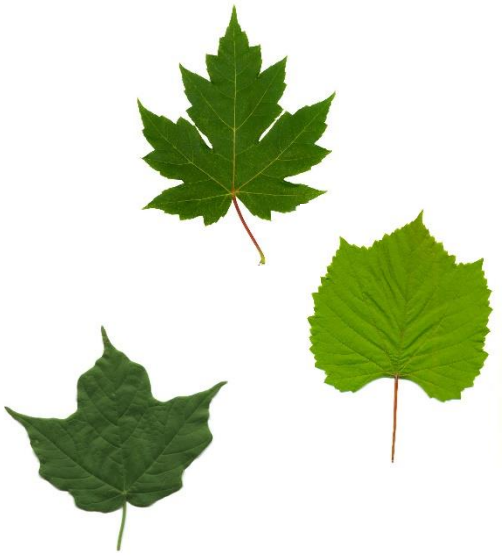
VIRTUES

(vertical integration of research, and technical, undergraduate, and graduate education for sustainability)

Summary Findings:

Roadmap for Post-Secondary Sustainability Education and Training



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ABOUT VIRTUES

With financial support from the Ray C. Anderson Foundation, a core team of researchers from the Georgia Institute of Technology, Georgia Southern University, and the Board of Regents of the University System of Georgia began a study in 2013 called *Vertical Integration of Research, and Technical Undergraduate, and graduate Education for Sustainability (VIRTUES)*. VIRTUES investigated how colleges, universities, and technical colleges in Georgia can work together to introduce the customs of sustainability during the higher educational experience when minds and practices are still forming, rather than later in the workplace at great cost to employers.

THE CHALLENGE

It is largely accepted that “sustainability” is a broadly interpreted concept whose meaning can change based on context and perspective. It is no surprise then that sustainability education as an academic discipline is equally ambiguous and lacking a universal core of knowledge and pedagogy that defines it. Among Georgia’s 30 state universities and colleges, 23 technical colleges, and dozens of private post-secondary educational institutions, there are only a handful of degree programs, minors, and certificates offered that even attempt to directly address sustainability – and relative to the ~500,000 students annually enrolled in Georgia higher education schools, these programs only touch a small fraction (<1%) of the student body. A key postulate of VIRTUES, however, is that business enterprises, government agencies, and other organizations can become more sustainable more quickly if individuals and units can coordinate their sustainability minded intentions and actions. For example, manufacturing is a relay of processes that occur across long chains of value. These chains may include activities as various as designing of goods, financing of business plans, acquiring raw materials, the fabrication of primary parts, the assembly of products, the transport and warehousing of goods, the marketing and sales of products, the consumer experience, and the disposal or recovery of residual materials and energy. Within each link, value is both produced and consumed, and agents work to optimize each process to maximize profits, reduce environmental harms, and meet social goals. Some agents may be able to bundle several activities under one common management scheme and optimize across several processes at once. Such “vertical integration” can result in benefits that are greater than those possible when each process is considered separately.

Unfortunately, few agents have the capacity to source every activity in-house – nor would most want to extend themselves beyond their core competencies. Still, the promise of whole systems optimization remains a desirable goal, for people, the planet, and the bottom-line. To get there though, requires a level of trust, cooperation, and synchronization between multiple agents that is not intrinsic to a system that reduces problems to be solved by different disciplines, and divides labor to be allocated among different trades. When and where it does work, companies, their suppliers, and their customers communicate openly, share practices, and collaborate on problem solving. They invest in learning about each other, their needs, and their challenges. Right now, engineers, managers, and trade-workers at progressive companies all over the world are teaching themselves how to do this. They are the pioneers of the forthcoming Clean Tech / Green Tech revolution in manufacturing – or as Ray Anderson was fond of saying, “the Next Industrial Revolution.” The key question raised here is: can this labor integration that is so critical to sustainability be initiated further up the workforce supply chain and into the universities, colleges, and technical schools? This would suggest a need for a shared language and conceptual foundation on which to create common ground. The challenge that VIRTUES set for itself was to create a roadmap that all the higher education schools in Georgia could follow to form (or at least begin to form) a common culture and understanding of sustainability that students could take with them post-graduation into employment and their communities.

STUDY FINDINGS

VIRTUES began with an amalgam of workshops, surveys, a literature review, and individual interviews inquiring about the need for workers with sustainability skills, and the ability of higher educational institutions in Georgia to help students develop those skills. The study invited input from Georgia based large corporations, small businesses, government agencies, and higher education institutions (technical colleges, colleges, and universities). The outcome of this investigation was a list of 11 generalizations that apply across all different employment sectors and across all different post-secondary educational institutions.

1. Employers greatly value prospective employees that have educational experiences collaborating in "the real world." In terms of non-peer interactions, however, students have scant opportunities to work with students from other universities or colleges, and during the time that they are still in school, do not often have scholarly or professional interactions outside of their own disciplines.
2. Competency in a host of soft skills including the ability to manage multiple priorities, possessing creativity in solving complex problems, and demonstrating the ability to think critically, plan strategically, and act logically are all important for individuals, but when working on teams, explicitly knowing one's own strengths (and weaknesses), and the strengths of the other team members, may be just as important.
3. The business case for sustainability is of paramount importance to the company, but for individual students or employees to connect to sustainability, the connection has to be personal, of direct interest, and of direct benefit.
4. Workplace sustainability initiatives were largely started and led by management for sound business reasons. "Because it is the right thing to do" is not a compelling enough reason to act.
5. Undergraduate individual courses offer the most opportunity to engage large numbers of students, however, requiring courses for students that do not want them, or surreptitiously including sustainability content in courses in which students are not expecting it, can foment resentment and distrust that can undermine the best of intentions.
6. Because it tends to be more specialized, graduate and trade education may be the most difficult higher education segments for sustainability to gain traction.
7. Extra-curricular and co-curricular activities present tremendous opportunities for introducing students to and engaging them in sustainability. This is tempered, however, by the understanding that many extracurricular activities are student led, for which enthusiasm, commitment, and engagement can widely vary from year to year, leader to leader, or campus to campus. Consistency is difficult to achieve or even predict.
8. Funding for sustainability in campus capital projects and operations has not carried over to the education side and the campus as classroom or laboratory remains largely underutilized for sustainability education and training despite a few resourceful faculty and administrators finding ways to use the facility and its staff to help introduce, teach, and inspire students.
9. There is wide variation in sustainability education, however, introducing a few concepts around lean manufacturing or community engagement are usually enough to get teams up and running with ideas, energy, and enthusiasm.
10. Assessment is limited or non-existent, but it is recognized that the process of continuous improvement ultimately is more important than the goal.
11. There is no common core of knowledge or skills for which all students are expected to obtain, and by extrapolation, can find common ground over later in their careers, nor are there any compelling reasons to create degree programs for which there are no clear pathways that connect the sustainability education and training to future employment or graduate school.

These findings altered the initial beliefs of the VIRTUES investigative team. At its outset, the investigators ultimately imagined programs of study, or projects of research or service, that involved interactions among a mixture of students from Georgia's public and private research, comprehensive, and state universities and colleges, and technical colleges. The investigators found almost no precedent for such intercollegiate non-athletic student interactions, however, and most faculty expressed skepticism that an effective intercollegiate education program could be accomplished – and certainly not at large scale. The reasons cited included students do not have time; lack of faculty interest; differing academic cultures between non-peer institutions; distance between campuses; disagreement over curriculum; and absence of accreditation. Though it is reasonable to assume, then, that students from a broad spectrum of disciplines will interact later in their professional and civic lives, higher education has evolved to segregate students by university and by academic discipline. The consequence of these long-standing structural divisions is that an initiative like VIRTUES that aspires to "pre-wire" students to enable them to connect later, may not be so easily achieved.

In abandoning the novel idea of providing academically diverse students with more opportunities to mix, mingle, and learn in ways that mimic the sustainability practices of successful organizations, VIRTUES looked at the current ways that college students in Georgia are being educated about sustainability. On the surface, there appeared to be a wide variety of instruction across different schools, but on closer consideration, the VIRTUES investigators surmised that the variations could be distilled into 6 general approaches:

Sustainability Instruction Format	**Examples**
1. Programs of study resulting in formally designated degrees, minors, and certificates in sustainability	University of Georgia: M.S. degree in *Conservation Ecology and Sustainable Development*; Savannah Technical College: diploma in *Sustainable Technology*; Kennesaw State University: Bachelor of Science in *Culinary Sustainability and Hospitality*; Lanier Technical College: *Sustainable Urban Agriculture Technician* technical certificate
2. Programs of study that are heavily influenced by the concepts of sustainability	Georgia Southern University: BA, BS, and MS degrees in *Biology*; Savannah State University: BS degree program in *Environmental Science*; Ogeechee Technical College: undergraduate certificate in *Photovoltaic Systems Installation and Repair*
3. Individual courses in sustainability or heavily influenced by the concepts of sustainability	Valdosta State University: *ECON 3850 Sustainability: An Economic Perspective*; Georgia College & State University: *ENSC 1050 Sustainability and World Pop*; Georgia State University: *PERS 2002 Scientific Perspectives on Global Problems*; Emory University: the *Piedmont Project* is a series of training workshops for faculty to learn about sustainability and how to incorporate sustainability content and context into new or existing courses

4.	Learning sustainability concepts through the example of campus facilities and operations	Clark Atlanta University: *LEED-silver renovation of Wright Young Hall*; Georgia Tech: *Campus Recreation Center Solar Array*; Agnes Scott: *Campbell Hall Geothermal HVAC system*; Augusta University: *Medical Center Energy Star Certified*; Emory University: *WaterHub*
5.	Student-led or initiated extra-curricular activities	Abraham Baldwin Agricultural College: *Students Envisioning Economic Developments in Sustainability*; Columbus State University: *Students for a Sustainable World*; Mercer University: *Students for Environmental Action*; Oglethorpe University: *Environmentally Concerned Oglethorpe Students*
6.	Intensely infused and broad-based curriculum development and reform	Georgia Tech: *Serve-Learn-Sustain Quality Enhancement Plan*

Unfortunately, none of these approaches are expected to yield fully the outcomes desired by VIRTUES for consistent, wide scale education across all the universities, colleges, and technical colleges in Georgia that prepare students to contribute collaboratively to the sustainability of organizations and communities. In the first approach, there are few degrees, minors, diplomas, and certificates in sustainability that are even offered at Georgia's schools and only a small handful of students that are actively pursuing them. The pools of students engaged are larger in the second and third approaches, but sustainability is less the learning objective (e.g. principles of biology) and more a means for achieving the learning objective (e.g. biology in its political, economic, social, and environmental context). Even in the sustainability focused classes (often offered as electives rather than as required core courses), it is difficult to discern how much "sustainability" students are taking away from these courses as they are assessed for their contribution to the breadth or depth requirement for the students' degree programs, but they are not assessed for their learning about sustainability itself. This is true even more in the fourth approach in which the campus facility is presented as a passive teacher of sustainable practices. That the number of LEED certified buildings on the campuses of Georgia's universities, colleges, and technical colleges has grown from zero to 75 in the last 15 years is an acknowledgement of the sound financial, sociological, and environmental reasons for building green. Their contribution to student learning of sustainability is assumed but has not yet been affirmed. At least the performance of the buildings, though, is relatively consistent from year to year. The same cannot be said of the student-led activities – the fifth approach. As organizations are led and populated by transient students, energy, enthusiasm, and priorities can fluctuate widely from one academic term to the next depending on the interests, passions, and capabilities of the leaders and members present at the time. Further there is no common core of principles and values from which all sustainability related student organizations derive their missions. Some may focus on business (e.g. Net Impact), while others may focus on service (e.g. Engineers for a Sustainable World). Variability in extra-curricular activities is substantially attenuated in programs that have been formally institutionalized and are overseen by academic faculty or professional staff (often at the behest of student-led campaigns to use mandated fees to formally fund sustainability initiatives on campus). Year-to-year programming and outcomes are more consistent and predictable, but again, assessment of impact and effectiveness are unknown. The sixth approach, to infuse all university and college programs and students with sustainability is only being attempted by one school in Georgia (Georgia Tech) and its efforts are in a very nascent stage. If it is successful, it may provide a new educational model by which other schools can replicate, but it should be acknowledged that it requires a substantial level of commitment and resources that other universities and colleges may not prioritize or have available. Finally, none of the six currently practiced approaches addresses the "vertical integration" ideal that is central to the VIRTUES postulate of a truly sustainable enterprise.

ROADMAP

Such is the general state of sustainability education in Georgia's universities, colleges, and technical colleges, and the dim prospects for molding existing educational efforts into a cohesive plan for wide spread training in sustainability that would enable all students to enter the workforce with an ability to communicate and collaborate with peers and non-peers alike to create a learning organization that continuously becomes more sustainable. This is the point from which this "roadmap" now unfolds.

Encouragingly, general sustainability education may not be as complicated or as difficult as perceived. Indeed, outside of higher education, organizations and businesses have conducted successful sustainability training exercises with their employees in as little time as a single afternoon. Other programs have extended over several days, but even across longer time periods, the contact time is considerably shorter than almost all the programs and courses described above in Georgia's universities, colleges, and technical colleges. The following then, may be considered this study's eponymous virtues for a universal sustainability training program that pre-conditions students to be ready for organizational roles that will be central to increasing the sustainability of their future employers and communities, and can be initiated while students are still enrolled in post-secondary education. It is expected that they could be adapted to meet the highly varying needs and demands from the widest span of academic and trade disciplines, yet provide sufficient continuity that all participants can find common ground now or later in their careers. These college attained general sustainability "skills" are the foundations on which employer or program specific sustainability education and training can later be added (at reduced cost and time).

1. **Find personal meaning in sustainability**. Most sustainability training programs begin with participants examining why sustainability matters. Rather than a common meaning, though, participants should be encouraged to discover their own personal connections. Not limited only to these, there are at least 4 categories in which participants often find their connections:

    a. Job performance / success of the enterprise / increased opportunities – these are the typical metrics of business and organizational success. Individuals may see sustainability as a pathway to earn more money, rise in rank or stature, or become qualified for new jobs. They may see how their organizations can gain market share, become more competitive, or increase profits that would also be of direct personal benefit.
    b. Moral / ethical / religious / social obligation – these can encompass a wide array of thoughts derived from many cultural, familial, and spiritual origins. They can be publicly expressed or highly personal and private. There are many reasons why an individual may feel compelled to act in a more sustainable way: to serve the poor, to right an injustice, or to care for the divine creation are but just a few.
    c. Safety / security / resilience – these may be personal or communal and address a variety of natural and human-made threats. Individuals may be interested in mitigating risks to their physical, fiscal, and social wellbeing. Examples might include being able to escape or weather a storm or an economic recession; to avoid or recover from illness, injury, or crime; to maintain a home, family, and friends; and to sustain the vigor and courage to explore, create and pursue new opportunities, and to grow in body, mind, and spirit.
    d. Independence / autonomy / freedom – these attributes can be highly personal, but may also apply at higher organizational levels such as firms, states, and nations too. Maintaining the ability and resources to support one's self and provide for one's family can be a culturally important affirmation. Equally important can be a cultural identity that citizens may derive from their nation being strong or resourceful enough to not depend on the imports, aid, or protection it receives from other countries.

    An important objective of any sustainability education and training program should be to ensure that every student finds his or her unique personal meaning and connection to at least one of the many possible outcomes that can result from more sustainable practices. Perhaps the most efficient means for a facilitator to help students find this meaning within themselves is to work backwards from the students own ideals and help them discover how the principles and concepts of sustainability can contribute to the realization of their goals. Students' would be recognized as meeting this objective when they can

articulate why sustainability is an important means for helping them achieve their own personal goals.

2. **Focus on connections more than depth**. By most definitions, sustainability pays reference to economic, environmental, and social issues and how they vary from place to place or time to time. Different proponents may emphasize one issue over the other (e.g. environmental sustainability or social equity), or they may pay equal attention to all three. Without regard to the relative weights in which the different elements might be featured by different parties, perhaps the most crucial concept here is to recognize the connections between processes and outcomes, some of which may be removed by several degrees of separation. For example, a new manufacturing process could reduce the amount of electric power consumed, saving the company money, while also eliminating the need for electric power peaking generators, whose absence results in better air quality that improves public health in the community making the region more attractive for other firms to locate, which increases the size of the local market. Helping students simply to become aware that these kinds of connections exist, that they can be described (or mapped), and that they can be managed (and mismanaged), would go a long way towards setting them on a path towards more sustainable practices in their present and future professional and private lives.

   The process of student learning about connections can be facilitated readily by linking this learning objective in a group setting with the first learning objective, finding personal meaning. Inevitably, any collection of students will have diverse values and reasoning. Exploring together, students can be asked to map the logical consequences of different actions (e.g. a college's decision to conserve energy) and how it might affect them in ways that they care (e.g. lowering the cost of college, reducing greenhouse gas emissions, or raising the profile of the school). While the maps will begin with the single prescribed perturbation introduced into the "more sustainable scenario" by the instructor, the maps will end at points at which each individual student's own interests are affected. The intervening points are the connections. In some maps, some students' connections will be shared. In other maps, some students will have wholly unique pathways radiating out from the initial perturbation. In still other maps, there will be loops that feedback on some processes either amplifying (positive feedback) or stabilizing (negative feedback) their effect. Students can also improvise off the pathways that other students have created to express how these alternate paths also affect them.

3. **Know your own strengths and those of others**. Common to many sustainability and leadership professional development programs are course modules that help individuals identify and understand their personality type, management approach, learning style, or personal talents. These modules may use open access or proprietary assessment tools such as Myers-Briggs, 360 degree feedback, and the Clifton Strengths Finder. A common and important quality of these and other tools like them is that they tend to highlight the unique perspectives, skills, and talents that individuals have, and how those traits have value and can contribute to the success of the individual/team/organization/community. Without explicitly confronting the persons being assessed with an account of their own shortcomings, they also help participants realize, often with the help of facilitators and counselors, that others bring additional and complementary perspectives, skills, and talents that also have value and can contribute to the even greater success of the team/organization/community. When done in a group context, the exercise may raise empathy among the participants that translates into a willingness to listen and share, to consider other viewpoints, and to find common ground. The presumption is that increased empathy can lead to increased cooperation and coordination, for example, along a supply chain with different actors that have different values and objectives. If in doing so, processes can be made more productive for employers, more valuable for customers, more just for employees, more benign towards the environment, or more attentive of the needs of the community, then it will increase sustainability. Even if they don't instill true empathy, these types of experiences should bring an awareness about other potential factors important to consider when making broad organizational decisions.

While these exercises can be enlightening at any stage of one's personal growth and development, there would appear to be more value exploring empathy in the context of VIRTUES' goals once a participant has a strong perception of one's own self. At least in regards to this aspect, this would suggest a college based general sustainability training program could be more effective nearer the end of students' collegiate careers when their self-identities as adults are more established. Students of course can and do understand the concept of empathy earlier in their lives, but in the context of workforce skills, it might not be as useful an idea to explore until they have a clearer understanding of what it is that their prospective profession demands from them.

4. **Acquire a holistic perspective**. A myopic focus on the competencies and accomplishments of any individual or organizational component can threaten attainment of broader goals. The old medical rationalization that "the operation was a success but the patient died," is an apropos analogy. Doing one's job well may not be enough. As higher education becomes more reductive and specialized, there is a need for students to train in some form of strategic thinking that challenges them to inquire about the purpose of their actions and how they contribute to their own, or to an organization's or community's, larger mission. This kind of inquisitive mindset requires students periodically to look up from their immediate work, and to ask contextual questions that further explore the depths of personal meaning, maps of connections, and empathetic relationships that were brought into students' consciousness through the previous three skill development objectives.

   While holism seems to be an innate human perspective, it is somewhat of an anathema to vocational/professional education. It is further dissuaded in the workplace in which the Frederick Taylor method of scientific management and division of labor dominates. Fortunately, the industrial quality movement that grew to prominence in the latter half of the last century reignited interest in holism that led to effective techniques for training workers to develop this strategic perspective for themselves. For example, training programs like "Lean Manufacturing" and "Six Sigma" employ a technique that compel trainees to ask "5 Whys" for rooting out the primary cause of problems. "5 Whys" leverages the natural wonder most everyone has as a child before our schools and workplaces train us to focus and narrow our viewpoint. In addressing a problem, students and workers are advised to ask "why" the problem exists. The answer to that first "why" is subjected to the "why" question again to explore the preconditions that created the original problem. Repeated a total of five times, the technique leads the inquirer to uncover the root cause of a problem and identify systemic solutions, some of which may be distant in time, space, or class from the original topic. Another approach is to engage students in problem/place/product-based learning. The system studied does not matter as much as the requirement that the target of attention is in fact a single contiguous system that forces students to address (and resolve) multiple objectives and deal with upstream and downstream consequences. These techniques, and others, can be adapted and employed in the pursuit of training programs for sustainability to encourage students to rediscover their latent "systems thinking" viewpoint.

5. **Understand that sustainability is not a goal, it is a process**. Only nature has a proven record of achieving a sustainable state. Human enterprise can aspire to be sustainable, but its pursuit will be asymptotic – ever approaching but never quite reaching the divine goal. The objective that is adopted, then, should always be to seek continuous improvement. It is in this regard that sustainability training can perhaps borrow again from the late 20th Century quality movement. Proponents of *Kaizen*, the Japanese coined practice of continuous improvement, stress the value of making frequent, small, and achievable changes that compound over time leading to big improvements later. The challenge for students is to trust that the steady investment process works, to be open to trying, and to not be discouraged if tangible change did not occur immediately. So while students can be introduced to the simple prescription for participating in a Kaizen event, it may be just as important to share successful case studies that are relevant to them. Games and computer simulations can also be useful for students to learn about process oriented thinking and how it applies to sustainability.

NEXT STEPS

To be clear, mastery of the five objective skills in the roadmap are not sufficient to attain any kind of competency in sustainability. They are, however, necessary for becoming a successful practitioner of sustainability. Pre-conditioning students before they reach the workplace may make it easier and more effective for firms, organizations, and communities to later develop and implement plans for increasing sustainability that are context specific (e.g. at a specific manufacturing facility, within a particular discipline, or at a distinct location). The next step would be to develop curricula and pedagogies for teaching the common five objective skills to students in different programs of study tailoring the content and approach to fit the student learning pathway. That is, while the five objective skills would be consistently introduced to all students at all technical colleges, colleges, and universities, the means and materials for teaching it will vary as appropriate to maximize engagement, comprehension, and retention. Delivery is envisioned to be in the form of workshops that may be as brief as a few hours, or as long as a few days, or via online through Massively Open Online Course modules. Lastly, assessment tools must be concurrently developed that measure effectiveness, and can be used to identify the optimum curriculum and delivery approach for any given target student audience.

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ABOUT THE RAY C. ANDERSON FOUNDATION

The Ray C. Anderson Foundation was created in honor of the late Ray C. Anderson (1934-2011), founder of Interface, Inc. During his time at Interface, Ray championed the notion of businesses doing well by doing good. It's these noble qualities of advancing knowledge and innovation around environmental stewardship and sustainability that recognized Ray as a pioneer in industrial ecology. The purpose of the Foundation is to perpetuate these shared values and continue the legacy that Ray left behind. Through research and funding, the Foundation aims to help create a better world for future generations—tomorrow's child. Web: www.raycandersonfoundation.org