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Integrating sustainability into a social science: what are the essentials?

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Abstract: Social sciences in higher education, including fiber, textile and clothing (FTC) programs, have been slow to integrate sustainability, impeded by limited understanding about *what* to integrate. The objective of this study was to identify the dominant knowledge and skill areas included in educational programs that evidence high commitment to sustainability education. Qualitative analysis of secondary data revealed fifteen knowledge areas and eight skills in formal curriculum and seventeen topics commonly covered via informal education. This analysis identified natural and physical science knowledge most emphasized in sustainability learning but also revealed the importance of knowledge regarding economic and social issues. The most emphasized skill areas were problem solving, planning and management, and civic engagement. When comparing formal and informal programming there were many commonalities, yet the latter emphasized practical application to daily living. The study utilized the FTC discipline to illustrate how this framework of essentials may be useful as other social sciences reframe curriculum.

Keywords: Educational development, sustainability, educational research, curriculum and co-curricular

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1. Introduction

Climate change and other multifaceted environmental issues are transforming the earth's surface and atmosphere. Advances in science and observation of climate change are providing a clearer understanding of the unpredictability of Earth's climate system and its response to human influences (Moss, et al. 2010). To stabilize ecosystems and decrease environmental impact, collective behavioral change is requisite, for which education is fundamental (UNESCO 2012).

The UN's Decade for Sustainable Development (2005-2014, DESD) inspired significant changes to the operations and educational programs found on college campuses around the globe. Yet, on the educational front, sustainability concepts have proven relevant and integrated with ease in the natural and physical sciences while integration in the social sciences has been less consistent. This inconsistency may be related to a lack of understanding about what is essential for integration as well as a lack of confidence on the part of educators. Social science educators may be hesitant to integrate sustainability science concepts into the curriculum as most lack formal natural and physical science training. If we better understood what essential science concepts are typically included in a sustainability curriculum we could better equip disciplines to address this deficiency with targeted professional development support that could stimulate integration.

The primary objective of this study was to identify the core knowledge areas and skills most frequently included in undergraduate sustainability-focused academic programs for the purpose of creating a framework of essentials for consideration in the fiber, textiles, and clothing (FTC) curricula, a social science discipline where sustainability integration has lagged. Importantly, this study sought to understand what has been successfully implemented in the university system, moving beyond theoretical speculation. Further, the study illuminates activities in both formal (curricula) and informal (co-curricular) programming, providing an understanding of the multiple pathways that could be utilized for integration by the FTC discipline. To address this objective, research questions were developed:

1. What is characteristic about educational programs that evidence high commitment to sustainability education?
    a. What are the dominant knowledge areas emphasized in these academic programs?
    b. What are the dominant skills targeted by these academic programs?

2. What is the relationship between knowledge and skills targeted among formal sustainability education programming and competences targeted via informal (co-curricular) educational activities?
    a. What are the dominant topic areas found in informal educational activities?
    b. How do informal topic areas compare to the dominant core knowledge areas emphasized by formal sustainability-focused educational academic programs?

The study included the qualitative analysis of secondary data related to eight institutions that evidence the greatest commitment to or movement toward sustainability in the areas of formal (curriculum) and informal (co-curricular) education programs. Formal and informal educational programs were reviewed to identify the dominant knowledge areas and skills targeted in these programs. Finally, this analysis was utilized in a conceptual exercise to connect these essentials to specific topic areas in the FTC curricula.

1.1 Formal and Informal Postsecondary Sustainability Education

Postsecondary education has changed dramatically in recent decades, largely in response to technological advancements and information availability. Education occurs through three distinct pathways: formal, non-formal, and informal learning. Formal learning is structured (curriculum-based) learning, typically provided through earned degrees or certifications. Non-formal learning is structured but does not lead to degree or certification completion. Informal learning is non-structured learning that is conducted through daily life activities related to work, recreation, or family (Colley, Hodkinson, and Malcolm 2003). The primary differences between formal and informal education are the educators, environments, and participants' receptivity to learning. The educator in the formal learning setting may be an instructor or professor utilizing a traditional lecture or laboratory room and the learner, who may have little contribution and feedback to the formal program, is typically following a specific course or path (degree or certificate). In the informal education environment, the educator may be a peer, the setting may be an event location (e.g. outdoors, restaurant, communal space/lounge), and the learner may willingly volunteer to participate in educational activity, which typically emphasize practical, real-life opportunities to apply learned knowledge and skills. Research has indicated the positive impact that informal education and learning can contribute to the development of a well-rounded and holistic thinking individual (Beckett and Hagar 2002). Some of the most important factors in promoting individual development and academic achievement for collegiate students are engagement, collaborative efforts, and challenging academic tasks (Astin 2001; Kuh 1996; Pascarella and Terenzini 1991). Co-curricular activities support self-development (Benerd 1953) and may supplement formal education to solidify learning (Colley, Hodkinson, and Malcolm 2002; Dewey 1938).

Sustainability education emphasizes the development of values, behaviors, and lifestyles required to support a sustainable future (UNESCO 2003). Institutions are challenged to reform educational structures to incorporate the knowledge and skills required to cultivate such future-oriented thinking. Education for sustainable development (ESD) advocates for lifelong learning, utilizing all possible spaces for learning – formal, non-formal, and informal (Calder and Clugston 2005), fostering respect for diversity, thoughtful human-nature relationships, and development that is more environmentally and socially responsible. Though many colleges and universities are committed to the goal of sustainability education, many graduates know little about the importance of aligning their personal, professional, and civic lives with sustainability principles.

Sustainability is not an independent field or discipline, but rather a vibrant arena that brings together scholarship and practice, global and local perspectives, and diverse disciplines (Century, Cassata, Rudnick, and Freeman 2012). It embodies "ideas and perspectives, sometimes conflicting, by which one might hope to achieve a viable future for humankind" (Rapport 2007, 1). Therefore, sustainability knowledge and skills may be implemented into any academic program's mission, guiding principles, or learning outcomes due to its multidisciplinary, interdisciplinary and transdisciplinary characteristics (Komiyama, Takeuchi, Shiroyama, and Mino 2011; Schoolman, Guest, Bush, and Bell 2011). Though numerous studies propose frameworks for embedding sustainability in higher education, the applicability of these frameworks is often constrained by the diversity of disciplines involved (e.g. engineering, business, physics).

Integrating sustainability into higher education requires a much more holistic approach to formal education and should utilize informal educational activities on campus and in the community to supplement (Cortese and Hattan 2010). By working to connect and integrate core concepts from formal paths with informal opportunities in organized ways, students can learn to think systematically, develop a deeper understanding of cause-and-effect relationships, strengthen their critical thinking skills, and better integrate classroom concepts to real-world situations (Cortese and Hattan 2010; Pasque, Bowman, Small, and Lewis 2009).

1.2 Fiber, Textiles, and Clothing (FTC) and Sustainability Education

The $3 trillion FTC industry substantially contributes to climate change, accounting for nearly 10% of total global carbon emissions (Zaffalon 2010). Natural resource consumption, toxic chemical use, and human health have been significantly impacted by FTC industry practice with social and environmental externalities spanning all phases of a garment's life cycle (Business for Social Responsibility 2009). Increasing global population and growing prosperity in developing countries is driving demand for FTC products, multiplying the industry's impact. The industry is now under substantial pressure to mitigate its environmental burden – increasing the demand for professionals who understand these issues and can implement change.

Ha-Brookshire and Hawley (2013) recently defined the aim of the FTC discipline as the "science of investigating the satisfaction processes of humans' clothing needs and wants" (22). Under this essential aim are a variety of disciplinary emphases that include clothing design, manufacturing and production, retailing and merchandising, and textile science, to name a few (Albanese et al. 1998). Many FTC scholars have advocated for an increased presence of sustainability throughout these emphases (Armstrong and LeHew 2011b; Dickson and Eckman 2006; Hiller Connell and Kozar 2012). Ha-Brookshire and Norum (2011) indicated that students have positive attitudes and interest toward sustainability, but do not possess full knowledge about the concepts and possibilities that sustainability education can offer. Further, pedagogical research affirms the need for new approaches for sustainability education in the FTC discipline, such as problem-based learning, the use of simulations/virtual reality learning modules, and informal activities like conferences and summits (Gam, Cao, Farr, and Heine 2009; Gam and Banning 2011; Ha-Brookshire and Norum 2011; Jacob 2007).

Armstrong and LeHew (2014) recently found that the integration of sustainability across many FTC foci is very active in both formal and informal programs, though not necessarily scaffolded or organized effectively. These authors argue that progress toward the acceleration of integration is largely constrained by faculty confidence and expertise, which are both currently lacking (ibid). Specifically, sustainable development requires a better understanding of environmental and social problems, which are based on scientific components (McKeown 2006). Unfortunately, many FTC programs have only a small portion of the curricula dedicated to science (Albanese, O'Neill, and Hines 1998). Further, the scientific concepts that have historically been included in the formal curriculum, primarily by way of textile science, has deteriorated over the last decade (Armstrong 2011; Pasricha 2010). This lack of natural and physical sciences in the curricula make topics like climate change and environmental sustainability difficult to comprehend and teach (Kenan 2009), especially pertaining to product composition, manufacturing processes, and life cycle assessment. This challenge nevertheless provides an opportunity to enhance the quality of postsecondary education to better prepare future graduates for the industry, and also capitalizes on the Millennial generation's motivation to take action and bring positive environmental changes to their communities (Boekeloo 2008).

2. Method

The primary objective of this study was to identify the core knowledge areas and skills most frequently included in undergraduate sustainability-focused academic programs for the purpose of creating a framework of essentials for consideration in the fiber, textiles, and clothing (FTC) curricula, a social science discipline where sustainability integration has lagged.. Accomplishment of this goal occurred through a multi-step process. First, identification of the leading higher education institutions offering sustainability-science academic programs occurred. Second, through a systematic process, the researchers identified eight institutions that evidence the greatest commitment to or movement toward sustainability in the areas of Curriculum and Co-curricular activities, followed by qualitative analysis of sustainability-related secondary data for each school.

2.1 Overview of STARS

To identify the leading baccalaureate academic institutions in North America that offer sustainability-science focused academic programs, the researchers utilized the Sustainability Tracking, Assessment and Rating System (STARS), a measurement tool developed by the Association for the Advancement of Sustainability in Higher Education (AASHE). STARS is a self-reporting system used by colleges and universities to assess performance regarding sustainability and is grounded in a system of assigning schools credits for engaging in a variety of sustainability activities. Over 200 US and Canadian institutions of higher education submit data pertaining to categories of: 1) Education and Research, 2) Operations, and 3) Planning, Administration, and Engagement.

This framework provides an understanding of sustainability within the context of higher education institutions of many shapes and sizes. It is grounded in a broad definition of sustainability that encompasses concurrent consideration for environmental, social, and economic health and viability, as reflected in the Bruntland Commission Report. Therefore, the selection and weighting of credits that comprise STARS is informed by these three tenets and is based on some core assumptions, chief of which is whether the credit is a good indicator of movement and/or improvement toward sustainability. Another assumption is the appropriateness of the credit for the vast diversity of institutions that report their activities. STARS also prioritizes performance indicators over specific types of strategies that may be used to achieve performance. Finally, an assumption is made that the credits selected are measurable, are as objective as possible, and are items on which an institution could take reasonable action. The intention of STARS is not to penalize institutions for areas in which implementation has not occurred but to recognize persistent movement. The system is thought to be most useful for information sharing and for measuring change over the long-term, indicating specific areas of progress (AASHE, 2012).

The STARS technical manual admits that this system is not perfect nor completely objective, and therefore, is continually evolving to more accurately depict sustainability efforts in higher education, as the landscape of activities continues to expand. In the current case, STARS version 1.2 was utilized (2012). Based on the reputation of AASHE and the rating of STARS by

Yarime and Tanaka (2012), the researchers selected this tool as the platform to identify schools for data collection.

For the purpose of this study, the researchers investigated data from the STARS sub-categories of Curriculum (formal) and Co-curricular (informal) Education, which fall under the Education and Research category. Within the Curriculum category, STARS awards credits for items such as sustainability-focused/related courses, sustainability learning outcomes, undergraduate and graduate academic programs in sustainability, and incentive programs for developing sustainability courses. Concurrently, institutions earn Co-curricular credits for activities such as student sustainability campaigns, sustainability content in new student orientation, sustainability themed housing, and on-campus sustainability events. Each STARS credit is assigned as either a Tier One or Tier Two type. Tier One credits are worth one or more points each and are grouped in a subcategory (e.g. Curriculum) within a category (e.g. Education and Research). Tier Two credits are worth 0.25 points each. Tier Two credits are earned by acknowledging strategies that warrant recognition but tend to have a smaller impact than Tier One credits, or by promoting strategies with benefits that are already largely captured by a Tier One Credit (See STARS 1.2 Technical Manual p. 9-10 for more details). In sum, the researchers utilized STARS as a tool, as it is currently the best measure of an institution's commitment to sustainability.

2.2 Identification of Institutions for Analysis

Identification of the institutions that evidence a high commitment to sustainability education began with a review of data within the Curriculum and Co-curricular sub-categories. This initial review identified 27 institutions (universities and colleges) that received a STARS rating of at least 70%.

To narrow the list further, the researchers expanded their data collection to review program details in these sub-categories. Within STARS, the maximum number of credits any institution can receive for the categories of Curriculum and Co-curricular totals 73 (Curriculum = 55 points, Co-curricular = 18 points). As previously stated, some Tier Two credits within Co-curricular (e.g. composting) may be largely captured by a Tier One credit in a category not reviewed in this study (e.g. Operations; Waste diversion), and therefore not properly represented in analysis, although the strategy merits recognition and coincides with research questions. Additionally, research has shown that informal education (co-curricular) is "not only more common, but also more effective than formal learning" (Colley et al. 2002, 9). Considering the comparable impact of informal education to formal education and that some co-curricular credits may be captured in STARS categories not under review, the researchers in the current study deemed Curriculum and Co-curricular credits equivalent in worth and assigned a weighted percentage to each credit when analyzing data. Weighting credit values permitted calculation of an overall average from the different data sets (Flores, 2011). The researchers averaged the calculated weighted percentages for each of the 27 identified institutions, which resulted in ranges from 62.38% to 100%. Ten institutions ranged from 81.57% to 100%. In order to achieve the study's research objectives and keep the amount of program data collected to a manageable and effective scale, the researchers chose to retain only eight schools, as there was a 5% drop between the eighth and ninth position. Table 1 illustrates the eight selected academic institutions and the corresponding weighted percentages.

Table 1

Selected sustainability-science institutions, annotations, and credit scores

Institution	STARS Curriculum Credits Assigned	STARS Co-curriculum Credits Assigned	**Curriculum and Co-curricular Weighted Average (%)**	Academic Programs Analyzed
Possible Credits Available	***55.00***	***18.00***		
Green Mountain College (GMC)	55.00	18.00	**100%**	2
Colorado State University (CSU)	52.45	17.75	**94.29%**	2
Georgia Institute of Technology (GTech)	54.00	17.75	**93.18%**	2
Appalachian State University (AppSU)	42.45	18.00	**90.92%**	2
University of Alaska Fairbanks (UAF)	31.55	18.00	**88.75%**	1
Portland State University (PSU)	36.35	18.00	**87.72%**	2
Northland College (NoLC)	46.73	17.75	**86.09%**	2
University of Wisconsin-Stevens Point (UW-SP)	43.49	17.75	**86.07%**	2

2.2 Data Collection and Analysis of Institutions

After identifying the eight institutions that evidence the greatest commitment to or movement toward sustainability in the areas of formal (curriculum) and informal (co-curricular) education, the researchers collected secondary data related to the academic programs included in the STARS assessment. Among the eight selected institutions, 15 academic programs were further analyzed (see table 1). Related to each academic program at each institution, the researchers gathered program descriptions, program-learning outcomes, required core course descriptions, and concentration option course descriptions for sustainability-science focused academic paths. Most information was available on the university's websites, but when information was missing, one of the researchers would contact the institution directly to acquire it. For the purpose of this investigation, the researchers avoided electives, as these are less indicative of required essentials. Informal education was reviewed through STARS credit submissions. Institutions provided a summary of activities relevant to each STARS subcategory, and this information was utilized for analysis. All data were analyzed using qualitative coding software (Nvivo) for identification and categorization of reoccurring themes across both formal and informal programs, separated into three different categories – Knowledge Areas (formal education), Skills (formal education), and

Topic Areas (informal education). The first author conducted the first phase of analysis. A peer debriefer was used later to review and refine aggregation of the themes.

3. Results

Inductive coding of formal and informal educational programs for the selected sustainability-focused academic programs revealed fifteen dominant knowledge areas and eight skill areas specific to formal education as well as fifteen topic areas included among informal educational activities. Results from the qualitative analysis are organized in Tables 2 through 4. These tables provide the most frequently cited concepts and relevant subcategories.

Table 2

Dominant knowledge areas by institution

Knowledge Areas	**Institution**								**Frequency**
	GMC	CSU	G Tech.	AppSU	UAF	PSU	NoLC	UW-SP	
Ecology	27	19	7	39	11	36	31	14	**184**
Policy and Law	41	6	6	11	16	24	8	41	**153**
Biology									**111**
Animals	7	10	---	---	8	5	7	10	47
Plants	6	8	---	---	---	1	5	12	32
Science and Evolution	1	4	10	4	3	4	3	3	32
Global Economics and Infrastructure	15	2	1	22	7	16	9	17	**89**
Energy									**67**
Energy Topics and Resources	14	2	4	10	1	4	6	2	43
Geothermal	1	---	---	1	---	---	1	1	4
Hydro	1	---	---	---	---	---	---	1	2
Nuclear	2	---	---	3	---	---	---	1	6
Solar	1	---	---	1	---	---	2	1	5
Wind	1	---	---	2	---	---	3	1	7
Water	11	7	10	14	2	11	4	6	**65**
Pollutants	4	3	8	9	2	13	4	18	**61**
Chemistry	10	7	17	11	1	3	1	6	**56**
Soil and Agricultural	15	---	3	18	---	1	---	13	**50**
Climate Change	8	---	7	7	1	11	2	10	**46**
Geography and Geology	9	1	2	17	2	4	2	9	**46**
Physics and Thermodynamics	1	6	15	6	---	---	---	---	**28**
Atmosphere	2	---	7	10	---	3	1	1	**24**
Forestry	---	2	---	---	---	5	2	5	**14**
Material Cycles	5	---	4	---	---	---	---	---	**9**

Table 3

Key skill areas by institution

Key Skills	GMC	CSU	G Tech.	AppSU	UAF	PSU	NoLC	UW-SP	Frequency
Problem Solving									**351**
General Skills	4	5	4	3	---	3	2	4	25
Case Study Investigation	3	---	1	3	3	7	1	3	21
Creativity	---	1	---	---	---	---	4	---	5
Critique and Analysis	16	6	10	16	3	14	9	16	90
Fieldwork	19	2	5	6	2	8	12	5	59
Inquiry and Research	13	9	3	11	9	13	17	7	82
Solution Development	5	6	1	3	---	1	---	1	17
Statistics	4	9	8	3	4	15	3	6	52
Planning and Management									**136**
General Skills	10	8	1	11	13	20	8	20	91
Natural Resource Management	1	14	---	1	9	9	2	9	45
Civic Engagement	17	6	3	10	11	19	11	6	**83**
Communication									**79**
General Skills	7	8	1	1	---	3	1	2	23
Media	4	5	---	2	---	3	2	5	21
Speaking	2	4	2	2	---	2	1	3	16
Writing	3	4	3	2	1	5	1	---	19
Ethics	10	12	1	12	2	14	22	4	**77**
Technologies	15	2	7	6	5	8	2	21	**66**
Systems Thinking	9	2	3	9	1	---	2	2	**28**

Table 4

Co-curricular topic areas by activity type

Co-Curricular Topic Areas	**Educators Program**	**New Stud. Orient.**	**Organic Garden**	**Outdoor**	**Outreach**	**Res. Life**	**Sustain. Enterprise**	**Sustain. Events**	**Student Group**	**Themed Year**	**Frequency**
Sustainable Behaviors											**201**
Choices for living	X	X	X	X	X	X	---	X	X	---	72
Consumption	X	X	---	X	X	X	---	X	X	X	54
Local systems	X	X	X	---	X	X	X	---	---	---	40
Transportation	X	X	---	---	X	---	---	---	X	---	35
Material Cycles											**137**
Composting	X	X	X	---	X	X	X	---	X	X	39
Recycling	X	X	---	X	---	X	---	X	X	---	77
Upcycling	X	X	---	---	X	X	---	X	X	---	15
Waste and disposal	X	---	---	X	---	---	X	---	X	---	6
Energy											**110**
Energy topics and resources	X	X	---	---	X	---	---	X	X	---	50
Conservation	X	X	---	---	X	X	X	X	X	X	43
Hydro	---	---	---	---	---	---	---	---	X	---	1
Nuclear	---	---	---	---	---	---	---	---	X	---	1
Solar	---	---	X	---	X	---	---	X	X	---	11
Wind	---	---	X	---	X	---	---	X	X	---	4
Biology											**56**
Animals	---	---	X	---	---	---	X	X	---	X	7
Plants	X	---	X	---	X	X	X	X	X	X	47
General science	X	---		---	---	X	---	---	---	---	2
Ecology and Permaculture	X	X	X	X	X	X	---	X	X	X	**45**
Water	X	---	X	X	X	X	---	X	X	---	**38**
Soil and Agricultural	---	---	X	---	X	---	---	X	X	X	**23**
Policy and Law	X	X	---	---	X	---	X	X	X	---	**21**
Economics and Management	X	---	---	---	---	---	X	X	---	---	**18**
Geography and Geology	X	X	---	---	X	---	---	X	---	---	**16**
Forestry	X	---	---	---	X	---	---	X	X	---	**14**
Pollutants	---	X	---	---	X	---	---	X	---	---	**11**
Climate Change	X	---	---	X	X	---	---	X	---	---	**10**

3.1 Dominant Knowledge and Skills Areas Characteristic of Sustainability Programs

Related to the first research objective of identifying characteristics about educational programs that evidence high commitment to sustainability education, ecology (f=184), policy and law (f=153), biology (f=111), and global economics and infrastructure (f=89) were among the most frequently cited knowledge areas found among the formal education materials analyzed (Table 2). Likewise, problem solving (f=351), planning and management (f=136), civic engagement (f=83), and communication (f=79) were among the most frequently cited skill areas (Table 3).

3.2 Dominant Informal Education Topic Areas Characteristic of Sustainability Programs

Regarding the second research objective, the analysis of Co-curricular programs revealed that sustainable behaviors (f=201), material cycles (f=137), and energy (f=110) were among the most frequent topics covered by informal education activities (Table 4). In Table 4, Co-curricular education subcategories were condensed into ten activities for this study. The sub-category areas of Student Sustainability Outreach Campaign and Sustainability Outreach and Publications were merged because they both involved outreach activities. A similar combination was performed for the subcategory areas of Model Room in a Residence Hall and Themed Housing into one sub-category activity titled, “Residential Life” as campus accommodations, living space, and campus housing community events are encompassed by the university unit of Residential Life. The table illustrates the many subject areas included in co-curricular education via a variety of activities, events, campaigns, programs, et cetera.

Though the study found knowledge areas such as ecology, energy, pollutants, and water among both formal and informal types of education, some noteworthy differences exist. The selected and analyzed programs more frequently cited ecology, policy and law, biology, and economics, management, and global infrastructure among formal educational activities while discussing topics like sustainable behavior, material cycles and energy more frequently found among informal activities. Interestingly, none of the formal education analyzed cited the topic of sustainable behaviors. Admittedly, language differences may fuel this gap, as behavioral issues may very well be explored under knowledge areas such as ecology, policy and law, et cetera. Nevertheless, it is clear that a primary difference between the formal and informal educational experiences is that the informal activities are denoted by practical applicability to daily living.

4. Discussion and Implications

The primary objective of this study was to build a framework of essentials relative to sustainability education that could be used by educators within a discipline to integrate sustainability into their curriculum. Specifically, the study has worked to identify the core knowledge areas and skills most frequently included in undergraduate sustainability-focused academic programs. The study identified some key natural and physical science knowledge areas that are most frequently associated with sustainability programs, but also identified a number of social and economic components. In addition, the study also identified some core skill areas most frequently associated with sustainability education.

This framework of essentials were used by the authors in the FTC discipline to identify potential points for integration in the field as well as specific needs for future professional development support. The framework is not intended to suggest a literal list of topics and skills to integrate into curricula; rather, this understanding provides a conduit for reframing some areas of a discipline to include such competences. The following discussion is organized around Figure 1; an illustrative map of the sustainability education essentials identified in the study and how these may be used in specific parts of the FTC curriculum to enhance the quality of education. In addition, this exercise illustrates how other social science programs may conceptualize the integration of such essentials.

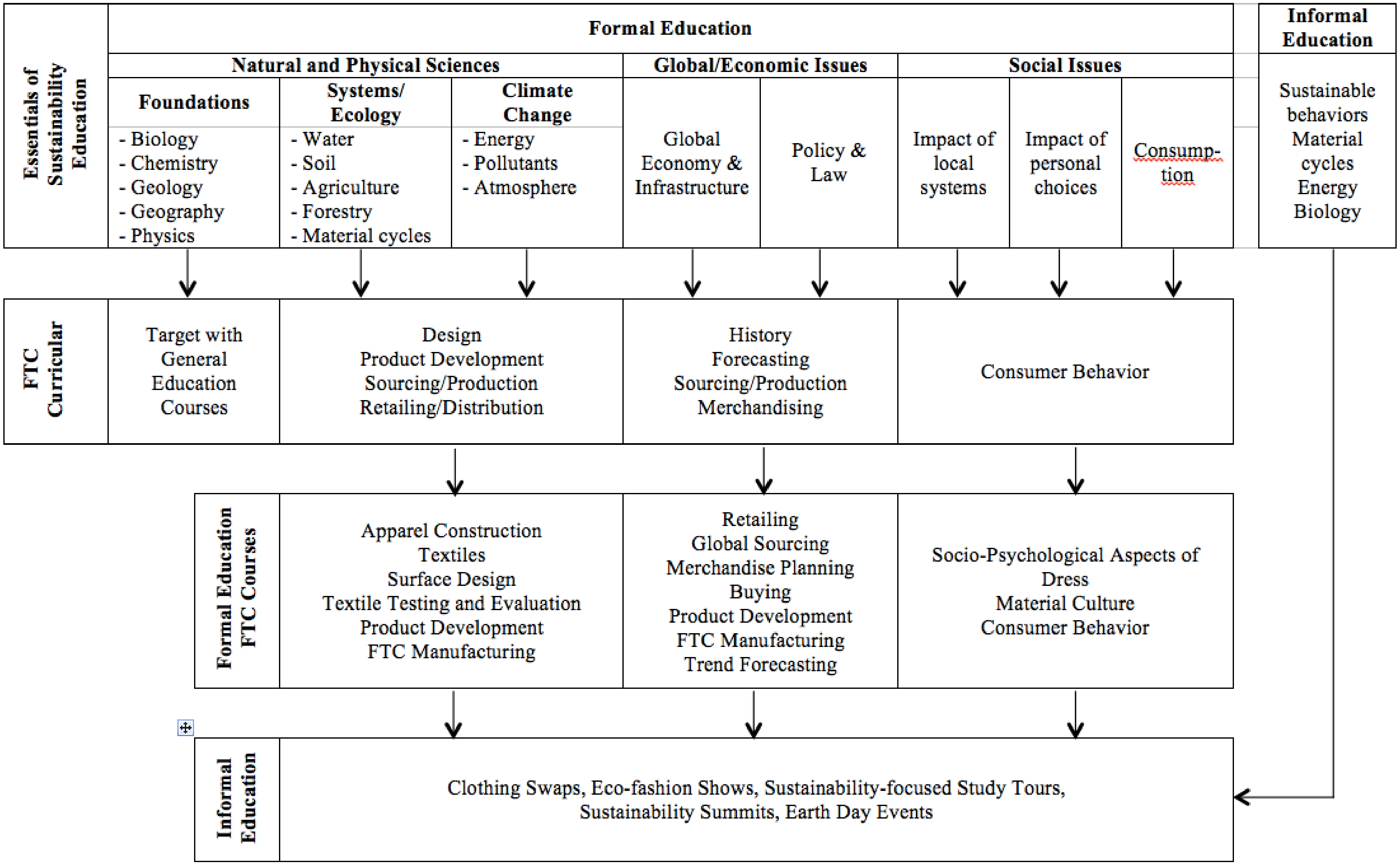

Figure 1. Integration of the essentials of sustainability education into FTC curriculum

4.1 The Essentials of Sustainability Education

For increased clarity, the sustainability competences were clustered into groups of interrelated items (see Figure 1). First, the data analysis revealed a variety of natural and physical science competences frequently cited as learning outcomes in sustainability academic programs. Some knowledge areas, such as biology, chemistry, and geography, were foundational areas not necessarily connected to sustainability explicitly, but considered requisite. Therefore, social science academic programs should consider enhancing general education requirements in natural and physical sciences, better preparing students to learn more specific sustainability science concepts in subsequent course work. The other two dominant natural and physical science areas discovered through data analysis were more explicitly connected to the topic of sustainability: systems (e.g. water, soil, material cycles) and climate change (e.g. energy, pollutants, atmosphere). These represent more specific and higher-level sustainability understanding that may be more appropriately handled within an academic program. Notably, the natural and physical science competences will most require professional development support for social science educators.

Global/economic issues, including infrastructure and policy and social issues such as understanding the impact of community and personal consumption choices also represent sustainability competences identified in this study. These topics may be connected to specific social science disciplines. Finally, problem solving dominated the skills targeted by sustainability academic programs, followed by other common capacities for planning and management (related to natural resources), civic engagement, communication and ethics. Similarly, although sustainability-related course content may specifically address these skills, it is also possible to enhance these skills through social science programs more generally and holistically.

4.2 Connecting the Essentials to the FTC Curriculum

Scholars have advocated for disciplines to problematize the concept of sustainability within specific fields, providing students with the discipline's interpretation of the relationship between humans and nature (Bonnett 2003; Stables and Scott 2002). The researchers in the current study sought to accomplish this by identifying connections between the essentials found in academic programs highly committed to sustainability education and the FTC curriculum. To facilitate this process, the researchers used two primary sources of information about the discipline. First, Ha-Brookshire and Hawley (2013) proposed a framework of the FTC discipline and highlighted seven major disciplinary foci: History/forecasting, consumer research, design, product development, merchandising, sourcing/production, and retailing and distribution, modeled after the major life cycle phases of clothing products. Additionally, the researchers gathered the course descriptions of required courses from five four-year FTC programs in the Midwestern United States. The latter information allowed the researchers to identify some common courses found across the curriculum, putting "skin" on the components identified above by identifying specific courses that could become the focus of sustainability integration. Finally, although this paper explicitly draws connections between the sustainability essentials and FTC curriculum, it would be feasible for other social sciences with similar goals of integrating sustainability content into curriculum to adapt the approach taken in this study to the specifics of individual programs.

When evaluating the potential connections between the natural and physical science knowledge areas, the researchers identified linkages by considering where environmental issues spike during FTC industry activities. Impacts on land as well as climate change are greatest in the design phase of FTC products, followed by sourcing and production as well as retailing and distribution. A closer look at the specific courses related to the design phase reveals a strong potential to enhance this competence area via the formal curriculum in courses such as the foundational textiles course found in most FTC programs. The textile supply chain is an example of a highly degrading environmental process due to the complex nature requiring extensive international, national, and local supply chain networks that must respond to the frequent changes in product lines and styles (Forman and Jørgensen 2004). Fiber production, dyeing and processing, garment assembly, transportation, and consumer use and maintenance also create enormous amounts of waste (Bhamra 2007; Chen and Burns 2006; Curwen, Park, and Sarkar 2013) and greenhouse gases that negatively contribute to climate change (Zaffalon 2010).

There is an urgent need to reframe foundational textile courses, along with other courses related to product development and manufacturing, with sustainability science; providing an enhanced understanding of the environmental and social impacts of production on water, soil, and forestry as well as energy and pollutants. For example, this learning might be facilitated by cases like cotton production and its excess water usage (Ha-Brookshire and Norum 2011) and the effect of insecticides, pesticides, and fertilizers with this crop on groundwater (Business for Social Responsibility 2009) and human health (Wilson 2000). Helping FTC students understand the systemic implications of industry decision making may concurrently enhance their capacity for problem solving and systems thinking, a central component of sustainability literacy (Dale and Newman 2005; McKeown 2006; Svanström, Lozano-García, and Rowe 2008; Wiek, Withycombe, Redman, and Mills 2011). Textbooks and other teaching materials related to these various courses currently do not adequately integrate such knowledge. Admittedly, this area of the formal FTC curriculum evidences the greatest need for renovation and innovation as well as the most substantial need for professional development support for FTC educators who currently lack training in the natural and physical sciences.

Requiring far less integration are the global/economic and social issues associated with sustainability challenges as these issues are already mainstays in the FTC curriculum. FTC has long been a global industry, employing millions around the world with a vast infrastructure. In this light, courses related to product development, retailing, and merchandising all have sustainability implications, but the goals of the current curriculum are not necessarily oriented to helping students understand the global implications of their professional decisions for sustainability. Moreover, there is little evidence among FTC course descriptions and learning outcomes to suggest that the topics of policy and law and their relationship to sustainability are covered with any degree of confidence. Pasricha and Kadolph (2009) argue that the current business focus in FTC and its emphasis on the bottom line does not aim to prepare individuals who can balance the drive to innovate with the need to advance positive change for sustainability.

The final knowledge area identified as essential within sustainability education is the social component of sustainability; specifically, understanding the impact of human behaviors and personal choices on sustainability. In the FTC curriculum, the disciplinary foci related to consumer research provides a conduit to integrate reflection on human behavior and sustainability into the formal curriculum via courses such as the socio-psychological aspects of clothing, consumer behavior, and material culture. Here, the emphasis must include but not be limited to the individual student as consumer, but to the student's future industry role and that system's impact on the persistent ailments of FTC business, such as human rights violations and threats to human and planetary health. Some issues associated with labor are already common components of the FTC curriculum and arguably an area that many FTC educators are most comfortable with. Thus, reframing content to include an understanding of the impact of the industry as system on sustainable development is anticipated to be relatively fluid.

As the goal of sustainability education is to alter attitudes and behaviors, these changes in the formal curriculum may be reinforced via informal educational activities that afford students the opportunity to experiment with alternative types of behavior (Cortese and Hattan 2010). Some FTC programs are already organizing sustainability-focused competitions and other informal educational events that indicate strong student interest and involvement, such as eco-fashion shows, clothing drives, student summits on sustainability, and student study tours that address issues of social responsibility and sustainability (Armstrong and LeHew, 2014).

Finally, upon review of course descriptions and learning outcomes related to the five Midwestern FTC programs referenced earlier, skills most frequently cited as student learning outcomes were problem solving and planning and management, though the former was heavily slanted to managing activities of the design phase, such as construction, production, and merchandising, not including the management of natural resources. The implication is that planning and management skills in FTC programs may be enhanced with linkage to sustainability impacts. This may require much more engagement with environmental impact assessment tools and the general enrichment of research skills. Again, there is also a scientific component to understanding the environmental ramifications of planning and management decisions. Communication and technological competency were also frequently cited among FTC programs. But these are again extended by the expertise required for civic engagement, cited in one FTC program as a learning outcome, and technological applications associated with environmental impact assessment.

5. Conclusion

While no one would argue that higher education faculty for all social science disciplines must consider how to integrate sustainability, the need to enhance FTC education for sustainability cannot be over stated. Certainly, by integrating the identified essentials into targeted areas of social science curricula, the quality of education could be enhanced, but the benefits go further, beyond the education and into the impact graduates can have in the world. The students trained by these programs who enter the FTC industry within the US are placed in a position to directly influence the raw material, production, logistics and marketing decisions that can increase the sustainability of the industry across the globe. However, lacking the basic understanding of the mechanism by which this or other industries impacts sustainability issues such as carbon production, water pollution or human trafficking places social science graduates at a disadvantage. By nature of their socially focused education, they may be filled with the desire to make good decisions, but the gaps in their natural and physical science foundation can make them vulnerable to missing important connections or misinformation (e.g. greenwashing) about how to actively create sustainability. Improving the integration of these essentials, however, will largely be constrained by the ability for disciplines to provide professional development support to aid the social science educator, especially in regards to the natural and physical sciences behind the sustainability challenges we face today. It is our hope that the framework of essential knowledge and skill areas illustrated here may provide a conduit for reframing, and in some cases renovating, components of the social sciences to better prepare citizens for the global challenges that are increasing in severity.

6. Limitations

Limitations of this study include the use of STARS as a tool to identify institutions evidencing the greatest commitment to sustainability education. Institutions can submit sustainability information to STARS over a three-year time period for credit rating. This broad time frame may have limited the submission of real-time sustainability academic programs offered or co-curricular programs occurring on collegiate campuses. Academic program evaluation was limited to secondary resources available online. Additionally, the selection and weighting of criteria to be included in STARS reporting is inherently imperfect and is evolving as the activities related to sustainability continually expand in higher education.

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