White, who inspired me to get involved in the programme and supported me throughout this research process.

I would also like to thank all of the postgraduate students involved with IFSTAL who participated in the focus group, interviews and survey. These individuals provided valuable insight about their experiences engaging with IFSTAL, offering positive feedback and beneficial suggestions of ways to enhance the programme for future years.

Finally, a big thank you to my family. Without you, this opportunity to study at the University of Oxford would not have been possible. I appreciate all of your support, patience and encouragement throughout my time here.

Abstract

This study investigates *Innovative Food Systems Teaching and Learning*, a postgraduate programme designed by the University of Oxford in collaboration with four higher education institutions. The programme aims to provide food systems teaching and interdisciplinary learning opportunities, to facilitate high-level knowledge and skills needed to understand, analyze, communicate and address complex systems-based efficiency, resiliency and sustainability challenges within the UK and globally. The purpose of this research study is to explore the ways in which the programme facilitated students' interdisciplinary learning outcomes within a community-based, blended learning environment. The study incorporates a variety of qualitative data collection methods including a focus group, interviews and survey, to capture students' in-depth interdisciplinary learning experiences associated with the programme. The findings indicate many ways in which IFSTAL demonstrated a successful community of practice and blended learning design, promoting students' interdisciplinary learning. However, participants identified some barriers and offered recommendations to improve the programme and further enhance interdisciplinary learning outcomes. The programme's in-person settings facilitated students' interdisciplinary learning but the virtual learning environment presented conflicting findings across the data collection methods, requiring further investigation.

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Introduction

1.1 Research Context

Across the world there are over 1 billion people starving, 2 billion with low nutrition and 2.5 billion overweight and obese (CWFS, 2014; UNEP, 2014; USDA, 2015; FAO, 2014; Porter et al., 2014b, Graham, Spring & Welch, 2014; Pinstrip-Anderson, 2009; Barrett & Bevis, 2015; Ng et al., 2014; Brown et al., 2015). This health and quality of life paradox is related to a variety of demographic, economic, political, environmental, cultural, infrastructural and behavioural issues (HLPE, 2014; UNEP, 2014; Porter et al., 2014b; Brown et al., 2015). In addition to food security and public health concerns, there are major challenges associated with food production, with 20% of greenhouse gas emissions attributed to agriculture, land degradation on the rise by 24%, 75% of water extracted for irrigation, and 70% of fish populations overexploited or depleted (FAO, 2014; Porter et al., 2014b; USDA, 2014; Brown et al., 2015). Beyond food production, there are major environmental impacts associated with processing, packaging, distributing, selling and consuming food (USDA, 2014; Brown et al., 2015). Food systems challenges such as food security and environmental degradation, are some of many food-related problems across the world. With ongoing food demand and climate change, these challenges will only continue to grow. As a result, there is an increasing demand for food system efficiency and sustainability, taking into considering major social, political, financial and environmental concerns. All levels of the food system are faced with ongoing challenges, requiring a broad interdisciplinary understanding of the food system to offer interventions at varying points within.

With problems across many points within the food system, governments have begun to prioritize the delivery of post-graduate level knowledge and skills pertaining to food systems topics to address these issues (Ingram, 2015). It is beneficial to provide interdisciplinary food systems education and training for graduating professionals entering the workforce, to be able to respond to system challenges. Yet, there is no single higher education institution in England offering an interdisciplinary food systems training approach to address food-related problems such as food security, environmental outcomes, policy and governance (Ingram, 2015). Although some universities offer postgraduate programmes pertaining to particular aspects of the food system, these programmes often target a specific branch of knowledge, point of view or subject area using a narrow disciplinary lense. In response to this need for holistic, interdisciplinary education to address complex food systems issues, the University of Oxford in

collaboration with four universities developed a programme known as Innovative Food Systems Teaching and Learning (IFSTAL). The aims of the programme seeks to gather a community of primarily postgraduate students, academics and professionals with varying disciplinary backgrounds, to interact and address food systems challenges within the UK and beyond. The programme offers a blended learning environment with food systems teaching, innovative research and interdisciplinary collaboration amongst its members. In turn, delivering high-level knowledge and skills to understand, analyze, interact and address complex, interdisciplinary and systems-based efficiency, resiliency and sustainability challenges (Ingram, 2015).

The following research aims to investigate IFSTAL's first year of implementation, gathering students' perspectives and opinions of their interdisciplinary learning associated with the programme. The study incorporates qualitative data collection methods involving a focus group, interviews and survey, to capture students' experiences. Participants' descriptive data is conceptualized into Spelt, Biemans, Tobi and Luning (2009) Presage, Process and Product Model, to explore the interactions between student, environment, learning process and interdisciplinary outcomes. The research distinguishes which components of the programme such as the lectures, post-lecture discussions, virtual learning environment, away-day events and lunch events, facilitate students' interdisciplinary learning outcomes. In addition, the research identifies any potential barriers associated with the programme and students' interdisciplinary learning process. To address these barriers, students are prompted to recommend solutions to improve the programme for future years and further support interdisciplinary learning outcomes.

The interdisciplinary, cross-institutional nature of IFSTAL intends to bring together a community of academics to engage in a process of social interaction and collaborative learning surrounding common interests, topic areas or problems pertaining to food systems (Eckert, 2006; Wenger, 2006; Cambridge, Kaplan & Suter, 2005; Wenger-Trayner, 2015). The following research study seeks to identify the ways in which the programme demonstrates a community of practice, taking into consideration Wenger's (2006) seven actions needed to cultivate a successful community. Through the use of a focus group, interviews and survey, descriptive data derived from participants presents ways in which the programme facilitated an effective community of practice and offers recommendations to improve its learning practice.

This research study also investigates the programme's innovative blended learning environment in relation to students' interdisciplinary learning outcomes. The blended learning environment is comprised of face-to-face learning opportunities such as instructor-led lectures, post-lecture discussions, away-day and lunch events, alongside online learning contexts via the virtual learning environment to engage with streamed lectures, forums, chat rooms, quizzes, virtual activities, newsletters, blogs and other learning platforms. Through the qualitative data collection procedures, participants' experiences engaging with the in-person and online components of the programme are explored. Participants' descriptive data highlights the ways in which the blended learning design influenced their interdisciplinary learning outcomes.

1.2 Research Questions

This research study plans to address the following research questions:

- 1) In what ways does IFSTAL facilitate students' interdisciplinary learning?
 - a) Are there any barriers associated with the programme and students' interdisciplinary learning outcomes?
 - b) How can these barriers be addressed?
- 2) How does IFSTAL demonstrate an effective community of practice?
 - a) What aspects of the programme should be improved to establish an effective community of practice?
- 3) In what ways did IFSTAL's blended learning design impact students' interdisciplinary learning outcomes?

1.3 Dissertation Structure

The following research begins with a brief overview of IFSTAL, including its organization and structure. The study then provides a theoretical background regarding communities of practice, interdisciplinarity and blended learning models, to offer a literary basis relevant to the programme. Following this literature review, the methodology of the research is presented which includes an overview of the research, qualitative approach, setting and participant information, data collection and analysis procedures, and ethical considerations. The study then presents the research results and discussion in a combined format using Spelt et al. (2009) interdisciplinary learning model. This model includes a presage section highlighting participant information and programme learning environments, a process section discussing the programme supports, barriers and proposed solutions, and a product section presenting students' interdisciplinary learning outcomes. Students' interdisciplinary learning outcomes

associated with the blended learning structure of the programme are then further discussed. Following the results and discussion, the dissertation finishes with a conclusion.

Literature Review

2.1 Introduction

This chapter begins with an overview of IFSTAL, presenting its cross-institutional affiliations, postgraduate focus, interdisciplinary nature, learning objectives, blended design and research aims. After the programme overview, key literature regarding communities of practice is critically analyzed, offering a theoretical framework to evaluate the success of IFSTAL's community of practice. Relevant literature pertaining to interdisciplinarity is explored and synthesized to provide a clearer conceptualization of the concept. The research also presents a comprehensive interdisciplinary model to investigate students' interdisciplinary learning outcomes associated with the programme. Finally, current research on blended learning design is discussed, providing deeper understanding of IFSTAL's innovative in-person and online learning environments.

2.2 Overview of IFSTAL

IFSTAL is a government funded programme established in 2015 by the University of Oxford in partnership with four other universities including City University London, University of Reading, University of Warwick and Leverhulme Centre for Integrative Research on Agricultural Health. The project offers innovative methods of collaborative cross-institution teaching to facilitate the holistic study of social, economic, biological, environmental and business-related food systems topics (Ingram, 2015). The objectives of the programme are to challenge postgraduate students to integrate their specialized disciplinary areas of study within the broader food systems context. This interdisciplinary educational opportunity also aims to prepare students to enter the professional workforce with skills and knowledge to make a contribution towards food policy and practice (Ingram, 2015).

IFSTAL is comprised of both online and in-person learning environments, establishing many opportunities for knowledge exchange, innovative research collaboration and multi-university interaction to address interdisciplinary food systems topics and issues. The programme offers lectures, an interactive virtual learning environment with resources, access to a wide range of food systems professionals, cross-institutional activities and events, a summer school and post-graduate internship opportunities. For the basis of this dissertation, the primary focus will be on the lectures, post-lecture discussions, virtual learning environment, lunch events and activity days, as these have been core aspects of the programme. Since the programme is still in its initial stages, components such as the summer school and internship opportunities cannot be

evaluated, as they have not occurred. As a result, the focus of this research will be primarily investigating the aspects of the programme that are fully developed with active student engagement.

2.3 Communities of Practice

The interdisciplinary, cross-institutional nature of IFSTAL attempts to develop a collaborative community of academics, researchers and professionals to address food systems challenges. Breaking away from the silos of disciplinary entrenchment and individualized learning outcomes found within many university environments, IFSTAL aims to bring together a group of people from a variety of backgrounds through interactive events, activities, lectures and online mediums, to facilitate interaction and collaboration amongst individuals addressing common problems pertaining to food systems (Plank, Feldon, Sherman & Elliot, 2011; Pharo, Davidson, McGregor, Warr & Brown, 2014; Clark & Wallace, 2015; Schaffer, Lei & Paulino, 2008; Jacob, 2015). The nature of the programme is grounded in the theoretical framework of cognitive anthropologists Lave and Wenger (1991) Communities of Practice. This theoretical concept involves a collection of people engaging in a process of ongoing learning, due to a common endeavor, interest or problem (Eckert, 2006; Wenger, 2006; Cambridge, Kaplan & Suter, 2005; Wenger-Trayner, 2015). Communities of practice facilitate collaboration, learning and knowledge generation through social interaction (Cambridge et al., 2005). Through active participation in social communities, individuals are able to share mutual knowledge, discuss frameworks, offer perspectives and develop new understandings surrounding a common interest in a particular domain (Cambridge et al., 2005; Pharo et al., 2014).

According to Wenger (2006), in order to develop a community of practice the following three main characteristics must be present: a domain of knowledge, notion of community and practice. These three characteristics are demonstrated within IFSTAL's community of practice approach. The domain of knowledge is not simply a group of friends or a network of people, but an identity defined by a community of individuals with a shared domain of interest (Wenger, 2006). IFSTAL is comprised of a group of postgraduate students with a shared domain of interest in food systems topics and challenges. This domain of knowledge encourages participation, guides learning and facilitates meaning (Wenger, 2006). Whilst members pursue their common domain of interest, individuals engage in joint activities, discussions, information sharing, collaborative learning and relationship building, known as a community (Wenger, 2006).

Within the IFSTAL programme, post-lecture discussions, away-day activities, internships, summer school, and online interactive environments are some of the many ways in which the programme facilitates discussions, information sharing, dissemination of knowledge and collaborative relationships, centering around food systems thinking. Not only is a community of practice a group of individuals with a common interest, but members are practitioners (Wenger, 2006). This practice is developed over time through sustained interaction, shared resources, experiences, stories, tools and more (Wenger, 2006). IFSTAL offers an interactive platform for practitioners to share their knowledge, resources and experiences, through various in-person and online mediums. With an identified domain of knowledge, notion of community and practice, IFSTAL clearly demonstrates the three characteristics of a community of practice.

Although IFSTAL may be conceptualized as a community of practice, its success is dependent on the purpose, objectives, interests and resources of the community. When designing an effective community of practice, Wenger, McDermott & Snyder (2006) highlight seven actions needed to cultivate a successful community:

- 1) "Design the community to evolve naturally - Because the nature of a Community of Practice is dynamic, in that the interests, goals, and members are subject to change, CoP forums should be designed to support shifts in focus.
- 2) Create opportunities for open dialog within and with outside perspectives - While the members and their knowledge are the CoP's most valuable resource, it is also beneficial to look outside of the CoP to understand the different possibilities for achieving their learning goals.
- 3) Welcome and allow different levels of participation - Wenger identifies 3 main levels of participation. 1) The core group who participate intensely in the community through discussions and projects. This group typically takes on leadership roles in guiding the group 2) The active group who attend and participate regularly, but not to the level of the leaders. 3) The peripheral group who, while they are passive participants in the community, still learn from their level of involvement. Wenger notes the third group typically represents the majority of the community.
- 4) Develop both public and private community spaces - While CoPs typically operate in public spaces where all members share, discuss and explore ideas, they should also offer private exchanges. Different members of the CoP could coordinate relationships among members and resources in an individualized approach based on specific needs.
- 5) Focus on the value of the community - CoPs should create opportunities for participants to explicitly discuss the value and productivity of their participation in the group.
- 6) Combine familiarity and excitement - CoPs should offer the expected learning opportunities as part of their structure, and opportunities for members to shape their learning experience together by brainstorming and examining the conventional and radical wisdom related to their topic.

- 7) Find and nurture a regular rhythm for the community - CoPs should coordinate a thriving cycle of activities and events that allow for the members to regularly meet, reflect, and evolve. The rhythm, or pace, should maintain an anticipated level of engagement to sustain the vibrancy of the community, yet not be so fast-paced that it becomes unwieldy and overwhelming in its intensity” (as cited in Monaco, 2013, p. 2-3).

For the purpose of this research, it is not intended to directly focus on evaluating IFSTAL’s community of practice and its success. However, the effectiveness of the programme’s community of practice may come into discussion if elements of the community influence students’ interdisciplinary learning. As a result, Wenger et al. (2006) seven actions necessary to cultivate a successful community of practice will be considered when evaluating students’ perceptions of the programme and its impact on their collaborative interdisciplinary learning.

2.4 Interdisciplinarity

IFSTAL’s community of practice approach facilitates social interaction and collaboration amongst its members to address food system challenges, which aims to promote interdisciplinary engagement and learning. As mentioned previously, IFSTAL offers lectures covering a variety of food systems issues, an interactive virtual learning environment with resources covering a variety of topics, access to a wide range of food systems professionals, cross-institutional events, summer school and post-graduate internship opportunities. Through active participation, individuals have the opportunity to engage with a variety of academics, researchers and professionals ranging in disciplinary backgrounds. Moreover, the educational content is extracted from a variety of disciplinary topics, with aims to build converging knowledge, negotiate perspectives and develop new understandings. The proposed research intends to obtain the opinions and perspectives of students who have engaged in the programme, to delve deeply into addressing the extent to which the programme has facilitated their interdisciplinary collaboration and learning.

In order to begin the process of acquiring students’ perspectives regarding IFSTAL’s impact on their interdisciplinary learning, it is important to offer strong theoretical background and conceptualization of interdisciplinarity. Terms such as multidisciplinary, interdisciplinarity and transdisciplinarity are regularly presented across the literature, but can often become interchangeably used and ambiguously defined (Bernard & Anita, 2006; Clark & Wallace, 2015; Pharo et al., 2014; Nissani, n.d.). According to Bernard and Anita (2006), multidisciplinary draws on knowledge from a

variety of disciplines. However, this knowledge does not converge and stays within its disciplinary boundaries (Clark & Wallace, 2015). Using a creative example involving food, multidisciplinary can be seen like a salad bowl, with ingredients remaining intact and clearly distinct (Bernard & Anita, 2006). Unlike multidisciplinary, interdisciplinarity analyzes, synthesizes and forms connections between disciplines, “establishing a new level of discourse and integration of knowledge” (Bernard & Anita, 2006, p. 355; Klein, 1990; Clark & Wallace, 2015; Spelt, Luning, Van Boekel & Mulder, 2015; Berg-Weger & Schneider, 1998; Bronstein, 2003). In other words, interdisciplinarity is like a melting pot or fondue, where the ingredients combine but are still partially distinguishable (Bernard & Anita, 2006). Whereas transdisciplinarity integrates a variety of disciplines, transcending their traditional boundaries by creating a succinct and coherent whole (Bernard & Anita, 2006; Clark & Wallace, 2015). In this case, transdisciplinary is like cake, where the initial ingredients are no longer identifiable within the final product (Bernard & Anita, 2006). To put these multi disciplinary terms into context, IFSTAL aims to move beyond multidisciplinary, as the programme intends to promote disciplinary collaboration, synthesis of subject areas, reciprocal interaction and other distinctly innate attributes of interdisciplinarity. Yet, the programme does not intend to progress to transdisciplinarity, where disciplines are no longer present, losing individual's unique disciplinary backgrounds, knowledge, perspectives and experiences that are inherently valuable. As a result, IFSTAL offers an interdisciplinary community of practice approach to connect postgraduate students from varying disciplinary fields to interact and synthesize knowledge.

Interdisciplinary approaches aim to solve real world problems, address complex challenges and offer differing perspectives (Bernard & Anita, 2006; Clark & Wallace, 2015). Interdisciplinarity shifts away from a single discipline derived from artificially fragmented knowledge not usually found in real life, that is often associated with a specific branch of knowledge, instruction or learning (Bernard & Anita, 2006). World issues are rarely confined to a particular academic discipline (Bernard & Anita, 2006). In order to tackle real life problems such as food systems challenges, integration of a variety of social, environmental, industrial, scientific, educational and other disciplinary knowledge is needed to address current issues to their full complexity (Clark & Wallace, 2015). For example, food waste is a major issue across the UK, with one third of purchased food and water thrown away (DEFRA, 2016). In order to tackle this challenge, various aspects of the food system need interdisciplinary action from production to

consumption. At a production level, one solution may be to improve harvesting techniques, needing technological innovation, engineering skills, agricultural knowledge and more (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014). At the consumer level, supermarkets could change their policies on the size and shape of fruit and vegetables to reduce waste, requiring business and policy related knowledge (Berdegue, Balsevich, Flores, & Reardon, 2005). As a result, real world problems benefit from an interdisciplinary approach, gathering teams of experts from a variety of disciplines to contribute their specialized knowledge and understanding to address complex problems (Bernard & Anita, 2006; Spelt et al., 2009; Dias, Dias & Lima, 2006; Barth, Godemann, Rieckmann, & Stoltenberg, 2007). An interdisciplinary method also provides differing perspectives on the problem (Dias et al., 2006; Lattuca, Voigt, & Fath, 2004). Experts with a specialization in one disciplinary subject will likely offer a differing perspective than those with expertise from another disciplinary background (Bernard & Anita, 2006). Addressing a problem through a variety of perspectives can be particularly valuable in offering a sustainable solution (Fortuin, Karen & Bush, 2010).

Interdisciplinarity has become a driving force in today's knowledge-based society, increasing contemporary knowledge production and interactive collaboration across fields through an integrative disciplinary approach (Mansilla & Duraisingh, 2007; Park & Son, 2010). In turn, interdisciplinarity has become common practice within higher education contexts, with aims of preparing young adults with the skills and knowledge needed to engage with major problems of our time (Spelt et al., 2009; Park & Son, 2010). Yet, there are a significant lack of educational frameworks and empirical research surrounding teaching and learning within interdisciplinary higher education contexts (Spelt et al., 2009). In particular, the ways in which interdisciplinary higher education programmes influence students' learning outcomes. In response to this gap in the literature, Spelt et al. (2009) designed a comprehensive model based on the theoretical background of Biggs (1993) for investigating teaching and learning in interdisciplinary higher education contexts (see Figure 1). This model includes four interactive components: student, learning environment, learning process, and learning outcomes (Spelt et al., 2009).

- 1) "Student: Student characteristics are brought into the learning environment by the students, for instance, prior knowledge and skills
- 2) Learning Environment: Addressed situational characteristics like teaching and assessment methods, which are decided by the institution, curriculum, and course developers

- 3) Learning Process: Characteristics and learning activities, such as the sequencing of specific learning activities
- 4) Learning Outcomes: Interdisciplinary thinking and represented subskills that constitute the complex cognitive skill interdisciplinary thinking” (Spelt et al., 2009, p. 2)

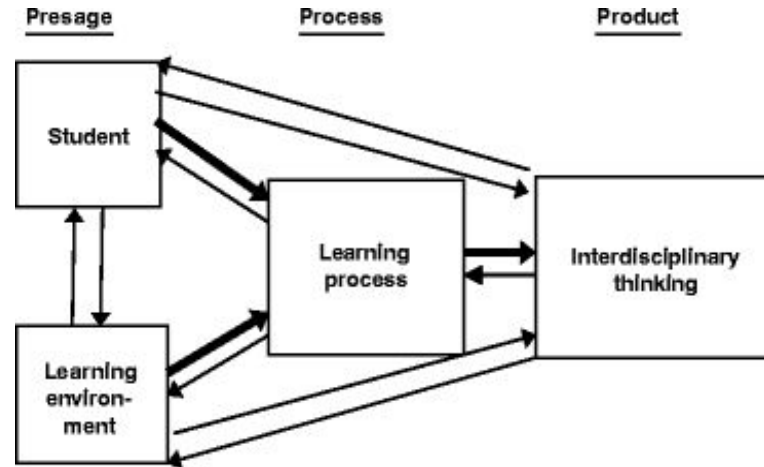


Figure 1 Theoretical Framework adapted from Biggs (1993)

The interactive model shown in Figure 1 depicts a systematic process of interdisciplinary learning. Within the presage level, the student and learning environment come prior to the learning process (Spelt et al., 2009). These components interact with the learning process level, involving the production of activities that students engage with, within a given learning task. Through the learning process, students reach the final product stage demonstrating interdisciplinary thinking and learning outcomes (Spelt et al., 2009). Learning outcomes are largely dependent on the interaction between the student, environment and process components (Spelt et al., 2009). This model offers a strong empirical framework for conceptualizing interdisciplinary teaching and learning. Within the context of this study, the model will be utilized as a tool to classify the presage, process and product stages of students' interdisciplinary learning facilitated by IFSTAL's community of practice.

2.5 Blended Learning Model

Interdisciplinary communities of practice come in a variety of forms, with both face-to-face and online learning environments. IFSTAL offers an innovative interdisciplinary community of practice that incorporates a blended learning design (Spelt et al., 2009). IFSTAL's learning environment includes physical formats such as instructor-led lectures, away-day, summer school, lunchtime seminars and other

networking opportunities (Singh, 2003). The programme also offers online platforms with interactive live-stream lectures, instant messaging forums and chat rooms, alongside self-paced asynchronous formats such as online documents, web pages, quizzes, surveys, lecture recordings, virtual activities, online calendar, social media outlets, participant profiles, email newsletters and blog posts (Singh, 2003). The following research study attempts to address IFSTAL's blended learning design, to critically analyze the ways in which it has impacted students' interdisciplinary learning outcomes.

A blended learning environment is comprised of a mixture of face-to-face and online learning components (Cooner, 2011; Porter, Graham, Spring & Welch, 2014; Graham, Woodfield & Harrison, 2013). This increasingly effective curriculum strategy provides a variety of mediums to facilitate interdisciplinary teaching and learning within higher education contexts (Cooner, 2011; Cooner & Hickman, 2008; Quinney, Hutchings & Scamell, 2008; Pack, 2010; Cooner, 2010; Lopez-Perez, Perez-Lopez & Rodrigues-Ariza, 2011; Graham et al., 2013). Current research involving blended learning models has highlighted the benefits of using multiple learning delivery mediums (Singh, 2003). A single learning method limits the reach of a programme, engagement, social contact, instructional choice, and relevant context needed for interactive and collaborative interdisciplinary learning (Cooner, 2011; Singh, 2003; King, Taylor & Carbonaro, 2008). A blended learning model with a virtual learning community enables greater flexibility and access, by extending its reach to audiences at a greater distance, offering virtual space to accommodate large groups, and enabling those who could not engage at a particular time to participate through online technology (Singh, 2003; Cooner, 2011; Perez-Lopez et al., 2011; King et al., 2008; Graham et al., 2012; Picciano, 2009). Information and communication technologies within a blended learning design can overcome issues of place, space and time, creating convenient opportunities for interactive, collaborative and meaningful interdisciplinary learning (Cooner, 2011; King et al., 2008; Picciano, 2009). A blended method of learning also offers distinct advantages over exclusively online-based learning. Unlike technology-based environments, in-person learning opportunities promote meaningful engagement with other students and teachers, mitigates the potential for procrastination, facilitates motivation to engage with learning materials and resources, and improves the quality of learning outcomes (Lopez-Perez et al., 2011). Moreover, a blended learning strategy offers a variety of structured and unstructured learning opportunities to meet learning styles, needs, preferences and content requirements relevant to students (Singh, 2003;

Picciano, 2009). This method engages learners in ways that are most comfortable but also challenges students to experience learning in other forms (Picciano, 2009). As a result, a blended learning model offers significant advantages unlike any other learning strategy. A critical investigation of the impact of IFSTAL's blended learning environment on students' interdisciplinary learning outcomes will be inherently valuable.

2.6 Summary

This chapter has provided an overview of the programme's structure and organization, alongside its aims and objectives to facilitate interdisciplinary food systems learning. The ways in which IFSTAL demonstrates a community of practice have been described, in addition to Wenger's (2006) seven actions needed to create an effective community of practice. Wenger's seven actions necessary to cultivate a successful community of practice will be considered when evaluating students' perceptions of the programme and its influence on their collaborative interdisciplinary learning. The chapter has also provided further understanding of interdisciplinarity and the importance of interdisciplinary learning to address complex issues. Spelt et al. (2009) comprehensive model has been presented, which aims to investigate teaching and learning in interdisciplinary higher education contexts. The following research data will be conceptualized using Spelt et al. (2009) interdisciplinary learning model, to highlight the ways in which the programme facilitated students' interdisciplinary learning within each presage, process and product levels. Finally, the chapter has provided substantive literature regarding benefits of blended learning environments and highlighted the ways in which the programme utilizes a blended design.

Methodology

3.1 Introduction

This chapter begins with an overview of the research and qualitative approach. The qualitative method used a variety of data collection procedures including a focus group, semi-structured interviews and descriptive survey questionnaire, to capture students' in-depth interdisciplinary learning experiences associated with the programme. The data was collected within flexible online and in-person settings, to encourage participation. Postgraduate students from each of the five affiliated universities were obtained using convenience sampling strategies to participate in the data collection process. Participant data from the focus group, interviews and survey was then collected and analyzed. The analysis process intends to make sense of the data by coding statements into themes, to produce succinct findings relevant to the research questions. Finally, ethical considerations relevant to the study were presented.

3.2 Research Overview

The proposed research intends to investigate the extent to which IFSTAL has facilitated students' interdisciplinary learning outcomes. IFSTAL incorporates a community of practice model involving a collection of people engaging in a process of ongoing learning through shared knowledge, perspectives and understandings surrounding a common interest in food systems (Eckert, 2006; Wenger, 2006; Cambridge et al., 2005; Wenger-Trayner, 2015). Through a blended learning design with lectures covering a variety of food systems issues, an interactive virtual learning environment with resources surrounding various topics, access to a wide range of food systems professionals, cross-institutional events, summer school and post-graduate internship opportunities, the programme aims to offer a platform for interdisciplinary learning.

In order to address the proposed research focus, a variety of approaches were considered. Primarily, a quantitative method was considered, as IFSTAL coordinators continuously monitor and track attendance rates for lectures, events and other in-person activities, in addition to participation duration and frequency through the virtual learning environment. Attendance and participation rates may be indicative of interdisciplinary learning, but this remains highly inconclusive and presumptuous. Beyond attendance and participation, IFSTAL has yet to develop assessment tools or methods to evaluate students' learning outcomes, creating limitations for the scope of this research. However, the programme intends to develop formative and summative learning assessment

methods in the future, which will be particularly valuable for future studies evaluating the impact of the programme on students' interdisciplinary learning outcomes. On the other hand, a variety of qualitative methods were considered to address the proposed research questions. Qualitative data collection methods involving interviews with programme developers, educators and other individuals involved in running IFSTAL may be able to offer some insight regarding their perceptions of the extent to which IFSTAL has influenced students' interdisciplinary learning, primarily through student observation. However, this process may be subjective, biased and difficult to conduct due to the quantity of students, varied levels of participation and blended learning approach with unobservable online components. With foreseeable concerns involved in this method, another qualitative approach emerged. Students' perceptions of the ways in which the programme has impacted their interdisciplinary learning offers direct insight about their experiences engaging in the programme. Through a variety of qualitative data collection techniques, an authentic rapport involving rich, in-depth descriptions of students' feelings, perceptions and opinions about the extent to which IFSTAL's community of practice has impacted their interdisciplinary learning experiences will be presented.

3.3 Qualitative Research Approach

Through ongoing deliberation and careful consideration of a variety of approaches to address the proposed research questions, a qualitative research method was employed. A qualitative research approach is used investigate and understand meaning individuals attribute to a particular situation or experience (Creswell, 2014). This strategy is largely focused on words and descriptions rather than the quantification of data, rendering contextually specific, deep and insightful findings (Bryman, 2012; Creswell, 2014). The following study investigates questions central to the research, using a variety of qualitative data collection procedures including a focus group, semi-structured interviews and descriptive survey questionnaire, within flexible online and in-person settings (Bogdan & Biklen, 2007). Descriptive data derived from the collection procedures offers an in-depth outlook on participants' experiences engaging with IFSTAL and its impact on interdisciplinary learning. The data analysis process inductively builds from particulars, including individualized learning experiences, towards generalized themes developed from similarities in students' opinions, beliefs and perspectives regarding the programme. Through a qualitative approach, contextually specific findings, rich in depth and descriptive complexity were interpreted to invoke meaning (Creswell, 2014).

A qualitative methodological approach offers distinct advantages relevant to the proposed study, including an in-depth understanding of participants' lived experiences engaging in IFSTAL's community of practice and their perspectives regarding the ways in which the programme has impacted their interdisciplinary learning. However, there may be potential limitations associated with this methodological approach requiring careful consideration. Common challenges associated with qualitative methodological approaches include increased time, context specificity and researcher preconceptions (Anderson, 2010; Malterud, 2001). To begin, qualitative research often involves lengthy data collection procedures such as interviews. Although increased time spent gathering data may be seen as a constraint, in-depth insight on participants' feelings, thoughts and perspectives offered by lengthy data collection procedures, such as interviews, can offer original findings unlike other methodological approaches (Anderson, 2010). A qualitative method can also be particularly effective for offering context specific results, relevant to the study (Anderson, 2010). This specificity can be seen as inherently valuable but can inhibit generalizability beyond the context of the research (Anderson, 2010). In the case of this study, context specific data derived from students' perceptions and opinions regarding the impact of IFSTAL on their interdisciplinary learning experiences, will be highly useful to improve IFSTAL and set a foundation for developing further interdisciplinary higher education communities to tackle food systems challenges within the UK and beyond. Another major concern recognized when utilizing a qualitative research method is the imposition of potential researcher idiosyncrasies and biases (Anderson, 2010; Malterud, 2001). As a member of IFSTAL with an innate interest in food systems, I carry my own motives, background, perspectives and hypotheses, which could instill bias and impact research findings. Although this factor may be difficult to mitigate, a process of introspective reflexivity through methodological triangulation is utilized in the present study to acknowledge preconceptions and minimize biases (Finlay, 2002). Overall, there are various limitations and challenges for using a qualitative methodological approach, many of which are mentioned and thoroughly considered. Yet, a qualitative method is highly valuable and necessary to derive authentic participant descriptions and data rich in detail to address the complex research problem at hand.

The following qualitative research study embraces a broad and comprehensive evaluative function. This evaluative function is used to obtain information, in order to identify the effects of programme engagement on participants and how these effects

have occurred (Creswell, 2014). In relation the following study, the qualitative research evaluates the ways in which IFSTAL's community of practice programme has impacted students' interdisciplinary learning. Information is gathered through a variety of data collection procedures including a focus group, interviews and survey, to investigate students' experiences participating in the programme and how it has influenced their learning (Arksey & Knight, 1999). This mode of formative evaluation offers action-oriented information and feedback from IFSTAL members, which can aid in changing or improving the programme to enhance students' interdisciplinary learning outcomes (Creswell, 2014; Clarke & Dawson, 1999; Scriven, 1967).

3.4 Setting

To provide an overview of the setting, consideration of IFSTAL's contextual environment as a cross-institutional blended learning model is particularly relevant. IFSTAL is comprised of five higher education institutions, with the University of Oxford as its central hub, in collaboration with City University London, University of Reading, University of Warwick and Leverhulme Centre for Integrative Research on Agricultural Health. IFSTAL is located in the Environmental Change Institute at the University of Oxford, where a team of educational coordinators and management facilitate the programme. At each of the affiliated institutions, there are one or two educational coordinators directing the programme. Although most of the programme is primarily conducted at the University of Oxford, some lectures, activities and events are held at each of the affiliated institutions. In addition to in-person settings, IFSTAL designed a virtual learning environment to offer another outlet for students to participate. The programme provided a variety of contextual environments, both in-person and online to facilitate student engagement.

When designing the following research study, it was particularly important to ensure that the setting of the study was reflective of the setting of the programme, to promote participation. The study offered both in-person and online data collection settings, to emulate the cross-institutional, blended nature of IFSTAL. To begin, the focus group was held in-person at the University of Oxford in the Institute of Environmental Change. Following the focus group, individual interviews were conducted both in-person at a location of their choice and online through video conferencing tools such as Skype and FaceTime. Two of the interviews were conducted in-person at Oxford, nine interviews were conducted through Skype and one interview was facilitated through FaceTime. After the interviews, a survey was administered through IFSTAL's

virtual learning environment to all students involved in the programme. Similarly to IFSTAL's cross-institutional blended learning environment, this study offers a variety of both in-person and online data collection methods.

Online and in-person interview settings were used to encourage participation in an accessible and innovative format. Traditionally, interview settings have largely been comprised of face-to-face encounters, as this natural setting has been known to stimulate a relaxed and friendly environment for free and open speech, necessary for rich in-depth data (Gillham, 2005; Shuy, 2003). Face-to-face interviews also create opportunities for expression and observing body language, which is a key communication tool and can offer significant contextual data (Farooq, 2015). As a result, an in-person focus group and some one-on-one interview settings were conducted at the Institute of Environmental Change. On the other hand, with a significant portion of the IFSTAL programme online, virtual interviews and a survey were also provided to establish an accessible setting for those who prefer or require an online platform for discussion. Virtual mediums such as Skype and Facetime offer benefits similar to traditional face-to-face interviews, whilst further advancing the advantages associated with telephone interviews in qualitative research (Hanna, 2012; Holt, 2010). Unlike telephone interviews which prohibit visual contact and interpretation of body language cues, online video interaction via Skype or FaceTime has been shown to be particularly effective (Farooq, 2015; Gillham, 2005; Hanna, 2012). Virtual interview settings using Skype or FaceTime video interaction have been shown to be cost effective, geographically accessible, environmentally friendly, technologically innovative, socially comfortable, and time efficient (see for example Edje, Miller, Kiefer & Oram, 2013; Deakin & Wakefield, 2013; Hanna, 2012). As one participant overtly noted, FaceTime enabled her to engage in the interview during her break time at work, as she has minimal in-person interaction time beyond her 40 hour work week and full-time masters coursework. As a result, this virtual interview setting was beneficial for increasing access and alleviating pressure associated with time constraints. Similar benefits associated with time, cost and accessibility are also found with online surveys, which were administered within this study (Fricker & Schonlau, 2002). The following research takes into consideration the busy lives of postgraduate students, offering an array of flexible in-person and online settings to gather data.

3.5 Population and Sample

The research population of this study is comprised of postgraduate students with voluntary membership to the IFSTAL programme, who are completing either master's or doctoral programmes at each of the five affiliated higher education institutions. A sample of the population was derived using a non-probability sampling technique, to gather participants for the focus group and individual interviews. At the Institute of Environmental Change, a focus group of postgraduate students from the University of Oxford participated within the study. This focus group was comprised of postgraduate students from the University of Oxford, as additional focus groups were conducted at each of the other higher education institutions. The focus group at the University of Oxford will be of primary focus due to practical and ethical limitations. The focus group was directed by IFSTAL's University of Oxford educational coordinator, using an opportunity sampling strategy. This strategy involved recruiting students from the University of Oxford who were familiar to the educational coordinator, are active members of IFSTAL and likely to engage in the research study.

Following the collaboratively facilitated focus group, interviews with two to three students from each of the five affiliated higher education institutions were conducted. Interview participants were obtained through an opportunity sampling method. In attendance at IFSTAL's Away-Day event, a variety of postgraduate students from each of the higher education institutions were present, enabling me to inform prospective participants about my dissertation. This in-person recruitment process aided in attracting four individuals to participate in the research study. Through a follow-up email invitation to all members of IFSTAL, eight additional respondents participated in the interviews. Overall, a total of twelve postgraduate students involved in IFSTAL from each of the five universities participated in interviews.

Following the individual interviews, an online survey questionnaire was administered through email to all members of IFSTAL. To become a member of IFSTAL, students are required to register through their university email address and create a profile on IFSTAL's virtual learning community. Through this registration process, IFSTAL obtains every member's contact information, which aided in administering the online survey through an email invitation. Each member of IFSTAL was offered equal opportunity to participate in the research study through this opportunity strategy. A total of 57 participants completed the survey out of 400 members.

3.6 Data Collection Procedures

To address the proposed research questions regarding the extent to which IFSTAL's community of practice higher education model has impacted students' interdisciplinary learning, ongoing collaboration with IFSTAL coordinators and researchers was necessary. Regular meetings were scheduled with the educational coordinator at the IFSTAL University of Oxford main office. Through ongoing deliberation and discussion, plans were devised to encourage the integration of this proposed research study alongside the programme's ongoing evaluative research. To meet the needs of both research parties involved, a variety of collaborative data collection procedures were considered and employed. Due to the complicated nature of working with others, differential research objectives and the cross-institutional spread of the programme, some practical and ethical challenges arose.

Through initial communication with IFSTAL's main educational coordinator at the University of Oxford, an original research plan was devised to integrate the following research questions and objectives into IFSTAL's current programme evaluation research. With IFSTAL's first year coming to an end, researchers were evaluating the success of the programme, by deriving feedback from students' experiences engaging in the programme through focus groups. In accordance with this plan, this research study intended to collect data by synthesizing questions relevant to this study within IFSTAL's pre-established focus groups that were held at each of the affiliated universities. Putting this research plan into action posed several issues, including practical constraints of timing and scheduling, ethical concerns with pre-established terms at each institution and communication difficulties across educational coordinators at varying universities. Due to these challenges and concerns primarily across the affiliated universities, a collaborative focus group was employed solely at the University of Oxford. This focus group was comprised of five postgraduate students from the University of Oxford, offering programme feedback for IFSTAL's annual evaluative research assessment. Within this pre-established focus group organized by IFSTAL, specific questions pertaining to this research study were integrated into the focus group script and data was recorded using hand written notes. These questions offered a broad introduction into the ways in which IFSTAL's community of practice, blended model has impacted students' interdisciplinary learning. The data derived from the focus group set a base for developing further, in-depth questions to be later investigated through individualized interviews.

With limitations associated with the collaboration of focus groups at each higher education institution, individual interviews were then conducted to obtain in-depth data and understanding necessary to address the research problem (Arksey & Knight, 1999). Semi-structured interviews were conducted, offering a list of open ended questions and subsequent optional follow-up questions to elicit views, opinions and perspectives of the participants (Creswell, 2014; Arksey & Knight, 1999). One-on-one interviews were conducted with twelve postgraduate students, including two or three participants from each university. Gathering participants from all of the affiliated universities attempts to uncover their individualized experiences with IFSTAL across varied institutional platforms. Interviews were conducted in-person or online through video conferencing software. Two of the interviews were in-person, one located at a coffee shop in Oxford and another at the Institute of Environmental Change. Within these settings, a list of seven open-ended questions were presented, alongside impromptu questions to obtain further depth and understanding. Throughout the interview process, data was recorded using a note taking method, similarly to the focus group. Another ten semi-structured interviews were conducted using video conferencing software, with one interview carried out using FaceTime and the remaining nine interviews using Skype. Within these online settings, the same list of seven open-ended questions were presented, alongside impromptu questions to obtain further depth and understanding. Once again, interviews were recorded using handwritten notes, similarly to the focus group. Although the online video conferencing method was highly effective for enhanced accessibility, mitigating time constraints and other factors, a strong internet connection was required for smooth video interaction. Within this research process, Skype offered higher quality picture and sound, but FaceTime was slightly less clear with minor computing hang, largely attributed to a weaker internet connection which may have impacted the quality of the interview. Overall, both online and in-person data collection procedures were utilized within this research to promote student engagement in order to address the proposed research question.

Following the interviews, an online survey questionnaire was administered to all members of IFSTAL through an email. This online survey was collaboratively designed with educational coordinators at each of the affiliated institutions through ongoing meetings, discussion and editing processes. Within the survey, questions central to my research study were integrated into IFSTAL's pre-constructed survey template on Survey Monkey. These questions were qualitative in nature, enabling individuals to

express their opinions and perspectives regarding the extent to which the programme facilitated their interdisciplinarity learning using a likert scale. In addition, the survey questions probed individuals to address which specific aspects of the blended learning model promoted interdisciplinarity. The purpose of these broad survey questions was to provide further data to follow-up on main findings derived from the focus group and interviews, and recognize comparable data results. In turn, enhancing the reliability and generalizability of students' perspectives and experiences engaging with IFSTAL within the context of the study.

3.7 Data Analysis Procedures

Within the context of this qualitative research study, data analysis intends to make sense of the data derived from the focus group, interviews and survey to produce succinct findings (Creswell, 2014). To make sense of the dense and rich data derived from the qualitative collection procedures, data was winnowed by focusing in on some data and disregarding other aspects (Creswell, 2014; Guest, MacQueen & Namey, 2012). Using Spelt et al. (2009) empirical framework, significant statements and relevant information derived from the focus group and interviews were coded into presage, process and product stages to demonstrate students' systematic interdisciplinary learning experiences facilitated by IFSTAL's community of practice (Spelt et al., 2009). Under the presage section, students' educational backgrounds, institutional affiliations and participation rates were provided. The programme's blended learning environment was also described, highlighting the various face-to-face and online learning platforms. Within the process and product stage, descriptive data was developed into clusters of meaning through the aggregation of data into themes (Creswell, 2014; Creswell, 2006). In-depth descriptions about students' similar or differential experiences engaging in the programme's interdisciplinary, blended learning activities and events were analyzed and categorized into core themes within the process stage. Descriptive and thematic interaction between student, environment and learning process were critically analyzed, to evaluate the ways in which the programme impacted students' interdisciplinary thinking and learning outcomes at the final product stage (Spelt et al., 2009).

Following the data analysis process for the focus group and interview methods, data derived from the survey questionnaire was then analyzed. Similarly to the data analysis procedure utilized above for the focus group and interviews, significant descriptive and thematic findings were coded into presage, process and product stages of Spelt et al. (2009) empirical framework to uncover the extent to which the programme

has impacted students' interdisciplinary learning. Descriptive and thematic data derived from the focus group and interview collection methods was compared to that of the questionnaire data results, to verify accuracy and validity across data sources. Methodological triangulation of data from multiple data collection sources by identifying recurrent themes, patterns and explanations from participants, minimizes bias and strengthens validity and completeness of the study (Creswell, 2014; Arksey & Knight, 1999). Survey questionnaires were utilized as a complementary data collection tool, to check the strength and evidence of the findings derived from the interviews and explore how widely the views, feelings, understandings of participants were shared (Arksey & Knight, 1999).

3.8 Ethical Considerations

When conducting research, activities involving human participants must proceed in way that respects the rights and well-being of participants, researchers, internal and external parties and affiliated higher education institutions (CUREC, 2016). In accordance with institutional policy at the University of Oxford, the following research study was subject to ethical review by the Central University Research Ethics Committee. The application process was comprised of a checklist form, information sheets, drafts of participant recruitment emails, consent forms, and focus group, interview and survey scripts. Within the application process, ethical principles such as respecting autonomy, nonmaleficence, beneficence, justice and fidelity were considered (Beauchamp & Childress, 1979; Bryman, 2012). Following the review process, ethical approval was obtained (see Appendix D).

Ethical principles and procedures outlined within the CUREC forms were carefully adhered to throughout the study. The following research demonstrated beneficence, as it aims to provide insightful information about IFSTAL and its impact on students' interdisciplinary learning outcomes. Participants were provided with a recruitment email, information sheet, and consent form, that was voluntarily completed prior to data collection. Individuals participating in the study were assured that all information derived from the data collection procedures was confidential, safely stored, anonymized and destroyed following the completion of the study. The research posed no harm and participants' best interests were of primary concern. Throughout the study, participants were offered the right to withdraw at any point in time. Overall, the research presented few ethical risks or concerns.

3.9 Summary

This chapter provided an overview the research aims and the qualitative approach. A variety of qualitative data collection methods including a focus group, interviews and survey were utilized, to capture students' interdisciplinary learning experiences engaging with IFSTAL's community of practice. The study offered both in-person and online data collection settings to emulate the cross-institutional, blended nature of IFSTAL and promote accessible participation. Postgraduate students from each of the affiliated universities were gathered using opportunity sampling strategies to participate in data collection. Descriptive data and thematic findings derived from the focus group, interviews and survey were coded into Spelt et al. (2009) Presage, Process and Product empirical framework, to present relevant findings pertaining to the research questions. Finally, ethical considerations relevant to the study were discussed, posing few ethical risks or concerns associated with the research study.

Results and Discussion

4.1 Introduction

Within this chapter, the research results and discussion are presented within Spelt et al. (2009) Presage, Process and Product empirical framework, to analyze the ways in which the programme facilitated students' interdisciplinary learning. The presage section provides key information about the students who participated within the focus group, interviews and survey. This section also presents the programme's blended learning environment, describing face-to-face and online learning contexts. The process section includes descriptive data and thematic findings pertaining to the ways in which the programme supports students' interdisciplinary learning process. In addition, programme barriers and suggested solutions are proposed, to further improve the programme and students' interdisciplinary learning process. Finally, the product section is developed from the interaction between the student, environment and process components. This section presents descriptive data and thematic findings pertaining to students' interdisciplinary learning outcomes associated within the programme. Throughout the process and product stages, aspects of an effective community of practice are addressed, in accordance with the data findings. Finally, students' interdisciplinary learning outcomes associated with the blended learning environments are analyzed and discussed.

4.2 Presage

4.2.1 Students

Focus Group

The focus group was comprised of five students completing Master's or Doctoral programmes in various disciplines at the University of Oxford. The following table provides an overview of each of the five focus group participants highlighting their degree, discipline and involvement in IFSTAL.

Student	Degree	Discipline	Involvement
F1	DPhil	Biotechnology	- Attended some lectures - Some use of VLE - Did not attend the away-day
F2	DPhil	Public Health	- Attended most lectures - Used the VLE a little - Did not attend the away-day
F3	MSc	Education	- Attended some lectures - Used the VLE a little

			- Attended the away-day
F4	DPhil	International Politics	- Attended some lecture - Did not use the VLE much - Did not attend the away-day
F5	MSc	Biodiversity	- Attended most lectures - Did not use the VLE - Attended the away-day

Interviews

The one-on-one interviews included twelve students completing Master's or Doctoral degrees in various disciplines at the University of Oxford, City University London, University of Reading, University of Warwick and Leverhulme Centre for Integrative Research On Agricultural Health (SOAS, LSHTM). Two or three students were interviewed from each of the five institutions. The following table provides an overview of each of the twelve interview participants noting their degree, discipline, university and involvement in IFSTAL.

Student	Degree	Discipline	University	Involvement
I1	PhD	Politics and International Studies	University of Warwick	- Attended every lecture - Some use of VLE - Attended the away-day
I2	PhD	Livelihoods (International and Rural Development)	University of Reading	- Attended every lecture - Did not use the VLE - Attended the away-day
I3	MSc	International Development, Food Security and Nutrition	University of London (SOAS)	- Attended most lectures - Used the VLE a little - Attended the away-day
I4	MSc	Biodiversity, Conservation and Management	University of Oxford	- Attended some lectures - Did not use the VLE much - Did not attend the away-day
I5	MSc	Environmental Change and Management	University of Oxford	- Attended some lectures - Did not use the VLE - Did not attend the away-day
I6	PhD	Food Policy	City University London	- Attended some lecture - Used the VLE a little - Attended the away-day
I7	PhD	Food Policy	City University	- Attended many lectures - Did not use the VLE much

			London	- Attended the away-day
I8	PhD	Geography and Environmental Science	University of Reading	- Attended a couple lectures - Some use of VLE - Did not attend the away-day
I9	MSc	Agricultural Economics	University of Reading	- Attended many lectures - Some use of the VLE - Attended the away-day
I10	MSc	Epidemiology	London School of Hygiene and Tropical Medicine	- Attended some lectures - Some use of the VLE - Did not attend the away-day
I11	PhD	Agricultural and Environmental Science	London School of Hygiene and Tropical Medicine	- Attended some lectures - Some use of VLE - Attended the away-day
I12	MSc	Food Security	University of Warwick	- Attended most lectures - Did not use the VLE much - Attended the away-day

The programme welcomes different levels of involvement, shown by students' varied participation rates within each learning environment, which demonstrates one of Wenger's (2006) seven actions needed to cultivate an effective community of practice. Students' participation rates and involvement will be taken into consideration throughout the analysis.

Survey Questionnaire

A short survey questionnaire was administered to 400 participants and 57 responded. The following table provides an overview of some general participant information including degree, university institution and status.

Degree	University	Status
- 35 Masters - 15 Doctorate - 1 Researcher - 6 No Response	- 11 City University London - 6 Leverhulme Centre for Integrative Research On Agricultural Health (2 London School of Hygiene and Tropical Medicine, 2 Royal Veterinary College, 2 School of Oriental and African Studies) - 7 University of Oxford	- 30 International - 20 Home - 7 No Response

	- 13 University of Reading - 14 University of Warwick - 6 No Response	
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4.2.2 Learning Environment

The programme environment is comprised of a blended learning design with face-to-face and online platforms. The two main components of IFSTAL's learning environment include lectures and the virtual learning community webpage. Other activities IFSTAL has facilitated are the away-day workshop and lunch events.

Lectures occur every other week on Thursday at 5:00pm for the first two terms, from October until March. These lectures take place in-person at one higher education institution affiliated with IFSTAL and are simultaneously live-streamed online to the other universities. Recordings of the lecture are then available on IFSTAL's virtual learning environment webpage following the live event. During the lecture, one or two specialists in the field offer an hour-long presentation of the relevant topic at hand. Immediately following the lecture, there is an open question and answer session between the key speakers and students that are participating in-person and online. Students watching the livestream of the lecture online are asked to submit any questions to the speakers through the VLE. Following the lecture, the presenters and students can attend a post-lecture discussion over drinks and snacks.

The Virtual Learning Environment (VLE) is a website created for IFSTAL members. Members can log-on through their university's online platform or directly on the main IFSTAL VLE web page. The VLE offers a platform for postgraduate students to create a profile, message other members, get updates, view the programme newsletter, engage in the online forum, participate in activities or games, access employment and internship opportunities, interact in the live chat room and stay connected via social media. The virtual learning environment aims to offer an online space for students to participate and interact.

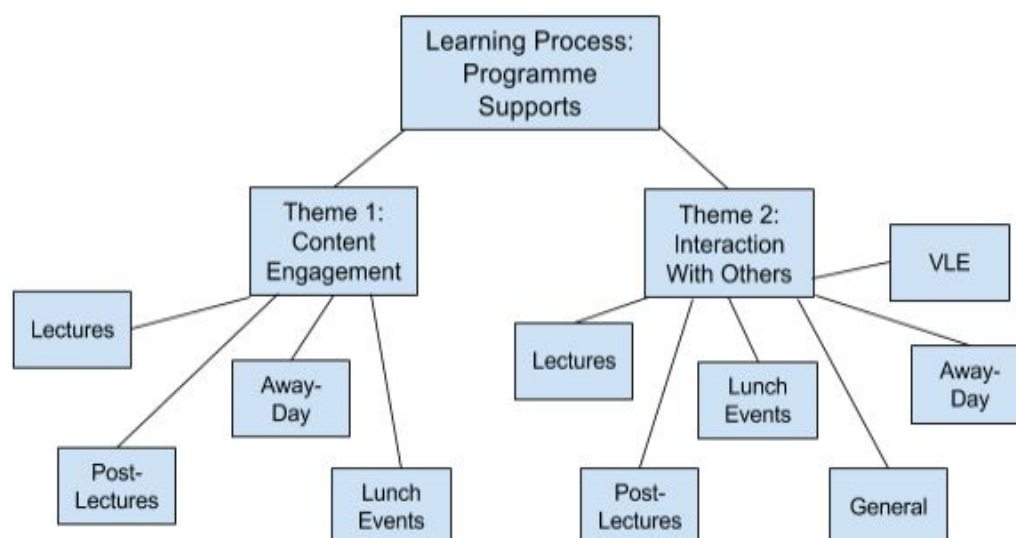
IFSTAL's learning environment is also comprised of other small events and activities. The programme offered an away-day event held at the University of Oxford in the Environmental Change Institute, where students from each affiliated university were invited to come together to network and collaborate with other fellow students and food sector professionals. Many of the universities affiliated with IFSTAL also hosted occasional lunch events, where academics came together to discuss their research and other food related topics. IFSTAL also offers a summer school programme at the

University of Reading. This week long event will not be included within the context of this study, as it has not taken place prior to data collection.

4.3 Process

The data derived from the focus group, interviews and survey provides insight regarding students' experiences engaging with the programme's interdisciplinary, blended learning activities and events, alongside the ways in which students understand interdisciplinary thinking and learning. Students' descriptive data is broken down into learning process programme supports, barriers and suggested solutions, which are depicted using mind maps. Descriptive data associated with programme supports, barriers and suggested solutions is further developed into clusters of meaning through the aggregation of data into themes. Under each theme, students' data is coded according to the learning environment and students' individual responses, as these components are precursors to the learning process. The descriptive data and associated themes are organized into tables, displaying students' learning processes associated with IFSTAL. Below each of the tables, a discussion of the students' interdisciplinary learning process facilitated by IFSTAL is presented.

4.3.1 Programme Supports



Theme 1: Content Engagement

Learning Environment	Learning Process Descriptive Data
Lectures	- Interesting (F2; I6; I8; I9; I10; Q3), informative (F1; I11) and useful (I4, Q*) information

	- Different topics each week covering general content and broad issues (I1; I6; I11; Q27; Q3), alongside subject specific areas related to food systems (F1; F3; I2; F8; I12) - Interdisciplinary mix of content, offering context to combine disciplines (F1; F8; I9) - Began with basic content, enabling anyone to attend without prior knowledge, that became more detailed and complementarily built upon each other in a sequential manner over time (I1; I4; I10) - Presents food issues and challenges (F3) in diverse ways and from various perspectives (I3; Q7) - Generates debate on food systems topics at a higher education level (F4) - Delves deeper by discussing the consequences of impacting particular aspects of the food system and its effect on the next part of the system (I2)
Post-Lectures	- Helps students to think about and discuss what they have learned from the lecture content (I11)
Away-Day	- Interesting content pertaining to food systems and challenges (F3; I9; Q3) - Exposure to different disciplinary information and topics during presentations and discussions (F6), which present a wide range of views, backgrounds and perspectives (F2; F3; I9)
Lunch Events	- Facilitates interaction with various disciplinary research, topics and issues related to food (F5)

* Q- Survey questionnaire: Participant ratings of lecture usefulness: 16 very useful, 23 useful, 1 of little use, 2 not useful, 1 don't know and 14 no response

Discussion

According to the descriptive data derived from the focus group, interviews and survey, the programme provided content that facilitated students' interdisciplinary learning process. A significant portion of students' content engagement occurred within lecture learning environments, in accordance with higher participation rates within this context. Most of the student participants noted that the lectures were interesting, informative and useful. The lectures included different topics each week covering general content and broad issues, alongside subject specific areas related to food. In particular, the lectures provided an interdisciplinary mix of content, offering context to combine disciplinary perspectives. During the lectures, presenters discussed food issues and challenges in diverse ways and from various perspectives. One participant also noted how the lectures generated debate on food systems topics at a higher education

level, which has not been previously done (Ingram, 2015). The sequential build of the content was also acknowledged by many students, as the lectures commenced with basic content that enabled anyone to attend without prior knowledge, which became more detailed and complementarily built upon each other over time. This process of gradual advancement is particularly useful in achieving interdisciplinary learning outcomes (Spelt et al., 2009). From a deeper standpoint, one participant that attended every lecture noticed how the lectures discussed the consequences of impacting particular aspects of the food system and its effect on the next part of the system, such as production and delivery of food to consumers and the environmental impacts. Across the data collection methods, lecture content was a highly prevalent topic of discussion, offering insight regarding the ways in which this learning environment instilled content that facilitated students' interdisciplinary learning process.

Alongside the lectures, some participants noted how the post-lecture, away-day and lunch learning environments offered content that promoted students' interdisciplinary learning process. One interview participant, who is an active member of IFSTAL with some engagement in the lectures, discussed how the post-lecture events helped students to think about and discuss what they have learned from the lecture content. This reflective process aids in achieving interdisciplinary learning outcomes (Spelt et al., 2009). Many students also discussed the ways in which the away-day event facilitated their interdisciplinary learning process. This interdisciplinary event provided interesting content pertaining to food systems and challenges. Students were exposed to different disciplinary information and topics during presentations and discussions, offering a wide range of views, backgrounds and perspectives amongst members and presenters attending the event. Finally, one member of IFSTAL who is actively engaged in the programme, discussed how the lunch events facilitate interaction with various disciplinary research, topics and issues related to food. As a result, the content derived from some of the learning environments implemented by IFSTAL were reported to have an impact on students' interdisciplinary learning process. However, it is important to note that when prompted for response, students did not discuss the content derived from virtual learning environment across each data collection method. Nor did the students address the ways in which the VLE content influenced their interdisciplinary learning. A range of factors may have promoted this lack of response, including lower participation rates within the virtual learning context and technological difficulties. Although, many students stated that they used the VLE primarily for practical reasons (see Theme 1:

Participation table) rather than for learning purposes, which may have influenced their engagement with VLE content and in turn, their interdisciplinary learning. Further investigation of students' engagement with VLE content is required to produce definitive findings.

Theme 2: Interaction with Others

Learning Environment	Learning Process Descriptive Data
Lectures	- Brings people together from different programmes (F2) - Offers a wide range of leading speakers from different disciplines, universities and industries (F2; I2; I3; I4; I6; I9; I12) - Includes diverse people from different disciplines to address food-related issues and propose innovative solutions from their perspective or lens (I3; I8)
Post-Lectures	- One of the best aspects of IFSTAL, as it facilitates discussions with other people from various disciplines (F2; I10) - Enables interaction (I1; Q45) with other individuals that have similar interests in food (F2) - Promotes academics to talk about the lecture and express different points of view from their disciplinary perspective (I4)
Away-Day	- Provides exposure to presenters from different disciplines and their perspectives (F4; F3) - Creates opportunities to network (Q20) and meet students, sponsors, actors, and academics from other universities (I1; I7; I12) - Facilitates interaction and collaboration amongst students, professors, researchers and professionals (F3; I1; I7) especially during interdisciplinary activities and group projects (F3; I9) ex. group activity where people worked together to address Tesco branding issue (I3) - Offers opportunities to present research and learn about others' research initiatives (I6; I7)
Lunch Events	- Builds connections amongst people (I5) - Helps students to learn about each other's research (I5) - Enables people from different disciplines to come together to brainstorm and discuss food issues, especially real-life local problems such as food waste (I5)
VLE	- Used members' profiles to connect and collaborate with individuals (F1) - Engaged with the online forum, where you can interact with other universities, ask questions and network with

	other students interested in the same research area (I8)
General*	- Provides an in-person social component to the programme, which is enjoyable (F5; I5) - Brings together a community of like-minded people from various disciplinary backgrounds and universities to meet and discuss (F4; I5; Q3; Q11) - Creates opportunities to meet people (F5) with similar interests (I3; I7; Q28) - Diversity of people aids in addressing food topics and issues from different lenses and points of view (F2; I7) (ex. As a public health person she didn't think milk powder was good for you but an Indian physicist she talked with at a table really though it was great. The participant found it interesting to be exposed to these different positions; ex. Different solutions for obesity from physical sciences to social sciences)

* General: unidentified learning environment

Discussion

The descriptive data derived from the focus group, interviews and survey presented another significant theme relevant to the ways in which the programme supports students' interdisciplinary learning process. Across each of the learning environments associated with IFSTAL, students continuously acknowledged how the programme facilitates a process of interaction with others, which aids in supporting students' interdisciplinary learning (Bronstein, 2003; Schaffer et al., 2008; Imafuku, Kataoka, Mayahara, Suzuki & Saiki, 2014). Within lecture learning environments, students highlighted how these bi-weekly events offer a wide range of leading presenters from different disciplines, universities and industries. It also brings together diverse people from different disciplines and programmes to address food-related issues and propose innovative solutions from their perspective or lens. Following lectures, students have the option to attend post-lecture discussions, which some participants felt was one of the best aspects of IFSTAL. Within this context, the programme facilitates discussion amongst people from various disciplines, as individuals come together to talk about the lectures and express different points of view from their disciplinary perspective. Moreover, post-lecture events enable interaction with other individuals that have similar interests in food. The lectures and post-lecture learning environments facilitate students' interdisciplinary learning process, bringing together a diverse community.

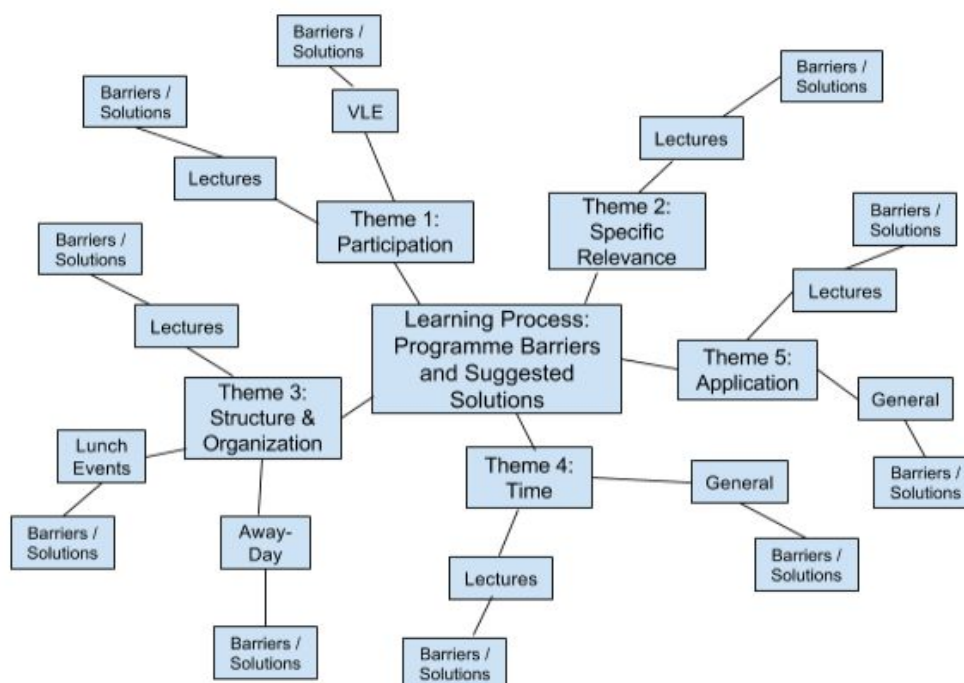
In addition to the lecture and post-lecture learning environments, the programme provides activities such as the away-day and lunches, which aim to achieve interdisciplinarity (Wenger, 2006). The away-day included presenters from different disciplines, offering diverse perspectives. At the event, students had the opportunity to network and meet students, sponsors, actors and academics from other institutions. During the away-day interdisciplinary activities and group projects, there was interaction and collaboration amongst students, professors, researchers and professionals. This event also provided a platform for students to present their research and learn about others' research initiatives. Many participants discussed how the away-day offered opportunities to interact with a variety of people, promoting students' interdisciplinary learning process. In addition to the away-day event, the programme had frequent lunch events, to which one participant who regularly attended these events noted how it was particularly beneficial in building connections amongst individuals. These lunch social events enabled people from different disciplines to come together to brainstorm and discuss food issues, including real-life local problems such as food waste. In addition, offer access to learn about each other's academic studies and research. Events such as IFSTAL's away-day and lunches, offers a context for individuals to engage in a process of interdisciplinary learning through interaction with others.

According to some participants, IFSTAL's virtual learning environment engages individuals in a process of social interaction, which aids in achieving interdisciplinary learning. One participant who was actively involved within the VLE noted how she used members' profiles to connect and collaborate with individuals. Another student, who is also an active participant on the VLE discussed how he engaged with the online forum, enabling him to interact with other universities, ask questions and network with other students interested in similar research areas. According to these participants, the VLE offers a platform for individuals to interact and collaborate with others, which are key components to facilitate interdisciplinary learning (Cooner, 2011). Yet, only two participants across the data discussed the ways in which interaction through the VLE supported their interactive interdisciplinary learning. As mentioned previously, a range of factors may have influence this response rate including low attendance, technological challenges and a preference for practical usage, which warrants further investigation.

As a whole, many participants discussed how the programme support students' interdisciplinary learning through interaction with others. The programme offers a social component by bringing together a community of like-minded people with similar interests

in food systems from various disciplinary backgrounds and universities, which many students found particularly enjoyable. The diversity of people aids in addressing food topics and issues from different lenses and points of view. This interactive component of IFSTAL demonstrates three of Wenger's (2006) components for an effective community of practice. The programme creates many opportunities for open dialogue within and welcomes outside perspectives during its activities, events and learning environments (2, Wenger, 2006). Not only does the programme facilitate open discussion amongst its members, it looks beyond its core community of practice to learn from other individuals in various industries. The programme embodies a public community space where individuals share, discuss and explore ideas pertaining to food systems topics and issues (4 & 6, Wenger, 2006). IFSTAL demonstrates elements of an effective community of practice, encouraging students' interdisciplinary learning process through interaction with others.

4.3.2 Programme Barriers and Suggested Solutions



Theme 1: Participation

Learning Environment	Learning Process Descriptive Data	
	Barriers	Suggested Solutions

Lectures	- Decline in participation (I2), often due to busy academic life and other priorities (I6) - Not as many people involved as hoped (F2; F5; F4)	- Invite high level speakers, such as members of government, to attract people (F4) - Change venues to encourage others to attend (F1) - Advertise IFSTAL further, by going to courses/ departments and explaining the aims and benefits of joining the programme (recruitment emails often got lost or deleted) (I4)
VLE	- Low attendance and participation rates online (I2; I4) due to a variety of factors including: log-in difficulties (F2; F1; F4; F3; I2; I4; I6; I9; I10; Q54; Q24; Q27; Q56; Q57), confusing interface and difficult to navigate (F1; F3; I4; I6; I7; I9; Q41; Q39; Q3; Q5; Q7; Q27; Q28; Q35; Q36; Q57), intimidation or discomfort posting online around well-known academic figures (I7; I12), preference for in-person engagement in learning (I5), a lack of desire to learn how to navigate and use another online platform (I4; I6), disconnect with other online platforms and social media (I7), and a general lack of awareness surrounding its value, purpose or use (I6; I4; I10; Q*) - Participation on the VLE was for practical purposes (I3; I7), such as a tool to stream lectures (F1; F3;	- VLE should shift towards a simple, practical space for email prompts, online sign-up and other practical usages (I3)- opposing distance learners (Q20; Q33) - The VLE should have the option to post anonymously (I7) or offer a student-only section on the VLE (Q3) to help with factors such as intimidation - The VLE should be connected to other online platforms and social media, with direct alerts and notifications ex. sign-in to VLE using Facebook account (I7; I10)

	F2; I1; I4; I7; I10; I11; I12; Q4), post questions (I5; I7; I8), obtain lecture slides (I1), register for events (I3; I9), engage with profiles (F1; I4; I7), gather event information (I9; I12; Q4), etc., rather than using it as a learning platform (I7)	
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* Q- Questionnaire findings demonstrate higher usefulness ratings for practical aspects of VLE such as the streamed lectures, email notifications and newsletter, event calendar, and lower usefulness ratings for learning components such as blog posts, forums, online activities and chat rooms (See Appendix A for further data)

Discussion

The descriptive data derived from the focus group, interviews and survey presented various barriers associated with the programme and students' interdisciplinary learning process. According to students' descriptive data, a common theme emerged regarding participation rates. Students discussed how there weren't as many people involved as hoped and noted a general decline in participation, often due to busy academic life and other priorities. With lower attendance, this may have impacted students' interaction with others and associated interdisciplinary learning outcomes. To improve this barrier in future years, students suggested inviting higher level speakers, such as members of government, to attract individuals to attend lectures. In addition, changing the venue of events may also encourage others to attend. It was also suggested to advertise IFSTAL further by going to courses and departments and explaining the aims and benefits of joining the programme. These proposed solutions are suggested to aid in improving and retaining participation rates in future years, consequently impacting students' interdisciplinary learning opportunities. Although, further assessment upon implementation is required.

Low attendance and participation rates were also reported within the virtual learning environment. Participants noted a range of factors impacting VLE attendance and participation including log-in difficulties, confusing interface and difficult navigation, intimidation or discomfort posting online around well-known academic figures, preference for in-person engagement in learning, a lack of desire to learn how to use another online platform, disconnect with other online environments and social media, and general lack of awareness surrounding its value, purpose or use. One of the most prevalent factors mentioned by the majority of participants pertained to technological

challenges of accessibility and usability, which are necessary technical components of the programme's blended-learning design (Khan, 2005). With difficulties logging-on and maneuvering through the VLE, it is difficult to assess the full-extent of students' interdisciplinary learning associated within the VLE. Beyond necessary technological improvements, it was suggested to provide the option to post anonymously and establish a student-only section to assist with factors such as intimidation. This is a key suggestion relevant to one of Wenger' (2006) seven actions needed to cultivate a successful community of practice, highlighting the importance of offering space for private exchanges based on specific needs (4). With private spaces for interaction, students feel as though it would establish a higher level of confidence to participate online. Another suggested method to boost participation is to connect the VLE with other online platforms and social media, with direct alerts and notifications to prompt engagement.

In addition to the factors impacting VLE attendance and participation, participants also discussed how many students participate on the VLE for practical reasons, such as a tool to stream lectures, post questions, obtain lecture slides, register for events, engage with profiles and gather event information, rather than as a learning platform. With students' participation preferences in mind, one participant recommended shifting the VLE towards a simple space, used primarily for practical purposes to obtain email-prompts, register for events and other practical usages, rather than a learning platform. A simple space for practical usage was proposed to be an effective method to boost participation. However, this reformative change could diminish, if not eliminate interdisciplinary learning online. Moreover, this alteration may not be to the benefit of distance learners, who only have access to the programme via the VLE and demonstrate an appreciation engaging and learning online. Altering the VLE from a learning platform to a practical tool requires further investigation of students' preferences and usage, alongside consideration of IFSTAL's aims for interdisciplinary learning online.

Theme 2: Specific Relevance

Learning Environment	Learning Process Descriptive Data	
	Barriers	Suggested Solutions
Lectures	- Balance between content depth and breadth, with	- Offer content with further disciplinary depth (I1)

	people from different disciplines you cannot go too deep in any one field because people won't understand, which limits learning new information in specific disciplines; nor can the content be too broad due to ambiguity (I1) - Lacked deeper, focused content (I1) that is specifically relevant to students' studies (F5; I2; I6; Q53) - Content was not always what people were expecting, not as interesting/useful as hoped nor connected to its intended topic (I2; I3) - Food related issues and challenges mentioned in lectures pertain specifically to developed countries (i.e. food waste, emissions, obesity etc.), which are not relevant for students coming from or studying developing countries, where food scarcity and access are major concerns (I8)	- Implement team-working exercises or case studies relevant to the lecture topic, to build in-depth understanding, collaborate with others and see how different people would solve related problem (I3; I8; I11) - Produce lecture content that caters to what people want to learn, their interests and research (I2; I3) - Establish lecture content that is focused on its mission and topic (I2) - IFSTAL should encompass food related issues relevant to developing and developed countries (I8)
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Discussion

The descriptive data from the focus group, interviews and survey presented another significant barrier pertaining to content relevance associated with the programme and students' interdisciplinary learning process. One participant discussed the complexity of this barrier, outlining the challenge of balancing content depth and breadth (Catravas, McMullen, Olsen & Chang, 2006). As one interview participant states, with people from different disciplines you cannot go too deep in any one field because people will not understand which limits learning new information in specific disciplines, nor can the content be too broad due to ambiguity. From a positive standpoint, participants did acknowledge the ways in which the programme covered an interdisciplinary mix of broad issues and general content. However, some participants

felt the lectures lacked deeper, focused content that is specifically relevant to their studies. Lecture content was not always what students were expecting, not as interesting or useful as hoped, and at times disconnected to its intended topic. From a holistic standpoint, it was suggested to offer more content with relevant disciplinary depth that caters to what people want to learn and is relevant to students' interests and research. Disciplinary depth is needed to reflect on the nature of disciplines, develop new schemas and make meaningful interdisciplinary connections (Mansilla & Duraisingh, 2007; Lattuca et al., 2014). Some participants suggest implementing team-working exercises or case studies relevant to the lecture topic, to build in-depth understanding, collaborate with others and see how different people would solve the related problem. It was also recommended to provide lecture content that remains focused on its mission and the topic at hand.

Another significant point addressed through the individual interviews pertained to lecture content and relevancy to students' nationality. One participant discussed how the food related issues and challenges mentioned in lecture pertain specifically to developed countries, covering topics such as food waste, emissions and obesity. Yet, these topics and issues are not relevant for students coming from or studying developing countries, where food scarcity and access are major concerns. As a result, this individual felt that IFSTAL should encompass food related issues relevant to developing and developed countries. This point is furthered by the survey data noting higher participants rates amongst students from international contexts, comparatively to those from the UK.

Theme 3: Structure and Organization

Learning Environment	Learning Process Descriptive Data	
	Barriers	Suggested Solutions
Lectures	- Standard traditional format, with one or two respectable professors at the front of the lecture hall whilst students are sitting and absorbing information (I6) - Presenters did not speak from their own perspectives and there wasn't much bouncing of perspectives off each other (F4) - Interdisciplinary blurring	- Alter the format of the lecture to a round table approach, by creating an open, democratic and non-hierarchical space amongst academics and students to break down topics, critique theories and ideas, receive research feedback and pose questions throughout (I6) - Establish a panel of diverse

	does not occur because of the type of people, as the professors and guests speakers were often like-minded, come from the same domain and display no contradictory opinions as an academic community (I7)	speakers such as engineers, urban planners, water specialists, philosophers and graduate students (I3), with different opinions, views, perspectives, personalities, research methods and disciplinary backgrounds to facilitate debate and interdisciplinary discussion (F5; F1; F3; I3; I7; I9) - Encourage speakers to introduce themselves as they take a particular disciplinary perspective or if talking on behalf of an organization, layout what they consider their 'approach' to be, as it is beneficial to know people's backgrounds, motivations, preexisting biases and disciplinary perspectives (F2) - Include speakers outside of academia, such as farmers, etc., with a strong practical understanding of the field (I6; I7)
Lunch Events	- Individuals often sit and talk with the same people all lunch (I7)	- Boosts interaction using a walking lunch approach, which includes portable food such as sandwich and space to walk around and is usually outdoors (I7)
Away-Day	- Wanting more in-person events such as the away-day (F3; I9; I10), especially since some participants felt as though it was one of the few occasions to interact with people in the industry (I9)	- Keen for more discussion, away-day events and brief in-person activities to get people involved and invested (F3; I10), - Start with the away-day at the beginning of the year for people to build connections, network, learn from each other and share their research and academic interests (I1; Q3)

Discussion

The descriptive data highlighted ways in which the structure and organization of the learning environments posed barriers for interdisciplinary learning. One participant discussed the disinteresting traditional format of the lectures, with students receiving information from highly respectable professors at the front of the classroom. To facilitate interdisciplinary learning, participants recommended altering the format of the lectures to a round table approach, by creating an open, democratic and non-hierarchical space amongst academics and students to break down topics, critique theories and ideas, receive research feedback and pose questions as a group. Within the conventional lecture format, participants also felt as though interdisciplinary blurring did not occur because of the types of people, as professors and guests were often like-minded coming from the same domain and displaying no contradictory opinions as an academic community. Presenters often did not speak from their own perspectives, nor debate differing perspectives. It was recommended to establish a panel of diverse speakers such as engineers, urban planners, water specialists, philosophers, graduate students and individuals outside of academia, with different opinions, views, perspectives, personalities, research methods and disciplinary backgrounds to facilitate debate and interdisciplinary discussion. Speakers should also be encouraged to introduce themselves as they take a particular disciplinary perspective or if talking on behalf of an organization, laying out what they consider their approach to be, as it is beneficial to know people's backgrounds, motivations, preexisting biases and disciplinary perspectives. As mentioned by Wenger (2006), to facilitate an effective community of practice, it is particularly valuable to obtain outside perspectives and establish open dialogue with individuals outside of the core community to understand the different possibilities for achieving intended learning goals. Within this context, it is beneficial to obtain the perspectives of individual outside of academia with expertise in food-related industries to promote interdisciplinary learning in the related field.

The descriptive data also brought forth barriers associated with the structure and organization of the lunch events. One participant mentioned that the format of the event involved individuals sitting at a table and talking with the same people throughout the event, limiting interaction with others. With interaction a key component for interdisciplinary learning process (Bronstein, 2003; Schaffer et al., 2008; Imafuku et al., 2014) and a community of practice (Wenger, 2006), it is suggested to boost interaction

using a walking approach. This approach involves portable food such as a sandwich and space to move around often outdoors, to enable interaction with various people.

According to participant data, the programme also presented suggestions regarding the scheduling and quantity of away-day events. Many participants desired more in-person events such as the away-day, as this event was one of few opportunities to interact with individuals in the food industry. Students demonstrated a preference for more discussion, away-day events and other brief in-person activities to get people involved and invested in the programme. A couple of participants also discussed how the away-day should commence at the start of the school year, to enable people to build connections, network, learn from each other and share their research and academic interests.

Theme 4: Time

Learning Environment	Learning Process Descriptive Data	
	Barriers	Suggested Solutions
Lectures	- Lectures times not feasible for some students (I2) - Lectures stopped too early (F3)	- Change lecture times, as students are often tired and go home at 5:30 (I2) - Continue ongoing lectures, in-between and throughout each term (F3)
General	- The programme runs during term with nothing in-between, which is not effective with students' school schedules, as they are already busy during term times with school work and teaching (F2; F5) - Needing ongoing regular schedule/calendar to inform people of events and activities associated with IFSTAL (F1, Q7)	- Between terms, it was suggested to run a project to maintain engagement with IFSTAL (however, some participants were opposed to this idea, as it required more work, F2) (F5) - Create regular, structured coffee sessions looking at what different people are researching/working on and how food systems influence their research (F2) - Don't make events too long, entire day in the classroom not appealing (I5) - Provide more notice for sign-up and tasks (F2)

Discussion

The descriptive data presented many barriers associated with time and students' engagement in the learning environments. Specifically within the context of the lecture settings, times were not feasible for some students as they were often tired and went home when lectures commenced at 5:00pm. Although this comment is derived from one participant, it may be beneficial to change the lecture times and evaluate students' preferences for scheduling. One participant also noted that the lectures stopped early in the school year, with nothing in-between or following each of the school terms. This participant recommended continuing ongoing lectures, which warrants further consideration.

To provide an effective community of practice, Wenger (2006) highlights how the community must establish and nurture a regular rhythm, with ongoing activities and events that allow for members to interact, reflect and grow as a community. This rhythm or time should maintain sustainable and reasonable levels of participation, ensuring that the pace does not become too fast or overwhelming (7, Wenger, 2006). Participants have presented some barriers associated time, relevant to the programme's effectiveness as a community of practice. Some participants discussed how the programme runs during term with no activities or events in-between, which is not effective with students' school schedules, as they are already busy during term times with academic work and teaching responsibilities. Between terms it was suggested to run a project to maintain engagement with IFSTAL. However, some participants were opposed to this idea, as it requires more time and work. Another suggestion was to create regular, structured coffee sessions throughout, to look at what different people are researching and how food systems influence their research. This suggestion offers students more opportunities to meet, reflect and evolve in their learning, which are central aspects of an effective community of practice. Participants also highlighted the need for an ongoing regular schedule or calendar to inform individuals of events and activities associated with IFSTAL, providing further notice for sign-up and tasks. Overall, there are various challenges associated with scheduling and duration that warrant further attention and alteration, to ensure the programme upholds a regular rhythm for an effective community of practice.

Theme 5: Application

Learning Environment	Learning Process Descriptive Data	
	Barriers	Suggested Solutions
Lectures	- Aware of food systems concepts and issues but don't know how to put this into practice (I8)	- Bring in speakers, such as business people, policy makers, farmers, and learn about the challenges they face and how they deal with these challenges (I6; I9)
General	- Need for practical, tangible experience engaging with food systems topics and issues (I3) - Gain reality first-hand of issues on the ground, outside of academia (I5)	- Provide research problems, such as an industry issue and offer various ways to approach this problem (I3; F5) - Facilitate a research project, such as a writing a report or policy proposal (I3) - Create events that involve role playing games, which persuade people to think of ways to tackle real-world issues (I5) - Teach students how to grow their own food which will solve many food-related issues through knowledge acquisition, maintain students involvement in the programme, boost physical activity and improve the environment (I5) - Have an activity day that shows students where our food comes from (I5)

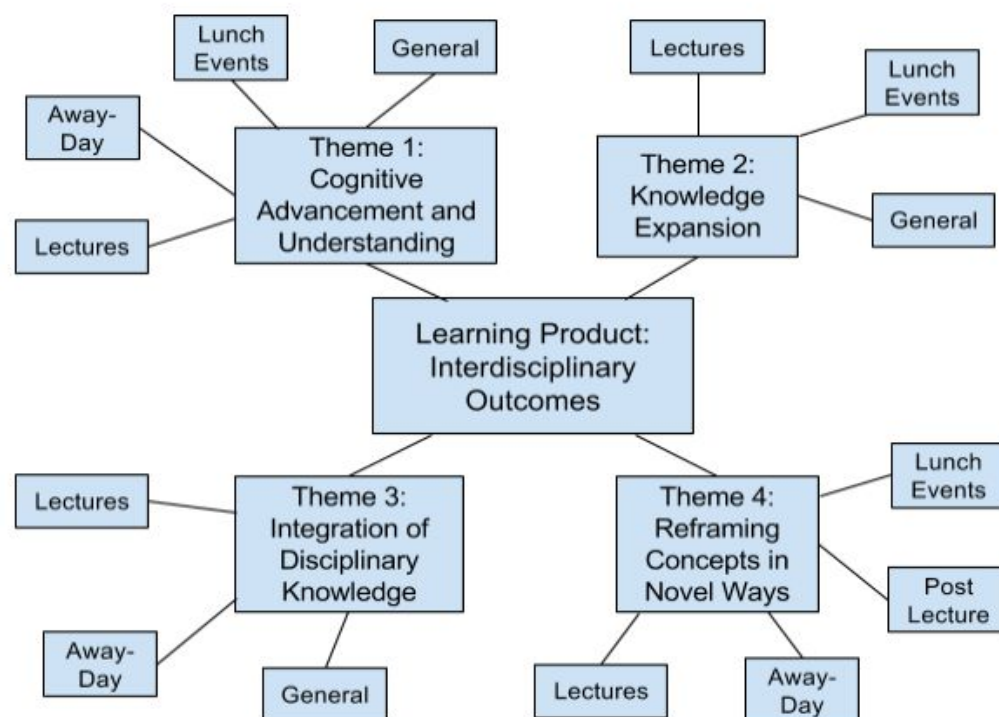
Discussion

The descriptive data presented findings surrounding students' interdisciplinary learning process and application. Within the lecture learning environment, one participant demonstrated an awareness of food systems concepts and issues, but indicated a lack of skills to put this knowledge into practice. In response to this challenge, some participants suggested bringing in speakers, such as policy makers, farmers and business people, to learn about the challenges they face and how they deal

with these issues. This suggestion builds upon one of Wenger's seven actions to cultivate an effective community of practice (2). Learning from individuals with outside perspectives and experience in the field aids in achieving IFSTAL's interdisciplinary learning goals.

From a general standpoint, participants discussed the need for practical, tangible experience engaging with food systems, to build further understanding of food-related issues outside of academia. Experiential learning opportunities have been found to enhance students' interdisciplinary learning (Cooper, Carlisle, Gibbs & Watkins, 2001). In response, participants provided many suggestions of activities and events to enhance their practical experience and understanding of food systems issues. It was recommended to provide research problems, such as industry issues and offer various ways to approach these problems. Another participant proposed facilitating a research project, such as writing a report or policy proposal. One student suggested creating events that involve role playing games, which persuade people to think of ways to tackle real-world issues. This participants also recommended teaching students how to grow their own food, which will solve many food-related issues through knowledge acquisition, maintain students' involvement in the programme, boost physical activity and improve the environment. It was also proposed to design an activity day that shows students where their food comes from. Across the data collection methods, participants offered a variety of strategies to put students' knowledge into practice and build tangible, interdisciplinary learning experiences.

4.4 Product



The focus group, interview and survey data present students' interdisciplinary thinking and learning outcomes associated with IFSTAL. The learning outcomes are developed from the interaction between the student, environment and process components. Participants' descriptive data is developed into clusters of meaning through the aggregation of data into four themes which include: cognitive advancement and understanding, knowledge expansion, integration of disciplinary knowledge and reframing concepts in novel ways. Analysis of this descriptive data and associated themes offers a deeper understanding of students' interdisciplinary learning outcomes facilitated by the programme.

Theme 1: Cognitive Advancement and Understanding

Learning Environment	Interdisciplinary Learning Outcomes: Descriptive Data
Lectures & Away-Day	- Exposure to food system information and challenges from differing disciplines (F3; I6; Q7; Q34)
Lectures	- Understand and build new knowledge surrounding food systems concepts, topics and subject areas (F1; I2; I8; Q16)

Lectures	- Develop an understanding and awareness of food systems in relationship to students' individual research interests (I2)
Lunch Events	- Interact with people to discuss food-related issues and learn about students' research pertaining to a variety of topics (I5)
General	- Incorporate information about food systems and associated stakeholders within academic work (F2)

Discussion

The focus group, interview and survey data provided key findings relevant to the ways in which the programme facilitated students' interdisciplinary learning outcomes. Participants presented various ways in which IFSTAL promoted cognitive advancement and understanding. Cognitive advancement and understanding are key components of interdisciplinary thinking and learning, as it involves developing an understanding of other disciplines, critically analyzing, conceptualizing and synthesizing knowledge, and building meaningful connections (Fruchter & Emery, 1999; Spelt et al., 2009; Mansilla & Duraisingh, 2007). Participants highlighted the ways in which the programme offered exposure to food systems information and challenges from different disciplines. This facilitated students' understanding and knowledge acquisition surrounding food systems concepts, topics and subject areas. Students also developed meaningful connections between their understanding and awareness of food systems in relation to individual research interests. Through interaction with others, students experienced further understanding of food-related issues and awareness of research pertaining to a variety of subject areas. One participant demonstrated cognitive advancement and understanding, with increased confidence incorporating systems information and associated stakeholders within her academic work. Participant data demonstrates many of the ways in which the programme initiated interdisciplinary learning through cognitive advancement and understanding.

Theme 2: Knowledge Expansion

Learning Environment	Interdisciplinary Learning Outcomes: Descriptive Data
Lectures	- Widens students' disciplinary scope looking at the bigger picture, rather than subject specific (F2; I1; I3; I11)
Lectures	- Discuss broad and general issues (I6) pertaining to food (Q27; Q3), offering insight on everything and covering a variety of areas (I2)

Lectures	- Engage with content that is basic, requiring no prior knowledge which then sequentially builds and becomes more detailed over time (I4, I10)
Lectures	- Students learn that if you affect one thing in the food system it affects the next, such as the consequences of system impacts from production to consumers (I2)
Lunch Events	- Opportunity to discuss different food issues, such as local problems, amongst people with various disciplinary backgrounds and diverse research focuses pertaining to food systems (I5)
General	- Students' narrow and specific academic work is put into context within the broader field (F1; Q20; Q57)

Discussion

The data presented another significant theme relevant to the ways in which the programme facilitated students' interdisciplinary learning. Many participants discussed how the programme expanded their disciplinary and interdisciplinary knowledge in various ways. Within the lecture learning environment, many students acknowledged how the programme widened their disciplinary scope by looking at the bigger picture, rather than a subject specific focus. The lectures often discussed broad and general issues pertaining to food systems, offering insight on everything and covering a variety of areas. The lecture content was initially basic requiring limited prior knowledge, which then sequentially built and became more detailed over time. One participant reported knowledge expansion, referencing to lecture content that discussed the consequences of systems impact, noting affects on one aspect of the system and its impact the next part of the system. During other events such as the lunches, participants discussed how this learning environment facilitated interdisciplinary knowledge expansion by providing opportunities to discuss different food issues, such as local problems, amongst people with various disciplinary backgrounds and diverse research focuses pertaining to food systems. From a general standpoint, many participants acknowledged how the programme enables students to place their narrow and specific academic work into context within the broader field. The descriptive data demonstrates knowledge expansion, as participants shift from disciplinary depth towards interdisciplinary breadth (Spelt et al., 2009).

Theme 3: Integration of Disciplinary Knowledge

Learning Environment	Interdisciplinary Learning Outcomes: Descriptive Data
Lectures	- Gathers disciplines to obtain big picture (I10)
Lectures	- Combine social and physical sciences to find innovative ways to address food systems topics and challenges (I8)
Away-Day	- Provides activities offering practical experience, where students from different disciplines and universities can work together to solve problems (F3; I9)
General	- Facilitates integration of knowledge pertaining to food systems amongst different people (I7)
General	- Interdisciplinary mix of content, offering context for combining subject areas (F1)

Discussion

Another key theme presented across the data, relevant to the ways in which the programme facilitated students' interdisciplinary learning, involves the integration of disciplinary knowledge. According to substantive literature, the capacity to integrate knowledge and thinking from two or more disciplines to facilitate new understanding, explore a problem or produce insight, is a key component of interdisciplinary learning (Spelt et al., 2009; Boix Mansilla, Miller & Gardner, 2000; Pharo et al., 2014, Klein, 1990; Miles & Rainbird, 2015). Within the lecture learning environment, participants noted how the programme gathers disciplines to obtain a big picture of food systems. In particular, one participant discussed how the lecture combines social and physical sciences to find innovative ways to address food systems topics and challenges, such as hunger and producing sustainable food. In addition to the lectures, the away-day event provided activities offering practical experience for students from different disciplines and universities to work together to solve food-related problems. Overall, the programme promotes integration of food systems knowledge amongst different people. Integrated efforts amongst members with different backgrounds and areas of expertise aids in interdisciplinary learning outcomes pertaining to problem solving, innovation, leadership, research and development (Dias, Dias & Lima, 2006; Jacob, 2015). The programme also offers an interdisciplinary mix of content, providing context for combining subject areas and enhancing learning opportunities.

Theme 4: Reframing Concepts in Novel Ways

Learning Environment	Interdisciplinary Learning Outcomes: Descriptive Data
Lectures, Away-Day, Post-Lecture & Lunches	- Gathers diverse people from various universities and disciplinary backgrounds to interact and collaborate surrounding food-systems topics or issues (F3), offering exposure to differing lenses, positions, perspectives, opinions and points of view (F2; F5; I4; I3; I7; I12; I9; Q7)
Lectures	- Understand food issues and topics in a new way (I3; Q32), with exposure to different disciplinary areas (I2) and ways of thinking (I1; I10; Q23)
Lectures & Away-Day	- Speakers with different disciplinary points of view, backgrounds and perspectives on topics (I9; I3; I4; Q20)

Discussion

The descriptive data presented findings regarding the ways in which the programme facilitated interdisciplinary learning, promoting students to reframe concepts in novel ways and from various perspectives. Across many of the learning environments, the programme established a community of diverse people from various universities and disciplinary backgrounds to interact and collaborate surrounding food systems topics or issues, offering exposure to differing lenses, positions, perspectives, opinions and points of view. In particular, the lectures were highlighted as a major context for individuals to understand food issues and topics in new ways, with exposure to different disciplinary areas and ways of thinking. In addition, the lectures and the away-day presented speakers with different disciplinary points of view, backgrounds and perspectives on topics. As a result, the programme facilitates key components of interdisciplinary learning, encouraging students to adopt different disciplinary perspectives, negotiate ideas and consider multiple viewpoints, to address complex problems (Bernard & Anita, 2006; Schaffer et al., 2008; Spelt et al., 2009; Fortuin, Karen & Bush, 2010; Jacob, 2015).

4.5 Interdisciplinary Learning Outcomes in a Blended Learning Context

Across the literature, there is rising support for blended learning environments within higher education contexts to facilitate interdisciplinary learning (Graham et al., 2012; Porter et al., 2014a; Cooner, 2011). As mentioned previously, a blended learning environment is comprised traditional face-to-face and technology mediated learning

opportunities, which are intended to meet the needs of diverse learners (Graham et al., 2012; Porter et al., 2014a; Singh, 2003; Picciano, 2009; Cooner, 2011). As a result, IFSTAL implemented a blended learning design, offering in-person and online environments to encourage interdisciplinary learning.

The focus group, interview and survey data presented common findings regarding the impact of IFSTAL's in-person learning environments and activities on students' interdisciplinary learning outcomes. Participants' descriptive data highlighted the ways in which the lectures, post-lecture discussions, away-day and lunches facilitated students' cognitive advancement and understanding, knowledge expansion, integration of disciplinary knowledge and ability to reframe concepts in novel ways, which are key components of interdisciplinary learning. In particular, across the focus group, interview discussions and survey findings, the lectures were repeatedly acknowledged as a leading environment for interdisciplinary engagement and learning (see Appendix B for further data).

On the other hand, the focus group, interview and survey data presented conflicting findings regarding the extent to which the programme's online learning environment has facilitated students' interdisciplinary learning outcomes. Across the focus group and interviews, participants did not discuss the ways in which the VLE facilitated their interdisciplinary learning outcomes when prompted. This lack of response may be attributed to lower attendance rates, technological challenges, accessibility or other barriers mentioned. The findings may also suggest that the VLE did not facilitate students' interdisciplinary learning outcomes, especially since the VLE was often utilized for practical purposes rather than a learning platform. Yet, the survey produced differing results indicating that the virtual learning environment did help to facilitate students' interdisciplinary learning, with many participants indicating that the VLE aided in their interdisciplinary learning "a great deal" or "occasionally" (see Appendix B for further data). With conflicting findings across the data collection methods, further investigation of the programme's virtual learning environment and its influence on students' interdisciplinary learning outcomes is required.

4.6 Summary

Within this chapter, the research results and discussions were integrated into Spelt et al. (2009) Presage, Process and Product empirical framework, to explore the interactions between student, environment, learning process and interdisciplinary outcomes. The presage section provided information about the participants, including

students' degree, discipline, university and programme involvement. This section also discussed the programme's blended learning environment, noting its face-to-face lecture, post-lecture, away-day and lunch events, and online virtual learning platform. The process section included descriptive data and thematic findings pertaining to the ways in which the programme supported students' interdisciplinary learning process, through content engagement and interactions with others. In addition, programme barriers and suggested solutions related to participation, specific relevance, structure and organization, time, and application were discussed to improve the programme and students' interdisciplinary learning process. Derived from the interaction between the student, environment and process components, the product section presented descriptive data and thematic findings pertaining to students' interdisciplinary learning outcomes associated within the programme. These interdisciplinary outcomes include cognitive advancement and understanding, knowledge expansion, integration of disciplinary knowledge, and reforming concepts in novel ways. Throughout the process and product stages, aspects of an effective community of practice were critically evaluated, in accordance with the data findings. Finally, students' interdisciplinary learning outcomes associated with the blended learning environments were analyzed and discussed, highlighting the ways in which the face-to-face environments facilitated interdisciplinary learning outcomes and provided inconclusive results regarding the virtual learning components.

Conclusion

This study set out to explore the ways in which IFSTAL influenced students' interdisciplinary learning. Through a focus group, interviews and survey, students' perspectives and opinions of their interdisciplinary learning experiences associated with the programme were investigated. According to participants' descriptive data, the programme facilitated students' interdisciplinary learning. Primarily through content engagement and interaction with others, students acquired cognitive advancement and understanding, knowledge expansion, integration of disciplinary knowledge and ability to reframe concepts in novel ways, which are key components of interdisciplinary learning. Although participants acquired interdisciplinary learning outcomes, various barriers associated with the programme, relevant to students' interdisciplinary learning were mentioned. These barriers pertain to participation rates, specific relevance, structure and organization, time and applicability. To address these barriers, students offered valuable recommendations, such as improving the accessibility and usability of the VLE, providing relevant in-depth content, altering the traditional format of the lectures and including a panel of diverse speakers with individuals outside of academia, changing the scheduling and time to meet the needs of students, and offering practical experiences to engage with food systems (see Appendix C for recommendations summary). These suggested solutions were provided to improve the programme and further enhance students' interdisciplinary learning outcomes. Upon implementation of these proposed recommendations, future studies should re-evaluate students' interdisciplinary learning outcomes.

The research study also investigated the ways in which the programme facilitated a community of practice and its influence on students' interdisciplinary learning. Participants' descriptive data derived from the focus group, interviews and survey presented many ways in which the programme implemented a successful community of practice, taking into consideration Wenger's (2006) seven actions needed to cultivate an effective community. The community of practice welcomes different levels of participation (3), creates opportunities for open dialogue (2), and offers a public space where individuals can share, discuss and explore ideas (4). On the other hand in association with programme barriers, participants highlighted ways in which the programme's community of practice can be improved. It was suggested to offer space for private exchanges based on specific needs within the VLE (4), obtain additional perspectives of experts from food industries outside of academia (2), and find and

maintain a regular rhythm of activities and events that enable members to regularly engage (7). Based on Wenger's (2006) theoretical framework, these suggestions would improve the effectiveness of IFSTAL's community of practice and consequently students' interdisciplinary learning outcomes. Although, further investigation of these recommendations would be beneficial following implementation. Moreover, a few of Wenger's (2006) actions needed to cultivate a successful community of practice were not explored within the context of this study (1, 5 & 6), as they did not relate to the interdisciplinary focus of the research or students' descriptive data findings. As a result, future studies should examine all of the actions needed to cultivate a successful community of practice in relation to the programme.

In addition, the ways in which IFSTAL's blended learning design impacted students' interdisciplinary learning outcomes were examined. The focus group, interview and survey data presented common findings regarding the in-person learning environments. The lectures, post-lecture discussions, away-day and lunches facilitated students' cognitive advancement and understanding, knowledge expansion, integration of disciplinary knowledge and ability to reframe concepts in novel ways, which are relevant components of interdisciplinary learning. On the other hand, the data presented conflicting findings across the data collection methods regarding the ways in which the programme's online learning environment impacted students' interdisciplinary outcomes. This may be attributed to various barriers, such as lower participation rates or technological challenges. With inconclusive results, further investigation of the programme's virtual learning environment and its influence on students' interdisciplinary learning outcomes is required.

5.1 Limitations and Considerations

This research study posed some limitations, many of which have been addressed throughout the dissertation. Although there are a few limitations relevant to the data collection process which will be further discussed, to provide recommendations for future research. To begin, participants within the focus group were comprised of postgraduate students from the University of Oxford, due to practical and ethical reasons. With students only representative of the University of Oxford, this may have created institutional bias regarding students' experiences and perspectives engaging with the programme. Future studies should include focus groups from each of the affiliated higher education institutions involved with IFSTAL, to gather a variety of perspective and experiences. During the both the focus group and interview process,

handwritten notes were utilized to record participant data, which provided efficient and concise results. This method posed some challenges, such as maintaining eye contact and rapport whilst simultaneously taking down legible notes. Future studies should consider tape recording focus groups and interviews, to maintain focus and build rapport with participants. In addition, tape recordings provide accurate, authentic and reflective transcriptions of participants' perspectives, enabling the integration of direct quotations within future research (Markle, West & Rich, 2011). Finally, the duration of the study poses some limitations, as it examines the programme only within its first year of implementation. Further research should investigate the programme's growth and development over time. In particular, exploring the ways in which the programme facilitated students' interdisciplinary learning following the implementation of students' proposed suggestions for improvement.

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Appendix A

Survey Question:

How useful have you found the online resources on the 'VLE' (IFSTAL online learning platform)?

	Very Useful	Useful	Of Little Use	Not Useful	Don't Know	N/A	No Response
Email Newsletter	12	19	6	1	1	3	15
Email Notifications	9	19	5	4	1	4	15
Blog Posts	4	17	12	1	3	3	17
Forum	4	15	12	0	6	5	15
Streamed or Recorded Lectures	20	19	1	0	0	2	15
Activities (ex. Quizzes)	10	11	4	1	9	7	15
Profiles	4	14	8	2	9	5	15
Calendar of Events	10	19	2	1	4	6	15
Chat Room	1	13	8	2	8	10	15
Social Media	10	10	5	1	7	9	15

Appendix B

Survey Question:

To what extent have the following aspects of the IFSTAL programme helped to facilitate interdisciplinary learning?

	A Great Deal	Occasionally	Rarely	Not At All	Don't Know	N/A	No Response
Live Lecture	18	19	4	0	2	0	14
Post Lecture Activities	7	19	2	1	9	5	14
Post Lecture Receptions/ Networking Activities	5	17	4	1	9	7	14
Away-Day *	8	3	4	0	7	20	15
VLE	13	12	5	2	8	3	14

*Away-Day restricted attendance, with a total of 30 people attending the event

Appendix C

Summary of Recommendations

Lectures	• Invite high level speakers, such as members of government, to attract people • Change venues to encourage others to attend • Advertise IFSTAL further, by going to courses/departments and explaining the aims and benefits of joining the programme (recruitment emails often got lost or deleted) • Offer content with further disciplinary depth • Implement team-working exercises or case studies relevant to the lecture topic, to build in-depth understanding, collaborate with others and see how different people would solve related problem • Produce lecture content that caters to what people want to learn, their interests and research • Establish lecture content that is focused on its mission and topic • IFSTAL should encompass food related issues relevant to developing and developed countries • Alter the format of the lecture to a round table approach, by creating an open, democratic and non-hierarchical space amongst academics and students to break down topics, critique theories and ideas, receive research feedback and pose questions throughout • Establish a panel of diverse speakers such as engineers, urban planners, water specialists, philosophers and graduate students, with different opinions, views, perspectives, personalities, research methods and disciplinary backgrounds to facilitate debate and interdisciplinary discussion • Encourage speakers to introduce themselves as they take a particular disciplinary perspective or if talking on behalf of an organization, layout what they consider their 'approach' to be, as it is beneficial to know people's backgrounds, motivations, preexisting biases and disciplinary perspectives • Include speakers outside of academia such as farmers, business people, policy makers, etc. with strong practical understanding of the field, to learn about how they address food systems challenges • Change lecture times, as students are often tired and go home at 5:30 • Continue ongoing lectures, in-between and throughout each term
VLE	• Resolve log-in challenges and make user-friendly • VLE should shift towards a simple, practical space for email prompts, online sign-up and other practical usages • The VLE should have the option to post anonymously or offer a student-only section on the VLE, to help with factors such as intimidation • The VLE should be connected to other online platforms and social media, with direct alerts and notifications ex. sign-in to VLE using Facebook account
Lunch Events	• Boosts interaction using a walking lunch approach, which includes portable food such as sandwich and space to walk around that is often outdoors

Away-Day	• Keen for more discussion, away-day events and brief in-person activities to get people involved and invested • Start with the away-day at the beginning of the year for people to build connections, network, learn from each other and share their research and academic interests
General	• Between terms, it was suggested to run a project to maintain engagement with IFSTAL (however, some participants were opposed to this idea, as it required more work) • Create regular, structured coffee sessions looking at what different people are researching/working on and how food systems influence their research • Don't make events too long, entire day in the classroom not appealing • Provide more notice for sign-up and tasks • Provide research problems, such as an industry issue and offer various ways to approach this problem • Facilitate a research project, such as a writing a report or policy proposal • Create events that involve role playing games, which persuade people to think of ways to tackle real-world issues • Teach students how to grow their own food which will solve many food-related issues through knowledge acquisition, maintain students involvement in the programme, boost physical activity and improve the environment • Have an activity day that shows students where our food comes from

Appendix D

The Impact of Interdisciplinary Teaching on Student Learning**(Name Change: Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model)**

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

If your research involves participants whose ability to give free and informed consent is in question (this includes those under 18 and vulnerable adults), then it is advisable to read the following NSPCC professional reporting requirements for cases of suspected abuse

<http://www.nspcc.org.uk/globalassets/documents/information-service/factsheet-child-abuse-reporting-requirements-professionals.pdf>

Should there be any subsequent changes to the project which raise ethical issues not covered in the original application you should submit details to research.office@education.ox.ac.uk for consideration.

Good luck with your research study.

Yours sincerely,

Nigel

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Appendix E

Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

Please take some time to read this information and ask any further questions if anything is unclear. Contact details can be found at the end of this document.

What is the purpose of the study?

This study aims to fill a gap in current literature about the impact of interdisciplinary teaching on student learning. In particular, the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning. To fill this gap, the study will conduct a focus group and interviews with participants from each of the universities affiliated with IFTSAL including the University of Oxford, City University London, University of Reading, University of Warwick and Leverhulme Centre for Integrative Research on Agriculture and Health. Following the focus group and interviews, surveys will be administered through IFSTAL's Virtual Learning Environment website, to provide a fuller picture of the ways in which the nature of the programme has probed critical interdisciplinary thinking and learning related to food system challenges.

Who is organizing and supporting this research?

The research for this study is being undertaken by _____, who is a MSc (Master) student in the Department of Education at the University of Oxford. This project is being supervised by _____, who has extensive knowledge and experience pertaining to educational research. This research is in support with Innovative Food Systems Teaching and Learning program and has been reviewed and approved by the University of Oxford Central University Research Ethics Committee (CUREC).

Why have I been asked to participate?

This project aims to interview students associated with the IFSTAL programme from a variety of affiliated universities, in order to gain further insight on teaching and learning outcomes associated with the programme.

Do I have to take part?

It is not compulsory to take part in this study and you may ask the researcher questions or ask for more information before deciding whether or not to participate. However, we believe that you have something important to contribute to this study and to further support researchers who want to study- interdisciplinary teaching and learning, and we hope that you will contribute. If you agree to take part in this study you will be asked to sign a consent form. Please note, however, that you are free to withdraw from the study at any time and will not be asked to give any reasons if you do choose to withdraw.

What will taking part in the study involve?

If you agree to take part in this study, I will arrange a focus group or interview with you. Ideally, I would like to organize the interview at a university location but if you would rather hold the interview somewhere more convenient for you, that can also be arranged. The focus group or interview will be conducted by _____, and will likely last 30 minutes. You will be able to take breaks throughout the interview, if so desired.

What are the possible benefits of taking part?

The aim of this project is to conduct a focus group and interviews to gather in-depth data from students affiliated with University of Oxford, City University London, University of Reading, University of Warwick or Leverhulme Centre for Integrative Research on Agriculture and Health who are engaged with IFSTAL, as these experiences have previously been little recorded or explored. The experiences of students involved

with IFSTAL are very important in allowing researchers to understand the nature of the collaborative cross-higher education institution programme and its impact on students' interdisciplinary learning. Participating in this study will provide you with an opportunity to relive some of your experiences and memories engaging with IFSTAL, and will give you the chance for these to be added to public knowledge about the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted your interdisciplinary learning. We hope that you will find it rewarding to have your contributions publicly recognized and that you will be pleased to be able to add to current literature surrounding interdisciplinary teaching and learning, enabling researchers to understand more about this subject area.

What are the possible disadvantages and risks of taking part?

We hope that the experience of taking part in this study will be enjoyable for you. However, it is likely that you will be discussing your opinions and beliefs surrounding IFSTAL and your personal learning experiences, within a group setting of fellow student colleagues and programme leaders. You will at no point be obliged to talk about any topic that makes you uncomfortable.

How will my focus group/ interview be used?

The focus group and interviews collected in this study will be used alongside survey data to uncover more about the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning. Publications which come out of this project may use quotations from your interview. Once the interviews have been deposited at the end of the project, future researchers may also wish to use and quote your interview in their work. On the consent form you will be asked to confirm that you are happy to assign your copyright for the interview to the researcher, meaning that you consent for researchers to use and quote from your interview. In all works produced using your interview, your name and other personal information will be anonymized.

What happens to the interviews collected during the study?

Interviews will be transcribed and stored digitally, managed by the researcher _____, for the duration of the project. Only the researcher and IFSTAL programme leaders who have conducted the interviews alongside _____ will have access to the interviews and personal information.

What happens at the end of the project?

If you agree to participate in this project, the research will be written up as a thesis. All participants are able to request a summary of the research findings should they wish to by contacting the researcher _____. On successful submission of the thesis, it will be deposited both in print and online in the University of Oxford, to facilitate its use in future research. The digital online copy of the thesis will be deposited with the Oxford University Research Archive (ORA) and will be published with open access, meaning that it will be available to all internet users. At the end of this project the data collected from interviews with participants will be deposited at the UK Data Service for use by future researchers.

What should I do if I have any concerns or complaints?

If you have a concern about any aspect of this project, please speak to the researcher who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the chair of the Research Ethics Committee at the University of Oxford (Chair, Social Sciences & Humanities Inter- Divisional Research Ethics Committee; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD). The chair will seek to resolve the matter in a reasonably expeditious manner.

Appendix F

Email for Focus Group Interview Recruitment

Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

The email will read as follows:

Subject line: Focus Group Participants Needed for IFSTAL Postgraduate Study

Dear *[Name]*

I am a graduate student in the MSc in Education (Higher Education) programme at the University of Oxford, where I am currently developing a thesis that examines the impact of interdisciplinary teaching on student learning. I am especially interested in the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning.

I would like to organize a **focus group** at *[insert university]*, to ask about your experiences engaging with IFSTAL. In particular, any insights regarding the nature programme and its impact on your critical interdisciplinary thinking and learning related to food system challenges. The focus group will be held at *[insert university]*, for one or two hours at your earliest convenience. All responses will be confidential and anonymous.

If you could help me by suggesting a time that works best for you, I'd be very grateful. Also, I can share results with you, before submitting them to the University. **Please reply stating whether you'd be able to do this, and if so, if there's a time between *[Date]* and *[Date]* that might suite your availability** (I am flexible with timing given the varied natures of your courses).

Please see the attached information sheet for further information. If you have any comments, questions, or concerns please contact me.

Sincerely,

*MSc Higher Education
Department of Education
University of Oxford*

Consent Form

STUDY TITLE Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

RESEARCHER DETAILS: MSc Education (Higher Education) student.....

PURPOSE OF STUDY:The purpose of the study is to investigate the impact of IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative, cross-higher education institution teaching model on students' interdisciplinary learning.....

Please read the following statements and sign your initials in the following boxes:

		participant initials each box
1.	I have read the study information sheet, have had the opportunity to ask questions and received satisfactory answers.	
2.	I understand that this project has been reviewed by, and received ethics clearance through the University of Oxford Central University Research Ethics Committee.	
3.	I understand that my participation is voluntary and that I am free to withdraw myself or my data at any time, without giving any reason, and without any adverse consequences or academic penalty.	
4.	I understands who will have access to personal data provided.	
5.	I understand how personal data will be stored eg. according to the Data Protection Act; and what will happen to the data at the end of the project.	
6.	I understand that the research will be written up as a master thesis and how personal data from this research will be published and archived.	
7.	I understand how to raise concerns or make a complaint.	
8.	I understand that in this project and all future works using this focus group interview, all personal and sensitive data will be anonymized.	
9.	I agree to take part in the study, and hereby assign to the researcher all copyright in my contribution for use in all work stemming from this project and future projects.	

If you do not wish to assign your copyright to the researcher or wish to limit public access to your contribution, please state these conditions here: _____

Name of Participant: _____

Signature: _____

Date: _____

Name of researcher: _____

Signature: _____

Date: _____

Focus Group Questions

1. What was your involvement with IFSTAL?
2. How did you find out that the IFSTAL programme was available?
3. What were your expectations and has it met them?
4. What does IFSTAL offer that your course doesn't, that you feel is valuable?
5. To what extent has IFSTAL enabled you to combine a variety of disciplinary perspectives to address food-systems topics or challenges?
6. What have you liked most and least so far?
7. Are there resources you aren't using?
8. What should the programme offer in future years?

Focus Group Notes Sample

Present:

What was your involvement with IFSTAL?

1 – Dphil. Went to the launch, some lectures, VLE – checked post-lecture discussions & watched lectures. Used profiles & is now collaborating with someone she met through IFSTAL at Oxford. Biotech Science

2 – Dphil. Attended most lectures, post-lecture activities, used the VLE a little. Found out about IFSTAL midway through the year. Public Health

3 – MSc. Found out about IFSTAL towards the end of the two terms, attended the awayday, watched lectures online and used the VLE a bit. Education

4 – Dphil. Found out about IFSTAL from the beginning. Attended some lectures. Didn't use the VLE much. International Politics

5 – MSc. Found out about IFSTAL from the beginning. Attended most lectures & the away day. Hasn't really used the VLE. Biodiversity

THE PAST:

What were your expectations and has it met them?

2 – That there were interesting lectures and that she could meet other people interested in food. Generally expectations were met, although didn't meet as many people as she thought/hoped.

4 – Hoped that IFSTAL would generate a debate on food systems, and bring it up the academic agenda at the University level – previously there hasn't been anything to turn up to. This has been done. But he was expecting to see more interest from diverse groups & this has not been fully achieved.

5 – No particular expectations. Thought some of the content might be more relevant to the issue of conservation which is what he is studying. Nice to have the social side of IFSTAL.

1 – No expectations because this is not her field. Her work is very specific and revolves around experiments, so IFSTAL was great to give her context and place her work in the broader field. Great lectures and information. Helped to build new knowledge and learn about different subject areas.

3- Did not come into IFSTAL with any particular expectations, other than to learn more about topics pertaining to food. Really enjoyed learning about different food systems challenges through the lectures and away-day. The away-day was highly interesting, as it was filled with a variety of interdisciplinary activities, group projects and collaboration amongst students, professors, researchers and professionals.

Appendix G

Email for Interview Recruitment

Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

The email will read as follows:

Subject line: Interview Participants Needed for IFSTAL Postgraduate Study

Dear [Name]

I am a graduate student in the MSc in Education (Higher Education) programme at the University of Oxford, where I am currently developing a thesis that examines the impact of interdisciplinary teaching on student learning. I am especially interested in the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning.

I would like to organize an interview at [insert university] or online (Skype, FaceTime) to ask about your experiences engaging with IFSTAL. In particular, any insights regarding the nature programme and its impact on your critical interdisciplinary thinking and learning related to food system challenges. The interview will be for 30 minutes, at your earliest convenience. All responses will be confidential and anonymous.

If you could help me by suggesting a time that works best for you, I'd be very grateful. Also, I can share results with you, before submitting them to the University. **Please reply stating whether you'd be able to do this, and if so, if there's a time between [Date] and [Date] that might suite your availability** (I am flexible with timing given the varied natures of your courses).

Please see the attached information sheet for further information. If you have any comments, questions, or concerns please contact me.

Sincerely,

*MSc Higher Education
Department of Education
University of Oxford*

Consent Form

STUDY TITLE Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

RESEARCHER DETAILS: MSc Education (Higher Education) student.....

PURPOSE OF STUDY:The purpose of the study is to investigate the impact of IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative, cross-higher education institution teaching model on students' interdisciplinary learning.....

Please read the following statements and sign your initials in the following boxes:

		participant initials each box
1.	I have read the study information sheet, have had the opportunity to ask questions and received satisfactory answers.	
2.	I understand that this project has been reviewed by, and received ethics clearance through the University of Oxford Central University Research Ethics Committee.	
3.	I understand that my participation is voluntary and that I am free to withdraw myself or my data at any time, without giving any reason, and without any adverse consequences or academic penalty.	
4.	I understands who will have access to personal data provided.	
5.	I understand how personal data will be stored eg. according to the Data Protection Act; and what will happen to the data at the end of the project.	
6.	I understand that the research will be written up as a master thesis and how personal data from this research will be published and archived.	
7.	I understand how to raise concerns or make a complaint.	
8.	I understand that in this project and all future works using this interview, all personal and sensitive data will be anonymized.	
9.	I agree to take part in the study, and hereby assign to the researcher all copyright in my contribution for use in all work stemming from this project and future projects.	

If you do not wish to assign your copyright to the researcher or wish to limit public access to your contribution, please state these conditions here: _____

Name of Participant: _____

Signature: _____

Date: _____

Name of researcher: _____

Signature: _____

Date: _____

Interview Questions

- 1) Why did you join IFSTAL?
- 2) Did you attend any of the lectures or view them online?
What aspects did you enjoy/ dislike?
- 3) Have you used the VLE?
What aspects did you enjoy/ dislike?
- 4) What were your impressions of the Away-Day?
- 5) In what ways has the programme integrated different disciplines?
How has it impacted your interdisciplinary learning?
Examples?
- 6) Did the programme help you to interact and collaborate with other people from other disciplines/ backgrounds?
Different Universities?
- 7) Are there any ways in which the programme could be improved to encourage interdisciplinarity?
- 8) Do you have any other positive or negative feedback regarding the programme?

Interview Notes Exemplar

Participant 3

1) Why did you join IFSTAL?

- Undergraduate in food security and nutrition in East Africa
- Masters dissertation in International Development and Creative Freedom
- Optional module not until next year, wanted to get involved in IFSTAL
- Interested in consortium of universities involved in IFSTAL
- New and exciting, fulfilling interests, stepping stone to understand issues in a new way

2) Did you attend any of the lectures or view them online?

What aspects did you enjoy/ dislike?

- Yes, attended lectures based at City, Royal Vet, LCIRAH and Oxford
- Enjoyed expertise of acclaimed people that are worthwhile learning from (economists, scientists, food security specialists)
- Enjoyed diversity of people (food issues from a different lense, learning in a diverse way from a wide perspective)
- Enjoyed interdisciplinarity, vital to connect through lectures, addressed similar and different issues a variety of ways
- Disliked mismatch of topic and outcome (moving away from lecture description)
- Lectures should use people in different ways, more practical ways
- Cater to interests, what people want to learn about (like in workshop platform)

3) Have you used the VLE?

What aspects did you enjoy/ dislike?

- Yes
- Good, only went on to register for events
- Used it for practical purposes
- Did not use learning materials
- Simple space, perfect for online forms (only if needed, notified by email prompts)

Appendix H

Email for Survey Recruitment

Interdisciplinary Communities of Practice: A Blended Learning in Higher Education Model

The email will read as follows:

Subject line: Survey Participants Needed for IFSTAL Graduate Study

Dear *[Name]*

I am a graduate student in the MSc in Education (Higher Education) programme at the University of Oxford, where I am currently developing a thesis that examines the impact of interdisciplinary teaching on student learning. I am especially interested in the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning.

Currently, I am looking for participants from the *[insert university]* to partake in a **short online survey questionnaire**, to evaluate your experiences engaging with IFSTAL. In particular, any insights regarding the nature programme and its impact on your critical interdisciplinary thinking and learning related to food system challenges. The survey will take no more than 5 to 10 minutes to complete. All responses will remain confidential and anonymous.

If you are interested in participating in the short online survey questionnaire, please click the following link to proceed: *[insert survey link]*.

Please see the attached information sheet for further information. If you have any comments, questions, or concerns feel free to contact me.

Sincerely,

*MSc Higher Education
Department of Education
University of Oxford*

General Information

We appreciate your interest in participating in this questionnaire. Quickly read through these terms before agreeing to participate by ticking the 'yes' box below.

This study aims to fill a gap in current literature about the impact of interdisciplinary teaching on student learning. In particular, the ways in which IFSTAL's (Innovative Food Systems Teaching and Learning) collaborative cross-higher education institution teaching model has impacted students' interdisciplinary learning. You will be given some survey questions to read, and then answer. It should take about 5-10 minutes. This is not a test of your academic knowledge, and no background knowledge is required.

Your answers will be completely anonymous and kept confidential. Please note that your participation is voluntary. You may withdraw at any point during the questionnaire for any reason, before submitting your answers. The data will be stored in a password-protected file and may be used in academic publications.

This questionnaire is for a Master dissertation. The principal researcher is _____, an Education student, who is attached to the Department of Education at the University of Oxford. This project is being completed under the supervision of _____. This project has been reviewed by, and received ethics clearance through the University of Oxford Central University Research Ethics Committee.

What if there is a problem?

If you have a concern about any aspect of this project, please speak to the researcher or supervisor, who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the chair of the Research Ethics Committee at the University of Oxford.

(Chair, Social Sciences & Humanities Inter-Divisional Research Ethics Committee; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD). The chair will seek to resolve the matter in a reasonably expeditious manner.

Please note that you may only participate in this survey if you are 18 years of age.

I certify that I am over 18 years of age.

If you agree to participate and have read the terms above, please check the relevant box below to get started.

Yes, I agree to take part

No, I do not wish to take part

Survey Questions

* 1. Please note that you may only participate in this survey if you are 18 years of age.

- ☐ I certify that I am over 18 years of age. If you agree to participate and have read the terms above, please check the relevant box below to get started.
- ☐ Yes, I agree to take part
- ☐ No, I do not wish to take part

2. Are you a

- ☐ Masters student
- ☐ PhD student
- ☐ Other (please specify)

3. Are you a

- ☐ Home student
- ☐ International student

4. Age group

- ☐ 18-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65
- ☐ 66+

5. Your institution is [select all that apply]

- ☐ City University London
- ☐ London School of Hygiene and Tropical Medicine
- ☐ Oxford University
- ☐ Reading University
- ☐ Royal Veterinary College
- ☐ School of Oriental and African Studies
- ☐ Warwick University

6. How did you find out about the IFSTAL programme? [select all that apply]

- ☐ Local IFSTAL Education Coordinator
- ☐ IFSTAL website
- ☐ IFSTAL online Virtual Learning Platform (VLE)
- ☐ Departmental email
- ☐ Course or programme director/supervisor
- ☐ Friend/colleague
- ☐ Other (please specify)

7. Why did you join the programme? [select all that apply]

- ☐ To improve your CV
- ☐ To learn about the food system beyond the content of your own programme/discipline
- ☐ To network
- ☐ To attend events
- ☐ To access online materials
- ☐ To access experts beyond those in your department(s)
- ☐ To liaise with workplace experts
- ☐ To access internships
- ☐ To access placements
- ☐ To get an IFSTAL certificate of participation
- ☐ Other (please specify)

8. Has the programme met your expectations?

Definitely	Mostly	Don't know	Rarely	Definitely not
☐	☐	☐	☐	☐

9. Please explain why:

10. How important to you are the following aspects of the IFSTAL programme?

	Very Important	Important	Don't know	Of little importance	Unimportant
Finding out about global food systems	☐	☐	☐	☐	☐
Systems thinking methodologies	☐	☐	☐	☐	☐
Developing workplace skills eg: communication, negotiating	☐	☐	☐	☐	☐
Mapping food systems	☐	☐	☐	☐	☐
Working in an interdisciplinary environment	☐	☐	☐	☐	☐
Meeting experts working in the food system	☐	☐	☐	☐	☐
Accessing internships or research placements	☐	☐	☐	☐	☐
Accessing online resources	☐	☐	☐	☐	☐

11. How useful did you find the following aspects of IFSTAL?

	Very useful	Useful	Don't know	Of little use	Not useful	Not applicable
Live lectures	☐	☐	☐	☐	☐	☐
Post-lecture [and /or for Warwick: lunchtime] activities	☐	☐	☐	☐	☐	☐
Post-lecture receptions/networking opportunities	☐	☐	☐	☐	☐	☐
Awayday (Oxford, March 5th)	☐	☐	☐	☐	☐	☐
Virtual Learning Environment (VLE)	☐	☐	☐	☐	☐	☐

12. Please explain why

13. To what extent has IFSTAL enabled you to combine a variety of disciplinary perspectives to address food system topics or challenges?

A great deal	Occasionally	Don't know	Rarely	Not at all
☐	☐	☐	☐	☐

14. To what extent have the following aspects of the IFSTAL programme helped to facilitate interdisciplinary learning? (where interdisciplinary learning means, 'the process by which students come to understand bodies of knowledge and modes of thinking from two or more disciplines and then integrate them to create a new understanding')

[illegible]

15. How easy do you find the IFSTAL online learning platform (the 'VLE') to use?

Very easy Easy Don't know Difficult Very difficult

16. Please explain why

17. How useful have you found the online resources on the 'VLE' (IFSTAL online learning platform)?

[illegible]

18. To what extent do you feel that IFSTAL enhances your post-graduate studies?

Definitely	Mostly	Don't know	Rarely	Definitely not
☐	☐	☐	☐	☐

19. Please explain why

20. What other resources or content would you like to see on the IFSTAL online learning platform ('VLE')?

21. Would you like to remain involved in the IFSTAL alumni network once you complete your programme?

Definitely	Possibly	Don't Know	Unlikely	Definitely not
☐	☐	☐	☐	☐

22. Please explain why

23. Do you have any other comments you would like to make about the IFSTAL programme?